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August 26, 1976

LAWRENCE BERKELEY LABORATORY

HEALTH AND SAFETY REGULATIONS

It is the policy of the Lawrence Berkeley Laboratory, and the responsibility of each person at the Laboratory, to provide a safe and healthful work environment. Because of the experimental nature of much of the work at the Laboratory, the programs often involve the use of potentially hazardous techniques, equipment, and material. Thus it is incumbent on every employee, visiting scientists, or any other person performing work at the Laboratory or at one of the Laboratory's off-site facilities, to be familiar with and to carry out applicable safety standards.

To achieve its safety goal the Laboratory's safety program requires that supervisors and employees--

- Comply with ERDA's safety and environmental control policies
- Plan and perform experiments and supporting work with full consideration given to prevention of accidents
- Proceed with work only after all the required safety controls are functioning
- Train employees to perform safely those operations that are potentially hazardous
- Maintain continual surveillance and evaluation of potentially hazardous conditions including methods of controlling them
- Prepare Operational Safety Procedures for operations that involve potentially hazardous conditions, and are not covered by the Health and Safety Regulations
- Correct hazardous conditions promptly after they are discovered.

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To aid supervisors and employees in establishing and maintaining an accident free work environment, the Laboratory provides the Health and Safety Regulations for general guidance. In addition, the services of the Safety Services Department, the Health Physics Department and the Medical Services Department are available for specialized support skills and resources. The personnel of these groups evaluate operations for hazardous conditions, recommend methods of safe operation, and monitor the work environment for all groups at the Laboratory, on or off-site.

Employees are required to use these services to assure that a complete safety program is developed for the situation or operation.

Andrew M. Sessler

Andrew M. Sessler
Director

Introduction and Explanation of Cited References

A. Introduction

This manual, THE HEALTH AND SAFETY REGULATIONS, is intended as a general purpose manual that covers all the occupational health and safety problems that may be encountered at the Lawrence Berkeley Laboratory.

The manual is divided into two parts. The first part contains guidelines and regulations for maintaining a safe work environment. The second part defines the responsibilities and functions of the various components of the Laboratory's safety establishment.

This manual is designed to be easily revisable as new regulations and guidelines are developed. From time to time, holders of the manual will receive pages to be added to, or to replace, the existing pages. It is the responsibility of the holders of these manuals to keep the manuals up to date.

B. Explanation of Cited References

Part I of the manual follows the same general subject outline as Part 1910 of Title 29 of the Code of Federal Regulations. Part 1910 is based on the Williams-Steiger Occupational Safety and Health Act of 1970. It is commonly referred to as "OSHA". Sections 1 through 15 of the manual correspond to subparts D through S of OSHA. Sections 16 through 20 cover topics not specifically mentioned in OSHA.

In writing the guidelines and regulations, an effort has been made to keep the instructions as simple as possible. Most of the instructions are taken directly from OSHA or other appropriate regulations. For a more detailed and technical treatment of a particular subject, the reader should consult the regulatory manuals cited at the beginning of each subsection. Safety Services maintains a complete and up to date set of these manuals and should be consulted whenever more detailed information is required. In addition, at least one copy of OSHA will be assigned to each department head and to each building manager.

The following is a key to the most common references cited in this manual:

OSHA 1910	= Title 29 Code of Federal Regulations
10CFR Part 20	= Federal Standards for Radiation Protection
41CFR Part 50	= Public Contracts, Department of Labor
ERDAM or AECM	= ERDA Manuals
LBL, UCRL, and UCID	= Lawrence Laboratory Publications

ANSI = American National Standards Institute
NFPA = National Fire Protection Association
CGA = Compressed Gas Association

C. Page Numbering

The number at the top of each page in Part I refers to the section and subsection. The number to the left of the decimal point is the section number and the three digit number to the right of the decimal point is the subsection number. If a subsection takes up more than one page, the additional pages are identified by a decimal fraction to the right of the subsection number.

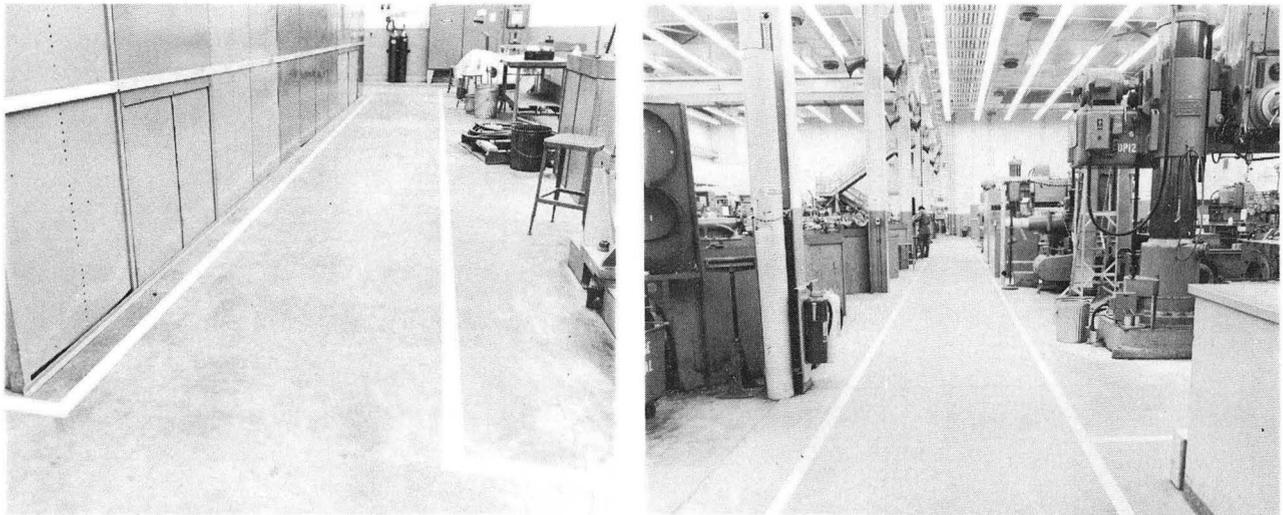
Section
|
Subsection
|
Continuation of subsection
|
5.105.2

D. Recommendations and Regulations

The safety instructions found in each subsection under the heading IMPLEMENTATION are either recommendations or regulations. Recommendations usually contain the phrase, "should be," and while not mandatory, are requirements Laboratory safety officials deem necessary for adequate worker protection. Regulations usually contain the words "shall," or "must" and are mandatory safety requirements. Variances from these requirements are granted only by the Safety Review Committee upon recommendation of the appropriate Laboratory safety official.

**1 WALKING &
WORKING SURFACES**

WALKING AND WORKING SURFACES
GENERAL REQUIREMENTS



NEED

Work areas free from tripping hazards and unnecessary obstructions.

IMPLEMENTATION OSHA 1910.22

Passageways, storerooms, and service rooms shall be kept clean and orderly.

Workroom floors shall be maintained in a clean and, so far as possible, a dry condition. Drainage, mats, platforms, or false floors should be used where wet processes are used.

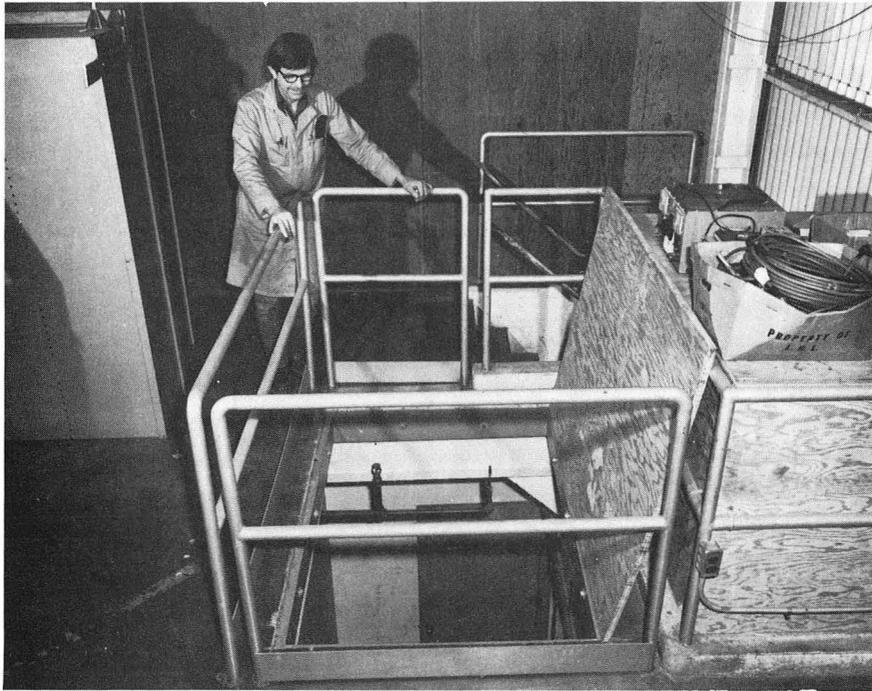
Floors shall be free from protruding nails, splinters holes, and loose boards.

Aisles and passageways shall be kept clear and in good repairs, with no obstruction across or in aisles that could create a hazard.

Permanent aisles and passageways shall be appropriately marked.

For further information call Safety Services, Ext. 5251.

GUARDING FLOOR OPENINGS AND HOLES



NEED

Protection from falls through floor openings.

IMPLEMENTATION OSHA 1910.21 (a), 1910.23 (a)

DEFINITIONS

Floor holes 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.

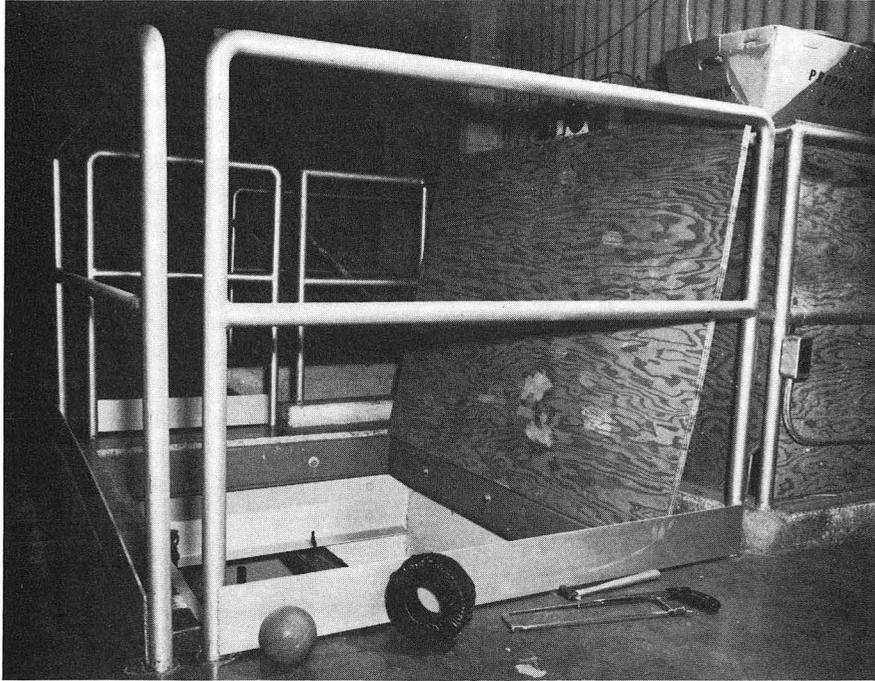
Floor opening An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard through which persons may fall; such as a hatchway, stairs or ladder opening, pit, or large manhole.

Stairway floor openings shall be guarded by railings on all sides (except at entrances to the stairways).

Ladderway floor openings or platforms shall be guarded by standard railings with standard toeboards on all sides (except at entrances to openings), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

Hatchways shall be guarded by one of the following:

(over)

GUARDING FLOOR OPENINGS AND HOLES

Hinged floor opening cover of standard strength and construction equipped with standard railings.

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.

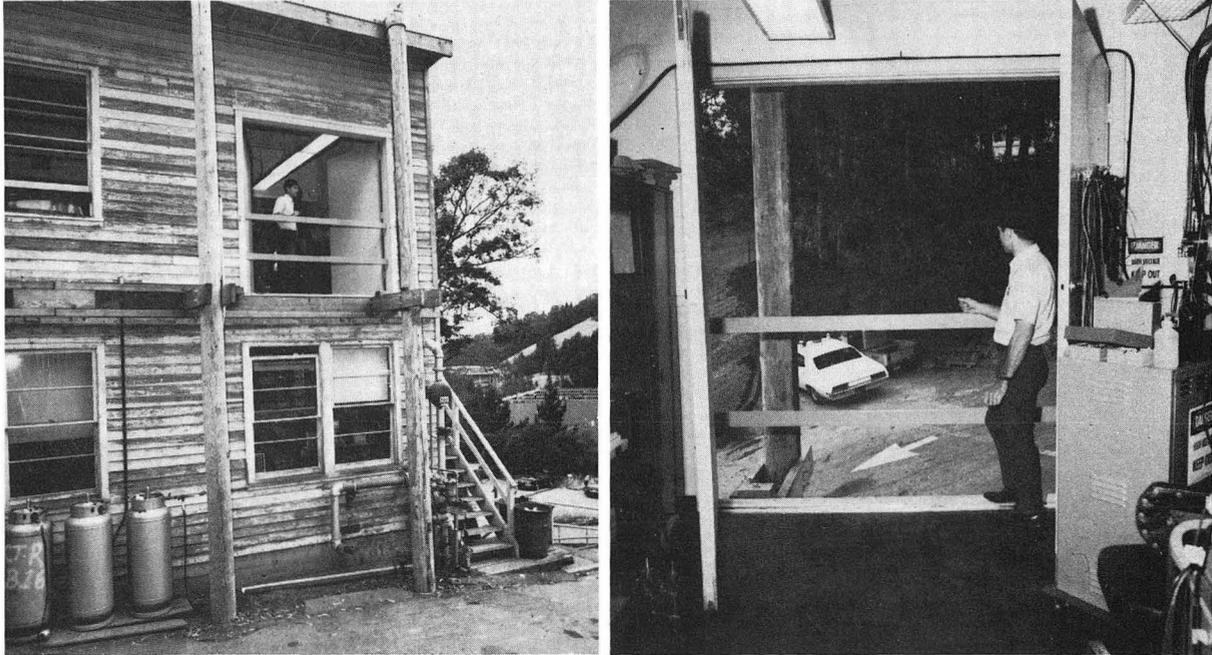
Manhole floor openings shall be guarded by a standard manhole cover. While the cover is not in place, the manhole shall be protected by a removable standard railing, or constantly attended by someone.

Floor openings into which persons can accidentally walk shall be guarded by a standard railing with standard toeboard on all exposed sides, or be provided with a hatchway as specified above.

Doors or gates that open directly over a stairway shall be provided with a platform. The swing of the door shall not reduce the effective width of the platform to less than 20 inches.

Floor holes shall be protected by a cover that leaves no openings more than 1 inch wide. The cover shall be securely held in place to prevent tools or other materials from falling through.

For further information call Safety Services, Ext. 5251.

GUARDING WALL OPENINGSNEED

Protection from falls through wall openings.

IMPLEMENTATION OSHA D 1910.21 (a), 1910.23 (b)

Definitions

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. A chute wall opening has a material chute attached. A window wall opening is glazed with glass or other window glazing material.

Every wall opening from which there is a drop of more than 4 feet shall be guarded by the following:

Fixed or removable standard railing, slots or grillwork, half-door, or equivalent barrier, or an extension platform equipped with fixed or removable standard railings. The requirement for guards does not change when a full door is used to close the wall opening when not in use.

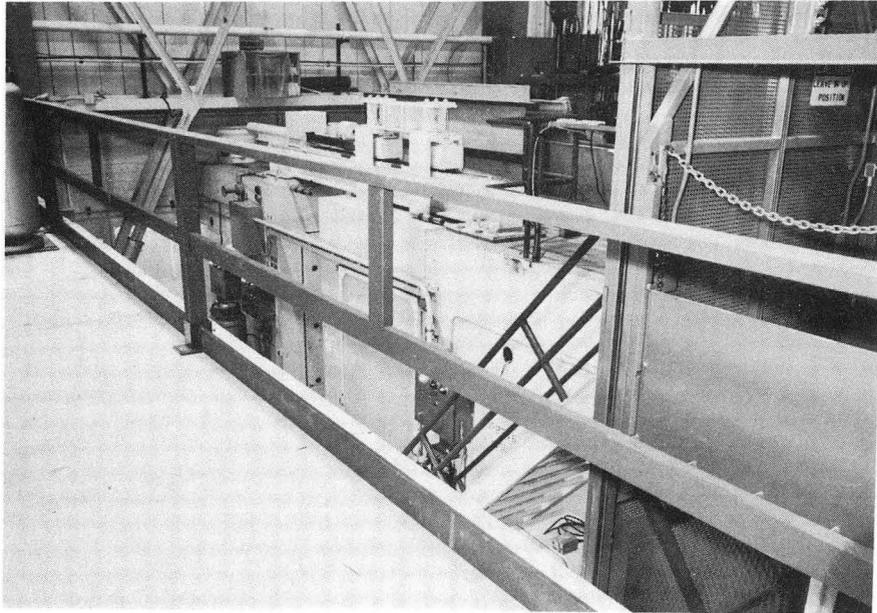
Every chute wall opening from which there is a drop of more than 4 feet shall be guarded by barriers equivalent to those recommended for wall openings mentioned above.

(over)

GUARDING WALL OPENINGS

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 rails, slots, or grillwork. Where the window wall opening is below the landing or platform, a standard toeboard shall be provided.

Every temporary wall opening shall have standard guards as specified above.

GUARDING OPEN-SIDED FLOORS AND PLATFORMSNEED

Protection from falls and falling equipment.

IMPLEMENTATION OSHA 1910.23

Open-sided floors, platforms and runways higher than 4 feet shall be guarded by standard railings.

Toeboards shall be used on open sides of floors, etc. wherever:

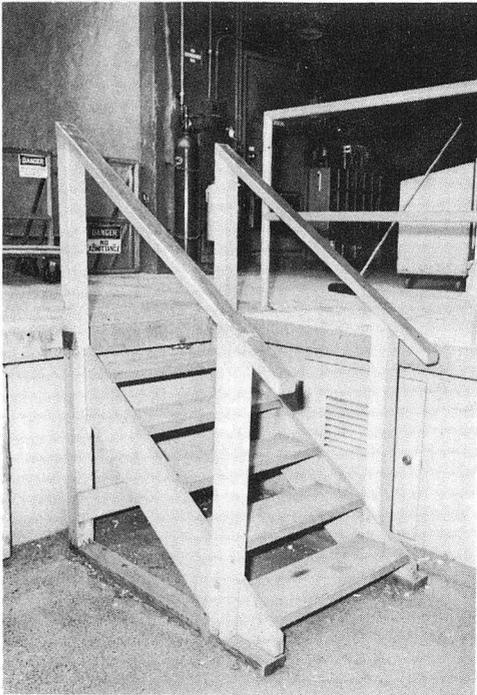
Persons can pass below

Equipment or material that could create a hazard is below.

Special runways that need to be open-sided must be at least 18 inches wide.

Regardless of height, open-sided platforms, runways, etc. next to dangerous equipment or processes shall be guarded by standard railings and toeboards.

For further information call Safety Services, Ext. 5251.

GUARDING OF STAIRWAYSNEED

Protection from falls on stairways.

IMPLEMENTATION OSHA 1910.23

Stairways with 4 or more risers shall be equipped with standard stair railing or standard handrails.

Stair railing shall be used in the following method:

Enclosed stairways less than 44 inches wide shall have at least one stair rail

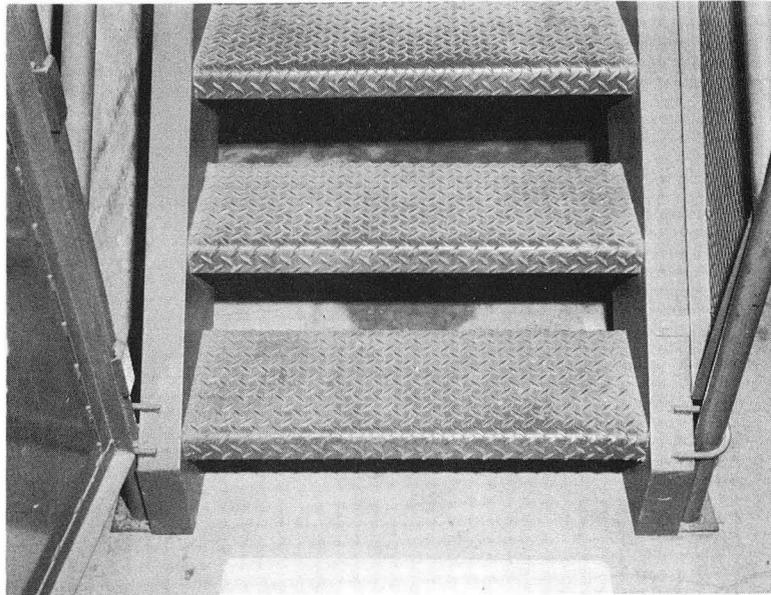
Open stairways less than 44 inches wide shall have stair rails on both sides

Stairways between 44 inches and 88 inches wide shall have railings on both sides

Stairways wider than 88 inches shall have stair rails on both sides and one in the middle.

Winding stairways shall have a handrail offset to prevent walking on the area of the tread that is less than 6 inches wide.

For further information call Safety Services, Ext. 5251.

FIXED INDUSTRIAL STAIRSNEED

Safely constructed stairs.

IMPLEMENTATION OSHA 1910.24

Fixed stairs shall have a load capacity of at least 5 times the anticipated live load and never less than a concentrated moving load of 1000 pounds.

Stair width shall be no less than 22 inches.

Angle of rise shall be between 30° and 50° to the horizontal.

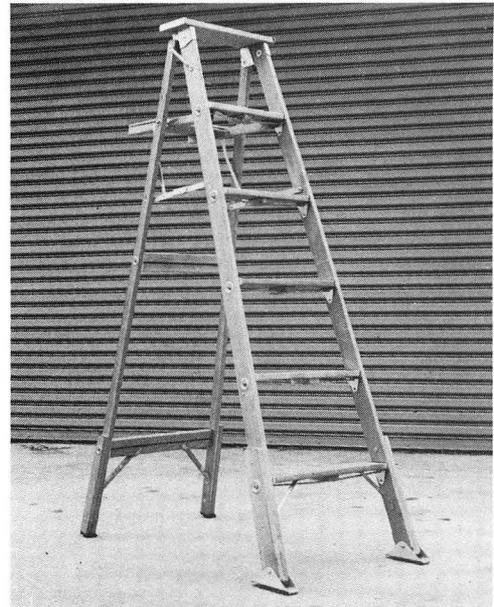
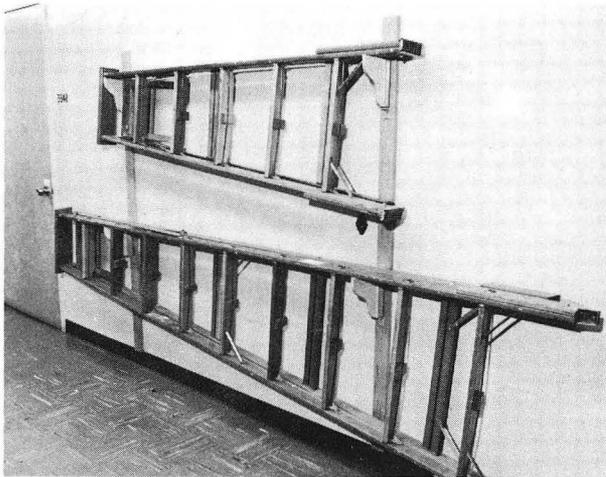
Stair treads where risers are used should have a nose $\frac{1}{2}$ to 1 inch beyond the face on the lower riser.

Rise height and tread width shall be uniform throughout a flight of stairs.

Overhead clearance shall be at least 7 feet (vertical) to the leading edge of a stair tread.

Tread nosing shall have nonslip edges.

For further information, call Safety Services, Ext. 5251.

CARE OF PORTABLE WOOD LADDERSNEED

Wood ladders that are safe and serviceable.

IMPLEMENTATION OSHA 1910.25

Inspection of ladders shall be performed on a regular basis.

Joints between steps and side rails shall be tight.

Movable parts shall operate freely without binding or undue play.

Worn or frayed rope shall be replaced.

Safety feet shall be kept in good condition.

Stored ladders shall be:

Easily accessible for inspection and service

Kept out of the elements

Well supported when stored horizontally.

Defective ladders shall be tagged with a DANGEROUS, DO NOT USE tag.

For further information call Safety Services, Ext. 5251.

SAFE USE OF PORTABLE WOOD LADDERSNEED

Prevention of accidents involving portable wood ladders

IMPLEMENTATION OSHA 1910.25(d.2)

Portable ladders shall not be:

Used in a horizontal position as a platform or runway

Used by more than one person at a time

Placed in front of doors that open toward the ladder

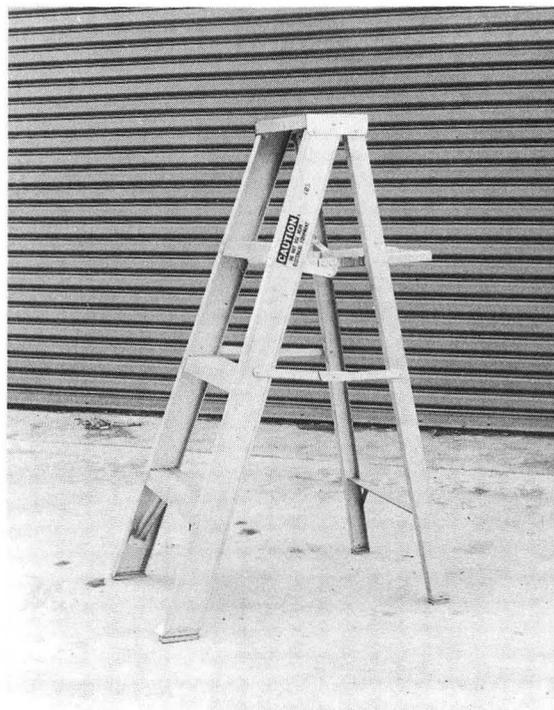
Placed on boxes, barrels or other unstable bases

Used as guys, braces or skids

Tops of stepladders shall not be used as steps.

Bracing on the back legs of stepladders shall not be used for climbing.

For further information, call Safety Services, Ext. 5251.

CARE OF PORTABLE METAL LADDERSNEED

Safe and serviceable metal ladders.

IMPLEMENTATION OSHA 1910.26 (2)

Metal ladders should be inspected periodically, or immediately when they are:

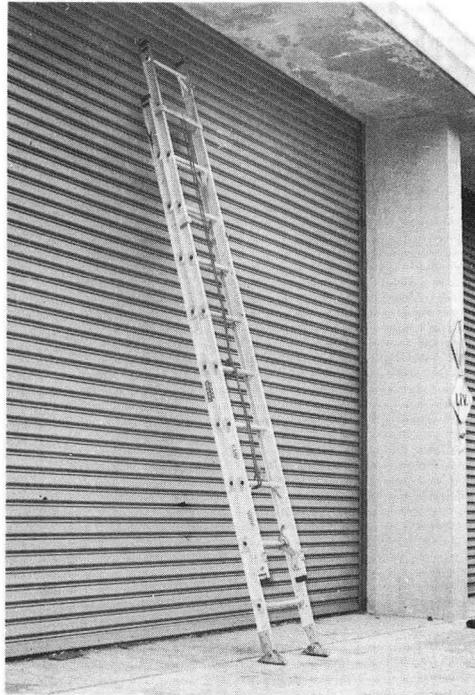
 Tipped over or dropped

 Exposed to excessive heat such as a fire.

Protective coatings should be applied to metal ladders used around acids or alkalis.

Defective ladders shall be taken out of service immediately.

For further information call Safety Services, Ext. 5251.

SAFE USE OF PORTABLE METAL LADDERSNEED

Prevention of accidents involving metal ladders.

IMPLEMENTATION OSHA 1910.26 (3)

Proper angle ($75\frac{1}{2}^{\circ}$) for a portable ladder can be obtained by placing the base of the ladder a distance from the vertical wall equal to $\frac{1}{4}$ the working length of the ladder.

Portable ladders are designed for one-man loads.

The foot of the ladder must be placed on a secure base.

Metal ladders shall not be used around electrical transmission lines or high-voltage equipment.

For further information call Safety Services, Ext. 5251.

SAFETY REQUIREMENTS FOR SCAFFOLDINGNEED

Safe and serviceable scaffolding.

IMPLEMENTATION

OSHA D 1910.28(a)

The footing and anchorage shall be sound, rigid, and capable of carrying four times the maximum intended load without settling or displacement.

Guardrails and toeboards shall be installed on platforms that are more than 10 feet above the ground or floor.

Scaffolds shall not be relocated while they are occupied by workers or laden with materials or tools.

Damaged or weakened scaffolds shall not be used until repairs are made.

All planking and platforms shall be overlapped (minimum 12 inches) or secured from movement.

Access ladders shall be provided and shall comply with OSHA D 1910.27, FIXED LADDERS.

Planks shall extend over their end supports not less than 6 inches nor more than 18 inches.

SAFETY REQUIREMENTS FOR SCAFFOLDING (Continued)

Tag lines shall be used when hoisting materials on the scaffold.

Overhead protection shall be provided when there is a danger of objects falling from above a scaffold.

Screens shall be provided between toeboards and guardrails when people are required to pass under or near the scaffolds.

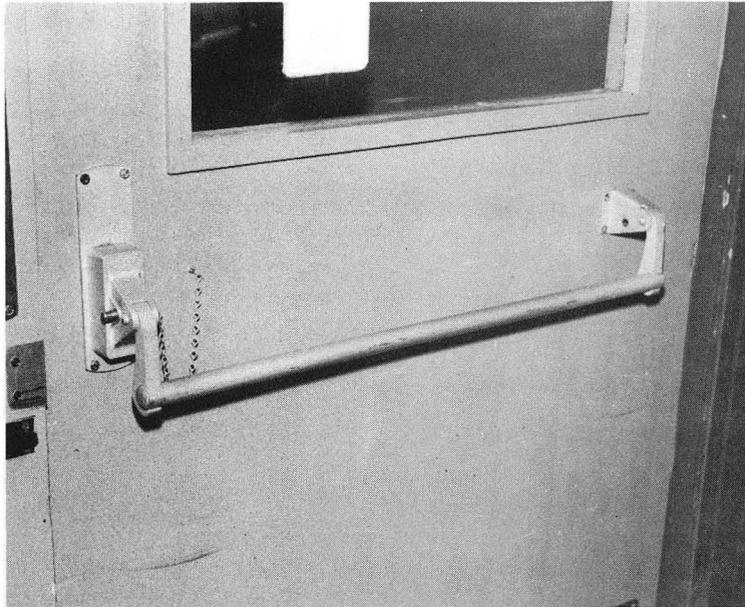
Employees shall not work on scaffolds during storms or high winds.

Anchor bolts or reveal bolts shall be used to secure scaffolds to permanent structures.

Heat-producing processes require the use of special protection for scaffold members, wires, and ropes.

For further information, call Safety Services, Ext. 5251.

MEANS OF EGRESS
GENERAL REQUIREMENTS



NEED

Safe and easy escape routes out of buildings in case of fire.

IMPLEMENTATION OSHA 1910.36(a)

Exits from buildings shall be so arranged and maintained as to provide free and unobstructed egress from all parts of the building at all times when it is occupied.

Locks or fastenings that prevent free escape from inside any building shall not be installed.

Every exit shall be clearly visible or the route to reach it conspicuously indicated.

Adequate illumination shall be provided for all exists and routes to exits.

New buildings can not be occupied until all exists are completed and ready for use.

No existing buildings shall be occupied during repairs or alteration unless all existing exits are serviceable.

For further information, consult Safety Services, Ext. 5251.

EXIT MAINTENANCE

Fig. 1

IMPLEMENTATION OSHA 1910.37(o)

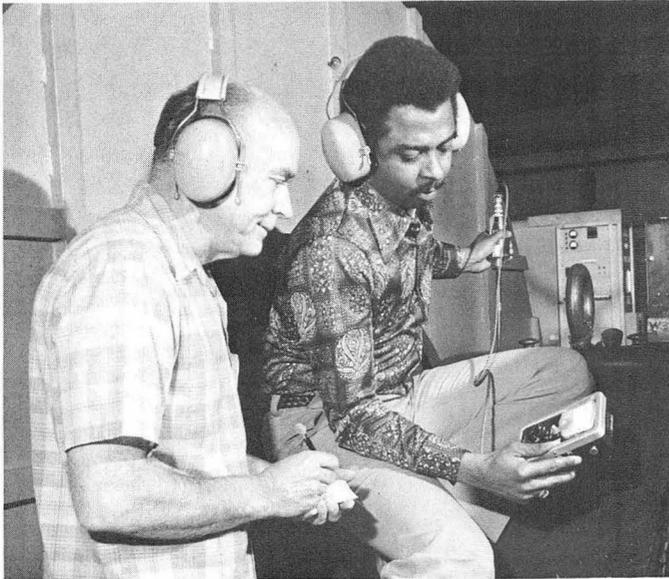
Fire retardant paints used on exit routes shall be renewed at such intervals as necessary to maintain the necessary flame retardant properties.

Any door, passage, or stairway which is neither an exit nor a way to an exit shall be identified by a sign reading "Not an Exit" or identified by its actual use such as "Storeroom".

An Arrow with the word "Exit" shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.
(Fig. 1)

Letters of exit signs shall be at least 6 inches high.

For further information, consult Safety Services, Ext. 5251.

OCCUPATIONAL NOISE PROTECTION

IMPLEMENTATION: DEPARTMENT OF THE AIR FORCE REGULATION AF161-35
HAZARDOUS NOISE EXPOSURE

NOTE:

For a more detailed study of the problem of occupational noise, see "Noise: Its Effects, Standards and Controls," LBL Safety News, No. 213, May, 1976.

The determination of noise exposure level is governed by exposure time versus dBA of the noise source (sound pressure level of the noise in decibels taken on the A scale of a standard sound level meter). Table 1 (page 4.230.1) indicates daily permissible exposure levels for varying exposure periods. Exposure above 115 dBA is not permitted without ear protection.

IMPULSE OR IMPACT NOISE

Employees should wear ear protection if they are exposed to impact noises exceeding 140 dBA peak sound pressure. Impact noises are those that occur at a frequency rate not greater than one per second, e.g., impact from a metal shear.

Noise level checks are performed on a routine basis by the Industrial Hygiene Group. Employees who suspect that their working area may have a noise problem should call Industrial Hygiene, Ext. 5829.

(continued)

Daily Permissible Noise Exposure Levels

Time	Noise level (dBA)
16 (hr)	80
8	84
6	86
4	88
2	92
1	96
45 (min)	98
30	100
15	104
7.5	108
3.75	112
2.23	115

Table 1

Control of noise exposure can be accomplished by engineering control, administrative control, or personal protective equipment. Personal protective devices (ear plugs or ear muffs) are the items of last choice.

Ear plugs are issued and fitted by the Medical Department (Bldg. 26) upon request from employees. Only approved-type plugs should be used. Do not use cotton wads. Ear plugs should be cleaned daily to prevent unsanitary conditions that cause ear infections.

Ear muffs are issued by the Stores Department (Bldg. 7) upon employees' request. These come in one size only, intended to fit all persons. Ear muffs are the preferred type of ear protection device.

For further information, call Industrial Hygiene, Ext. 5829, or Environmental Health and Safety, Ext. 5251.

RADIATION SAFETY
GENERAL INFORMATION

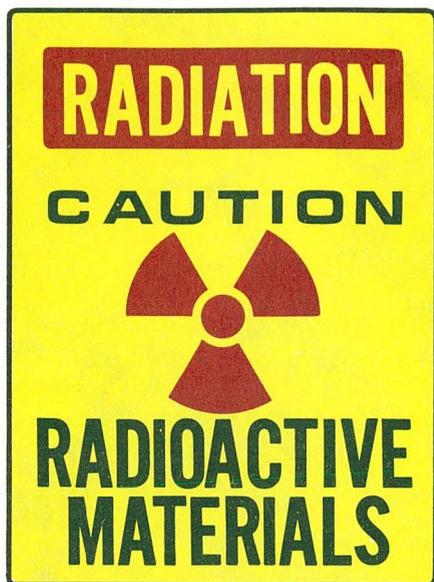


Fig. 1

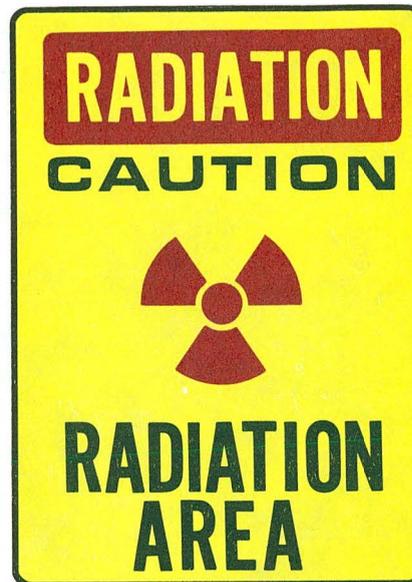


Fig. 2

NEED

Work environments that are free from radiation hazards.

IMPLEMENTATION OSHA G 1910.96 ERDAM 0524 10 CFR Part 20

NOTE

Responsibility for the control and monitoring of radiation and radioactive materials is divided between the Health Physics Department and the Safety Services Department. Health Physics is primarily responsible for the monitoring and control of radiation produced by machines such as the large accelerators and X-ray machines. Safety Services is primarily responsible for monitoring and control of radioisotopes, radioactive materials, and the radiation produced by them.

Restricted Areas

Certain areas at the Laboratory are designated Restricted Areas due to the presence of radiation or radioactive materials in amounts above the safe levels set by ERDA. These areas are identified by the universal radiation symbol and the words Caution Radiation Area (Fig. 1) or Caution Radioactive Materials (Fig. 2).

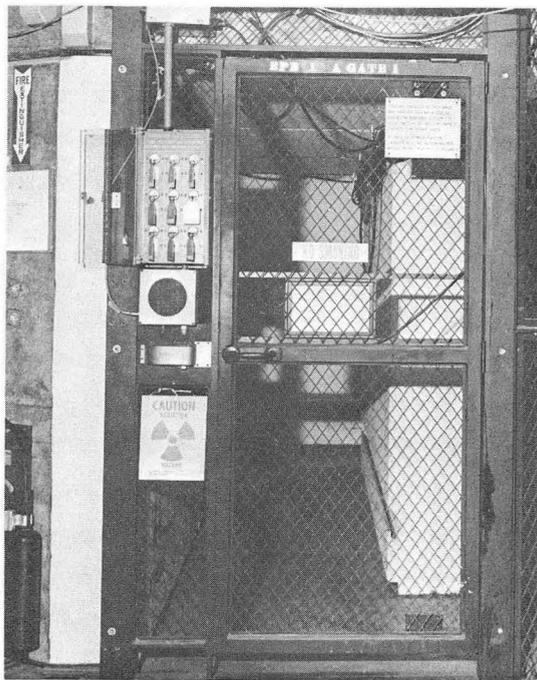
(continued)

Restricted Areas (continued)

Entry into these areas is controlled by Health Physics, Safety Services, and the person in charge of the area. Never enter one of these areas without permission.

High Radiation Exclusion Areas

Radiation of a level high enough to cause possible injury exists in certain areas of the Laboratory. These are areas such as the large gamma irradiators in Building 74 and the various vaults and experimental caves associated with the accelerators. These areas are identified by warning signs and, when in operation, by flashing magenta lights. All of these areas are equipped with various types of entry interlocks and run-safe switches. Never enter one of these areas unless you have permission and you are fully familiar with the operational safety rules of that particular facility. These rules are printed in the facility's Operational Safety Procedures, which can be obtained from the facility's Building Manager.



For further information, call Health Physics, Ext. 5006, or Safety Services, Ext. 5251.

RADIATION SAFETY
GENERAL REQUIREMENTS



Fig. 1

IMPLEMENTATION OSHA G 1910.96 ERDAM 0524 10 CFR Part 20

All employees at the Laboratory are responsible for:

Keeping their occupational exposure to radiation as low as possible.

Wearing their film badges in the prescribed manner (see page 4.302).

Following verbal instructions in regard to radiation safety and observing radiation safety rules and regulations.

Reporting radiation accidents, incidents and unsafe working conditions to their supervisor or Environmental Health and Safety (EH&S), Ext. 5251.

All supervisors are responsible for:

Instructing all employees under their supervision in the rules and regulations of radiation safety and insuring these rules are obeyed.

RADIATION SAFETY - GENERAL REQUIREMENTS (Continued)

Forwarding copies of radiation safety rules which they initiate to Health Physics, Bldg. 72, or EH&S, Bldg. 4.

Forwarding the results of radiation surveys which they make to Health Physics, Bldg. 72, or EH&S, Bldg. 4.

Insuring that radiation levels under their control do not exceed the prescribed limits.

Furnishing Health Physics or EH&S with pertinent radiation information on individuals and activities under their control.

Notifying Health Physics of any new radiation producing machines that may be proposed for purchase or construction.

Notifying Health Physics of any modifications to existing radiation-producing machines.

Notifying Health Physics whenever any new or modified radiation-producing machines are to be started up or tested.

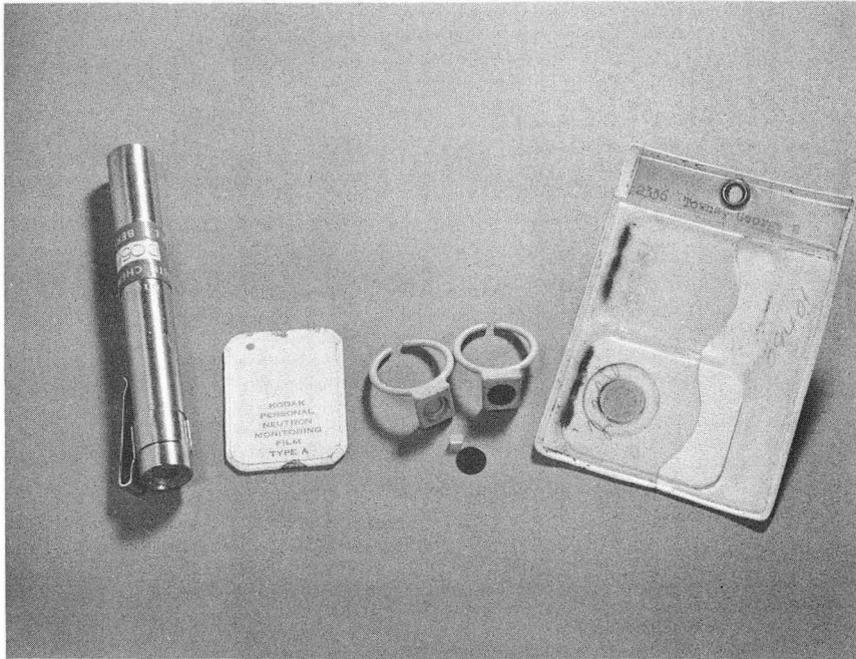
Radiochemical Operations The handling of or working with any radioisotope (except the sealed sources described on page 4.320) shall not be performed without a EH&S Monitor being present on the Laboratory site. Normally radiological assistance is available during the following hours: Monday through Friday, 8:00 a.m. to Midnight.

Off-hour Radiological Assistance (hours not listed above) is available. However, arrangements must be made at least one week in advance with EH&S, Ext. 5251.

Persons under the age of 18 are restricted from working regularly in certain areas of the Laboratory. Each summer, Health Physics and EH&S notifies the Personnel Department of the areas that are deemed unsuitable for employment of minors. Supervisors intending to employ minors should contact Personnel, Health Physics, or EH&S prior to the start date.

Casual visitors to the Laboratory must not enter designated RESTRICTED AREAS (Fig. 1) unescorted. Employees accompanying casual visitors should contact Health Physics, Ext. 5006, whenever there is any doubt about the radiation level of an area they want to enter.

For further information, call EH&S, Ext. 5251, or Health Physics, Ext. 5006.

PERSONAL RADIATION DETECTORSIMPLEMENTATIONOSHA G 1910.96 (d)ERDAM 052410 CFR Part 20IMPORTANT

Personal radiation detectors are used for the purpose of measuring the amount of radiation absorbed by the body. This is most often referred to as the dose. It is important to remember that personal radiation detectors can only measure the radiation dose a person has already received. They cannot warn a person ahead of time of the presence of a radiation field. Personal radiation detectors cannot protect a person from radiation. Only proper shielding and distance can do that.

Personal radiation detectors used at the Laboratory are of the following types:

Film badge and film rings

Pocket ionization chambers (pocket dosimeters)

Thermoluminescent dosimeters (TLD's)

Fission-track plates.

(continued)

PERSONAL RADIATION MONITORING

Film badges are the primary personal detectors used for monitoring the general Laboratory staff.

Each employee is issued two film badge packets. One packet has a blue identification tag; the other, a yellow identification tag. On the tag is the employee's name and film badge number. This number is permanently assigned to the employee.

Each film badge packet is worn for one month then exchanged for the alternate badge. Film badge exchange points are located throughout the Laboratory. Each department is responsible for informing their new employees of the location of the exchange points in their work area and insuring that all employees exchange their film badges at the proper time.

Film badges must be kept on one's person during all times spent on the site. Employees working with or around radioactivity should clip the film badge to the front of their torso. Female employees are cautioned not to keep their film badges in their purses. Lost film badges should be reported to Health Physics immediately.

Film rings are worn on the finger and are used by experimenters whenever they handle concentrated amounts of radioisotopes. The film rings are used only for short intervals and then sent to Health Physics for development and reading. Film rings are normally issued and collected by Safety Services monitors.

Pocket dosimeters are the self-reading type and are worn in areas where the radiation levels are unpredictable. Usually these areas are around the accelerators. The purpose in wearing a dosimeter is to provide the wearer with a means of keeping a running check on the approximate radiation dose received while working in a high radiation field. When the wearer is finished using the pocket dosimeter, he must record the amount of radiation he received in the log book that is kept with the dosimeters.

TLD's are a supplementary means of measuring the dose received on the extremities such as the hands and forearms. TLD's are issued by Safety Service monitors.

Fission track films are used for the measurement of the dose received from neutrons. These are issued by Health Physics, and Safety Services personnel.

For further information, call Health Physics, Ext. 5006, or Safety Services, Ext. 5251.

EMERGENCY PROCEDURES FOR RADIOACTIVE SPILLSNEED

Emergency procedures that minimize personal exposure from accidentally released radioactive material (spills).

IMPLEMENTATION OSHA 1910.96(1) 10 CFR 20.403 AECM 0502,0524

The following procedure shall be followed whenever a spill has occurred or is suspected to have occurred:

Immediately notify Safety Services, Ext. 5641, and evacuate all personnel from the immediate area.

Retain personnel in a safe area until Safety Services can monitor them for contamination.

Quarantine the spill area to prevent further personnel contamination.

Give as many details of the incident as possible to the Safety Services person in charge of the clean-up operation. This information will be used for reports and accident analysis.

Never attempt to clean up a spill without the assistance of a Safety Services monitor.

For further information call Safety Services, Ext. 5251.

SAFE FUME HOOD PRACTICESNEED

Fume hood procedures that will guard against the accidental release of radioactive aerosols into the atmosphere.

IMPLEMENTATION OSHA G 1910.96 (c) 10CFR Part 20

CAUTION

FUME HOODS ARE NOT ADEQUATE FOR USE IN OPERATIONS THAT GENERATE RADIOACTIVE AEROSOLS UNLESS AIR-CLEANING DEVICES HAVE BEEN INSTALLED ON THE HOOD EXHAUSTS.

Fume hoods are designed and intended for carrying off noxious or toxic gases. For operations that might release contamination to the atmosphere, enclosures such as Berkeley boxes (see page 4.311) should be used.

Storage of radioactive material in hoods for long periods of time -- even though well packaged -- is discouraged. The material should be turned over to Safety Services for storage in their Pit Room facilities (see page 4.314). If radioactive material must be kept in a hood for short periods, it must be safely packaged and Safety Services must be notified of its location. A radioactive warning tag or sticker identifying the isotope, level of activity, chemical form, etc., must be affixed in a prominent location outside the hood.

Unnecessarily high radiation levels in chemistry labs are often caused by inadequately shielded gamma emitting isotopes stored in hoods. Therefore,

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SAFE FUME HOOD PRACTICES

high gamma emitters should never be stored in hoods unless absolutely necessary, and then only when adequately shielded (contact Safety Services for proper shields). It is important to remember that the high gamma emitter must be shielded on the front, the sides, and the back.

Flammable or explosive liquids, and pyrophoric material should never be stored in hoods in large quantities. Where large quantities are required to be on hand, they should be stored in approved storage lockers.

Acids, solvents, and heat sources can damage the inside surfaces of hoods, therefore protective coverings such as sheet plastic, asbestos, and absorbent paper should always be used as working surfaces.

The sliding front window that most hoods have performs two functions:

Protection against splashing chemicals and unexpected reactions.

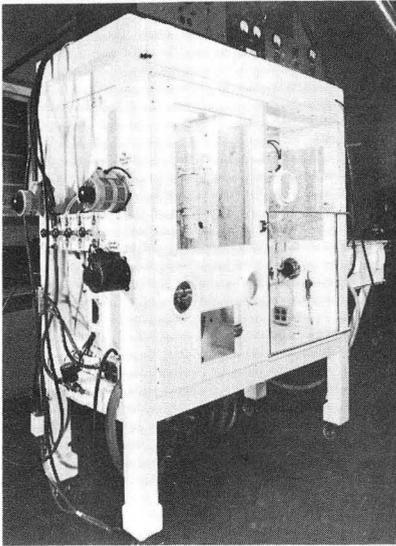
Control of air intake velocity at the front of the hood.

The hood window should be kept as low as possible in order to insure that aerosols are drawn away from the person doing chemistry in the hood.

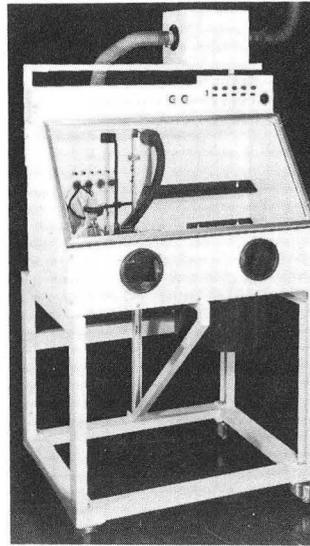
Periodic maintenance and repair of the hood blowers located on the roofs of the chemistry laboratories necessitates the shut-down of the hoods' ventilating system. When this condition exists, a Safety Service monitor will place a sign reading, CAUTION -- HOOD OUT OF SERVICE -- DO NOT USE, on the front of the hood. The sign must remain in place until service is restored. Because of poor hood ventilation, the hood window must be in its lowest position during shut-down conditions.

Liquid waste spouts are located in most hoods. Do not pour liquid radioactive waste (LAW) into this drain. If this is done by accident, notify Safety Services immediately. (For proper disposal of LAW, see page 4.315).

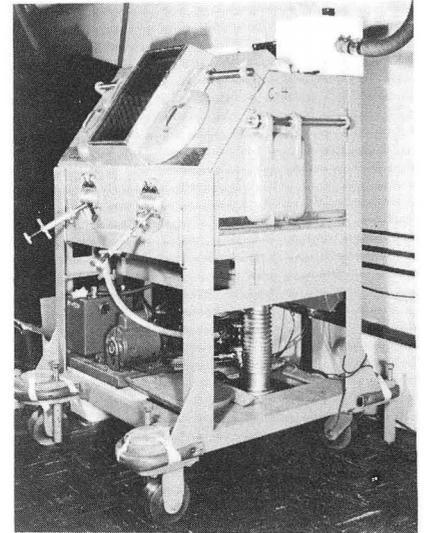
Air sampling devices (Filter Queens) must be located next to any hood where radioactive chemistry is being performed or where radioisotopes are stored.

SAFE GLOVE BOX PRACTICES

Piano box



Berkeley box



Junior cave

NEED

Glove box operations that are safe from personal injury, radiation overexposure, and fire.

IMPLEMENTATION OSHA 1910.96(c) 10 CFR Part 20

Glove boxes used at the Laboratory include "Berkeley" boxes, lead shielded "junior" caves, inert atmosphere boxes, and "piano" boxes.

Adequate ventilation of glove boxes must be maintained at all times. Be sure the flow meter on the glove box exhaust manifold reads no lower than the black line.

Exhaust manifold control box alarms occasionally go off due to an interruption in power or a malfunction. Notify Safety Services, Ext. 5641, immediately. Never turn the control box off.

Never disconnect a glove box from an exhaust manifold. Call Safety Services, Ext. 5641.

Box gloves and glove O rings should be checked for holes and deterioration before entering the box. If they need replacing, call Safety Services, Ext. 5641.

Surgeons gloves should be donned before entering box gloves.

Sharp objects used inside the glove box should be kept in protected containers to prevent accidental puncture of gloves.

Radioisotope contents and approximate level of radioactivity inside the glove box should be posted in a prominent location on the front of the box.

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SAFE GLOVE BOX PRACTICES



Box passouts and passins shall be done with the assistance of a Safety Services monitor.

Flammable liquids or gases used in ordinary glove boxes must be in volumes small enough to prevent the buildup of explosive concentrations.

Spark-proof glove boxes are available for experiments requiring large volumes of flammable liquids or gases.



Special fire extinguishers for use on glove box fires are available from Safety Services and should be located near any glove box containing flammable material.

Never enter a shielded "junior" cave until the radiation level inside the cave has been checked with a portable survey meter.

Check hands and feet for contamination when you are finished working in a glove box.

For further information call Safety Services, Ext. 5251.

TRANSPORTATION AND SHIPMENT OF RADIOACTIVE MATERIALNEED

Transportation of radioactive material in a manner safe from accidental release or exposure.

IMPLEMENTATION OSHA G 1910.96(e) AECM 0524

IMPORTANT

REMOVAL OF ANY RADIOACTIVE MATERIAL FROM THE LABORATORY PREMISES WITHOUT THE PERMISSION OF THE DIRECTOR'S OFFICE IS PROHIBITED!

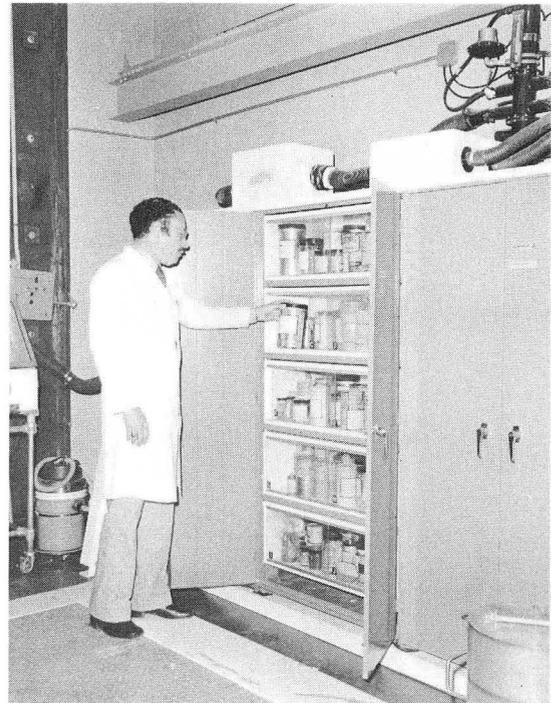
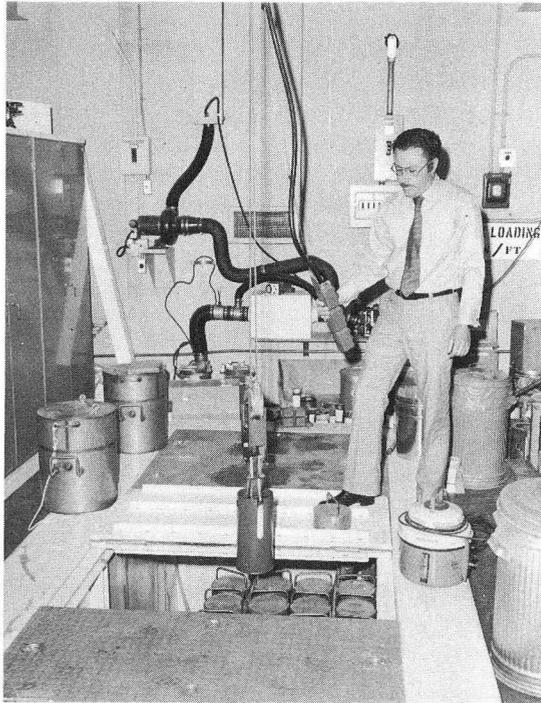
Shipment of radioactive material or equipment must be handled in the following manner:

✓ The person wishing to ship radioactive materials from the Laboratory must fill out a HAZARDOUS MATERIALS REQUEST FOR SHIPMENT (Form RL-3634) available from Safety Services Operation Section. The completed form must be returned to Safety Services which will forward a copy to Property Management for approval.

After receiving approval for the shipment, the material must be turned over to Safety Services Transportation Group, Ext. 5251, for proper packaging and shipment.

Inter-building transferral of radioactive material or equipment must be done by Safety Services Transportation Group. Exception to this rule can be made for certain low-level, well-contained items provided prior permission from Safety Services has been obtained.

For further information call Safety Services, Ext. 5251.

STORAGE OF RADIOACTIVE MATERIALSNEED

Safe storage of radioactive material

IMPLEMENTATION OSHA 1910.96(j) AECM 0524 10 CFR Part 20

Radioisotopes and radioactive material that are not being used should be stored in a secure environment such as:

Pit Room (70-147A) storage operated by Safety Services, Ext. 5641

Lockable, fire retardant Berkeley Boxes or air-filtered cabinets.

Radioactive research equipment that is too large to be stored in on-site storage facilities can be stored at the Howard Terminal warehouse provided that:

The level of radiation at the surface of the package does not exceed 2 mr/hr

The only alpha emitters present are fixed, low-level (≤ 100 dpm/cm²) alpha emitters such as ²²⁶Ra, ²³²Th, or ²³⁸U

The package has been monitored and tagged by a Safety Services monitor.

Unsafe storage areas include:

bench tops fume hoods
desk drawers wooden cabinets or lockers.

For further information call Safety Services, Ext. 5251.

RADIOACTIVE WASTE DISPOSAL



NEED

Safe disposal of radioactive waste in accordance with federal regulations.

IMPLEMENTATION OSHA 1910.96(k) AEC 0524

New employees intending to work with radioactive material must contact a Safety Services monitor for instruction in the proper handling and disposal of radioactive material.

All radioactive material that is to be discarded must be turned over to Safety Services, Ext. 5641.

Active waste collection containers are provided by Safety Services. They include:

Dry waste

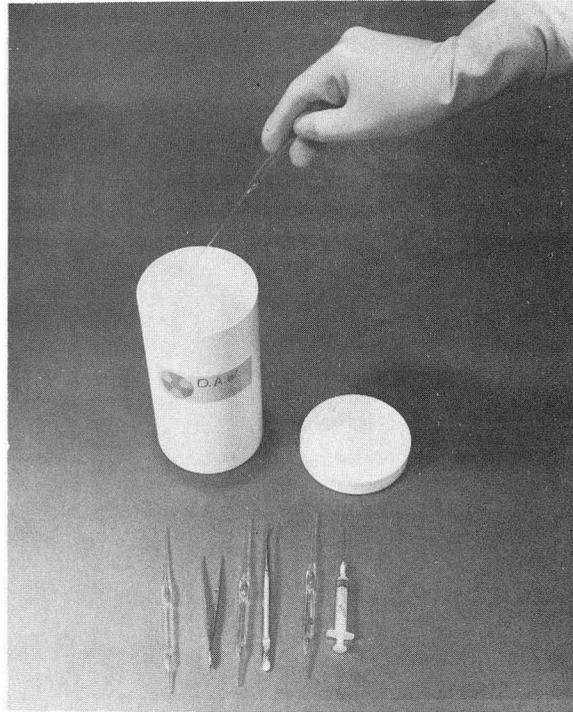
16 gal. galvanized waste cans
55 gal. steel drums (shielded and unshielded)
ice cream cartons, plastic bags, and cement sacks.

Liquid waste

5 gal. carboys
absorbant-filled containers.

Accidental release of radioactive waste into the sanitary or storm sewer system shall be reported to Safety Services, Ext. 5641, immediately.

For further information call Safety Services, Ext. 5251.

PROPER PREPARATION OF RADIOACTIVE WASTENEED

Radioactive waste packaged in a manner that will prevent injury or accidental release.

IMPLEMENTATIONOSHA 1910.96(k)ERDAM 0529

Safety monitors are available for advice and assistance whenever radioactive material is to be discarded (Ext. 5251).

Dry active waste (DAW) shall contain no liquids greater than several grams.

Liquid active waste (LAW) shall be clearly identified by chemical name or formula (HNO_3 , Toluene, etc.) or by group (organics, aqueous, etc.).

Scintillation vials can be received unopened if packaged in 30 or 55 gallon steel drums containing enough absorbent material to absorb at least twice the total volume of liquid in the vials and if the concentration of liquid does not exceed 0.02 microcuries per milliliter.

Alpha-emitting waste shall be identified by isotope and segregated from beta-gamma waste whenever possible. Mixed waste containing both alpha- (and beta-gamma shall be treated as alpha waste.

Explosive, flammable, or highly toxic radioactive chemicals shall not be discarded in DAW cans.

Sharp objects such as hypodermic needles, spitzers, and scalpels must be put in a protective container, such as an ice cream carton, before they are placed in DAW cans.

DAW cans shall not be used for non-radioactive waste.

DECONTAMINATION OF RADIOACTIVE EQUIPMENTNEED

Reclamation of radioactively contaminated equipment whose replacement cost exceeds the cost of its decontamination.

IMPLEMENTATION OSHA 1910.96(k) AECM 0524

Contaminated articles that are of sufficient value to make decontamination worthwhile should be turned over to Safety Services, Ext. 5641, for decontamination.

Proper packaging and identification of contaminated items shall be done by a Safety Services monitor.

Glove boxes, hoods, and other enclosed work areas can be decontaminated in-place by Decontamination personnel.

Clothing and other personal items that become contaminated must be decontaminated by Safety Services before they can be removed from the Laboratory premises.

Decontaminated equipment will be released to the owner when the residual contamination cannot escape into the air, be transferred by contact, and there is no radiation hazard from induced radioactivity.

Contaminated lab coats shall be turned over to a Safety Services monitor.

For further information call Safety Services, Ext. 5251.

CONTAMINATED PRECIOUS METALSNEED

Recovery of contaminated precious metals.

IMPLEMENTATION OSHA 1910.96(k) AECM 0524

Radioactively contaminated precious metals shall be kept separate from non-contaminated precious metals.

Return of contaminated precious metal to the Property Accounting Office is done in the following manner:

The user, with the assistance of a Safety Services monitor, shall load a tared weight ice cream carton with the contaminated metal.

The ice cream carton is then sealed, surveyed for radioactivity, and reweighed for the true weight of the metal.

The identification of the metal, its weight, contaminating isotope, survey meter readings in mr/hr or dpm, and its ownership shall be put on the carton. The same information shall be relayed to the Property Accounting Office, Bldg. 90, Rm. 1148, Ext. 5026.

The carton is turned over to Safety Services and sent to Livermore.

For further information call Safety Services, Ext. 5251.

MONITORING OF MATERIAL



Fig. 1

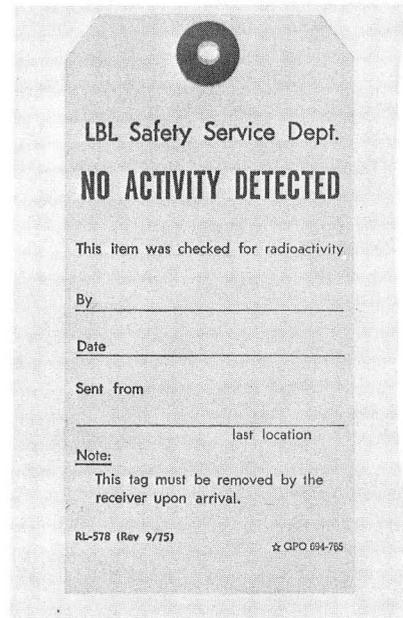


Fig. 2

NEED

Prevention of accidental removal of radioactive material from experimental areas of the Laboratory.

IMPLEMENTATION OSHA G 1910.96(k) ERDAM 5024

All equipment and furniture must be tagged with a NO ACTIVITY DETECTED tag (Fig. 2) before they can be removed from the following experimental buildings:

1	10(rooms 115,202)	63	71	80
3	51,51A,51B	64	74	88
6	57	70,70A	75	

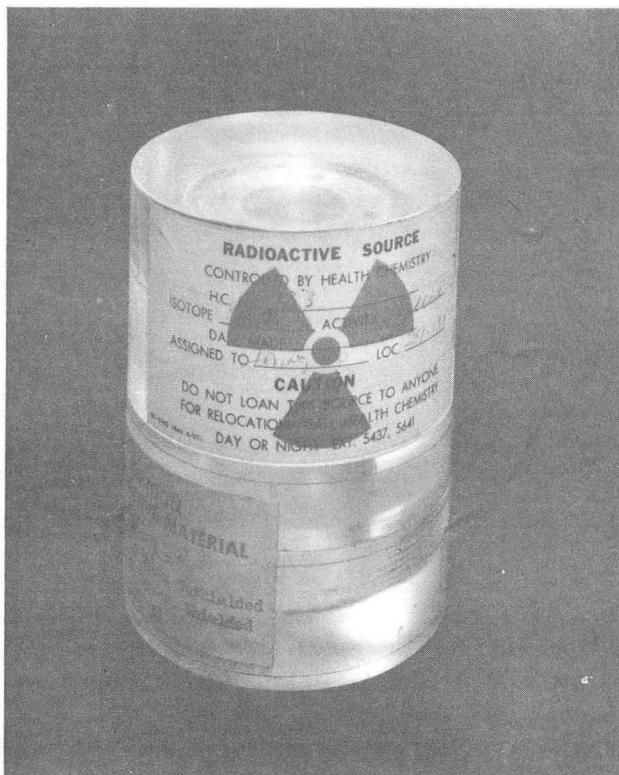
(All LBL research equipment coming out of other Campus buildings must also be tagged.)

All material that is to be scrapped, regardless of its point of origin, must be monitored and then tagged with a NO ACTIVITY DETECTED tag before it is sent to reclamation (salvage), Building 17.

Refuse collected from Buildings 1, 3, 70, 70A, 71, 74, and 75 must be certified free of radioactivity before it is released to refuse collectors.

Gas cylinders do not require a tag if they are located in the designated cylinder collection areas for each building.

For further information, call Safety Services, Ext. 5251.

CONTROL OF RADIOACTIVE SOURCES

IMPLEMENTATION OSHA G 1910.96(j)(k) 10 CFR Part 20 ERDAM 0524

WARNING

WILLFUL VIOLATIONS OF THE FOLLOWING REGULATIONS, OR NEGLIGENCE IN HANDLING AND STORAGE OF RADIOACTIVE SOURCES ARE GROUNDS FOR DISCIPLINARY ACTION (SUPERVISOR'S HANDBOOK, PAGE 2-10, PARAGRAPH 2.03) AND MAY ALSO RESULT IN THE CANCELLATION OF FURTHER PRIVILEGES TO DRAW OR USE SUCH MATERIALS AND/OR IMMEDIATE RECALL OF SUCH MATERIALS.

A Radioactive Source is defined as a radioisotope of a known amount of activity (in Curies) that has been encapsulated in such a manner that the radioisotope will not be released under conditions likely to be encountered by the source.

Serial numbers shall be assigned, by Safety Services, to all radioactive sources whether they are purchased from an outside vendor or fabricated at LBL. The only exceptions to this rule are sources that are fabricated and used exclusively in the following exempt areas: Building 70, 70A, 71, 1, and 3. If an unnumbered source from an exempt area is to be used outside the area, approval must be obtained from Safety Services, and a serial number must be assigned.

Procurement of radioactive sources is handled through Safety Services. Arrangements can be made to purchase new sources from commercial vendors. Also, Safety Services maintains a supply of used sources of various types.

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RADIOACTIVE SOURCES

Responsibility for the location and condition of the source belongs to the person in whose name the source is assigned. This rule remains in effect regardless of whether the assignee loans the source to another person.

Sources not in use must be stored in a locked storage area, room, or container bearing the sign: CAUTION - RADIOACTIVE MATERIAL.

Sources left unattended in an unsecured or unauthorized area will be confiscated by Safety Services. A confiscated source will not be released to its former assignee without authorization from the Director's Office.

Periodic inventory and inspection of all serially numbered sources is conducted by Safety Services. The user of a serially numbered source shall produce the source for inspection when requested by Safety Services. The inventory schedule is as follows:

<u>Source Class</u>	<u>Hazard</u>	<u>Frequency</u>
A	Low	Annual
B	Medium	Semi-annual
C	High	Every 1-4 months

Missing sources shall be brought to the attention of Safety Services immediately. If, after a thorough search, the source is not found, a memo stating when and where the source was last seen must be sent to Safety Services.

Destruction of, or tampering with, a serially numbered source without the approval of Safety Services is prohibited.

Removal of any radioactive source from the Laboratory premises without the written authorization of the Director's Office is prohibited. Persons wishing to ship a source to another site should see page 4.312.

Sources no longer needed or sources that may not be used for long periods of time should be turned in to Safety Services for safe keeping.

Employees terminating from the Laboratory must turn in to Safety Services all radioactive sources assigned to them. Termination processing will not be complete until all sources have been accounted for.

Violations of any of the preceding rules and regulations will be reported, by Safety Services, to the Director's Office.



Fig. 1

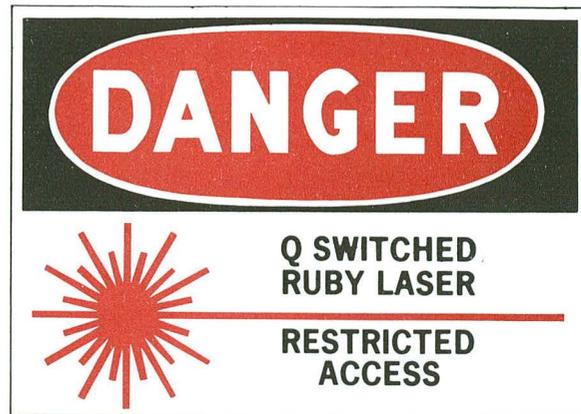


Fig. 2

NEED

Proper training in the use of lasers and adequate protection from laser beams.

IMPLEMENTATION ANSI Z136.1-1973

General

It is the responsibility of the supervisor of any group which acquires a laser for use at LBL to notify the Health Physics Department (Building 72, Ext. 5006) of the acquisition. The Health Physics Department must also be notified whenever a laser is to be used in a manner which will result in a classification change, or when it is to be used in such a manner as to require a review of safety procedures.

The Health Physics Department must periodically evaluate laser hazards and assure that effective safety procedures are being followed.

Definitions

Laser A device which produces an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to lower energy levels. Also, an acronym for Light Amplification by Stimulated Emission of Radiation.

Radiant Energy Energy emitted, transferred, or received in the form of radiation. Unit: joule (J).

Radiant Flux, Radiant Power Power emitted, transferred or received in the form of radiation. Unit: watt (W).

Irradiance (at a point of a surface) Quotient of the radiant flux incident on an element of the surface containing the point, by the area of that element. Unit: watt per square centimeter ($W \cdot cm^{-2}$).

LASER RADIATION SAFETY

Radiant Exposure Surface density of the radiant energy received.
Unit: joules per square centimeter ($J \cdot cm^{-2}$).

Maximum Permissible Exposure (MPE) Those values of irradiance or of radiant exposure which are below known hazardous levels. See Table I (page 4.321.6).

Laser Maximum Permissible Exposure (MPE) Guides

MPE levels for direct ocular intrabeam viewing are given in Table I. MPE guides for skin exposures will not be exceeded when using these same MPE values. These values are based on the dependence of biological damage relative to the wave length of the emitted laser radiation, duration of the laser pulse (if other than continuous wave) and the exposure duration. The source for these guides is the American National Standard for the Safe Use of Lasers (ANSI A 136.1-1973) and is accepted as constituting the official LBL position on laser safety. For sub-nanosecond pulsed lasers, the MPE's are more restrictive, and the Health Physics Department should be consulted about the proper MPE to use and about special considerations in the use of protective goggles.

Operation Safeguards

Physical protection measures necessary to prevent injuries shall be used, as well as adherence to established operating procedures. These protective measures may include warning signs (Figs. 1 and 2), warning lights, interlock systems, physical barriers, and special locations for equipment. The extent of these safety devices will depend primarily on the laser type and power. Lowest power lasers require only minimum precautions.

Training

The Health Physics Department advises on questions of laser safety, conducts training and maintains records. Health Physics periodically provides short seminars on laser safety, and is available at all times to discuss the various aspects of the LBL laser safety program.

Eye Examination

The supervisor of each laser installation must arrange with the Medical Services Department for all individuals working with Class III and Class IV lasers for an appropriate eye examination.

Responsibilities

As with all hazardous equipment each person involved must show a degree of responsibility for the use or operation of this equipment. Generally, those responsibilities will be as follows:

LASER RADIATION SAFETYSupervisor of Laser Operation

Establish and maintain a safe work environment.

Make certain that all laser users in his group have been adequately trained and can conduct the operation safely.

Properly administer the Laboratory's safety regulations for all of the hazards associated with the laser operation.

Write an Operational Safety Procedure and make the calculations or beam power measurements necessary to select the proper eye protection. Health Physics Department personnel are available for help, both in making these calculations and in writing the Safety Procedure.

Employee or Laser Operator

Take all reasonable precautions to prevent injury to himself, to his fellow employees, and visitors.

Become familiar with and follow the Operational Safety Procedures established for safe laser operations.

Check with the supervisor when a question about safe laser operation arises.

Do not perform a task when there is some uncertainty about its safety.

Health Physics Department

Provide guidance and assistance in evaluation of the safety of the experiment.

Recommend adequate safety controls and procedures appropriate to the type of laser operation.

Check the experimental area periodically for unsafe conditions or procedures.

Provide and maintain safety glasses and warning signs.

Laser Facility Construction

The degree of safety precautions necessary will depend primarily on the power of the laser system. Health Physics, Ext. 5006, and Safety Services, Ext. 5251, will cooperate in achieving the optimum safety and flexibility.

LASER RADIATION SAFETY

Continuous and pulsed lasers above 100 mW will require that the following topics be reviewed for safety: electrical equipment, capacitors, lighting, enclosures, shielding, and coolants.

Personnel Controls

People working in experimental laser areas must be informed of the hazards associated with the equipment and the laser beam. They must be instructed in the proper operation of the equipment and the use of the safety devices and protective equipment. Each person shall be expected to read the applicable Operational Safety Procedure and this safety guide.

Visitors

Constant care and attention must be given by those normally working with lasers to protect visitors against accidental laser exposure. The individual in direct control of the laser operation in progress is responsible for the safety of visitors and he must be certain that visitors clearly understand what they can and cannot do in the area. Visitors must be equipped with eye protection if necessary, and be advised of any other local safety rules and procedures that may be in effect.

Personnel Protection

Eye Protection The chief hazard of exposure to a laser beam is injury to the eyes. The most important protective measures, therefore, are those that protect the eyes from the laser beam or its reflection. Procedures that are effective in protecting the eyes are:

Total enclosure of the laser beam -- the most effective method of beam control.

Remote laser operation, or wearing laser safety glasses of the appropriate density and spectral absorption, when total enclosure of the laser beam is not practical. Call Health Physics, Ext. 5006, for procurement of proper laser safety glasses.

Direct Viewing Direct intrabeam viewing of laser beams must not be attempted if alternative procedures are possible. If direct viewing is absolutely necessary, the experimenter must ascertain (or determine from Health Physics) that the energy or power intensity of the beam is below the MPE values listed in Table I (page 4.321.6).

Invisible Wavelength Lasers Beams from lasers operating beyond the visible portion of the spectrum can be defined through the use of an image converter. When using an image converter, protect the free eye with an opaque patch or with laser glass of the appropriate density.

LASER RADIATION SAFETY

Cryogenic Fluids Liquified gas is sometimes used for lowering the temperature of laser apparatus and can be hazardous because of the possibility of burns caused by mishap or improper handling. When liquid gas is in the apparatus or being handled in the vicinity, personnel need to wear proper hand, face, and body protection.

Work Area Controls

Listed below are general practices that will contribute to a safe work environment in the laser operating area. These include:

Laser Warning Signs These must be of the proper type for each installation and must be placed on entrance doors (Figs. 1 and 2).

Beam Position When the laser beam is not totally enclosed, install the laser apparatus so that the beam will be outside the normal eye level range -- that is, below 4 feet or over 6-1/2 feet from the floor. Point the beam away from doors or aisles.

Smooth Surfaces Keep the laser area and equipment free of polished or reflecting surfaces.

Targets Surfaces used to spot laser beams must be diffuse reflectors. Many apparently diffuse reflectors give rise to substantial mirror-like reflections that vary with the law of reflection from plane surfaces. The conical reflected region of 10° half-width from the axis of the beam must not be occupied by an observer unless it has been determined to be safe. Whenever possible, use a light trap to capture the beam.

Unattended Equipment A laser shall not be operated or a capacitor bank charged unless an operator remains in attendance. Turn off the power and cover gas laser apparatus when the beam is not actually in use.

Lending Lasers The possessor of a laser shall not lend it to any person or group until the borrower has a Health Physics Department approved Operational Safety Procedure describing its intended use. The borrower must be aware of the hazards involved and must comply with all aspects of the procedure.

Interlocks Interlocks will be installed on all cabinets and area entrances as necessary. They will be of the standard type and will be redundant in all cases.

LASER RADIATION SAFETYLaser Systems by Classification

Lasers are grouped by class following the ANSI Z136.1-1973 standard. Each class except Class I and Class V requires control measures, and medical surveillance is required for Class III and IV. Class I is exempt because power levels are low enough so that MPE's cannot be exceeded. Class V lasers are exempt because they are completely enclosed. The other classes require appropriate control measures and medical surveillance (Class III and IV) as outlined in the ANSI A136.1 standard.

For further information call Health Physics, Ext. 5006.

Table I. Maximum Permissible Exposure (MPE) for Direct Ocular Intra-beam Viewing for Single Pulses or Exposures (ANSI-Z136.1-1973)

Wavelength, λ (μm)	Exposure Time, t (s)	Maximum Permissible Exposure (MPE)	Notes for Calculation and Measurement
<u>Ultraviolet:</u>			
0.200-0.302	10^{-2} - 3×10^4	$3 \times 10^{-3} \text{ J} \cdot \text{cm}^{-2}$	} 1-mm limiting aperture. In no case shall the total irradiance, over all the wavelengths within the UV spectral region, be greater than 1 watt per square centimeter upon the cornea.
0.303	10^{-2} - 3×10^4	$4 \times 10^{-3} \text{ J} \cdot \text{cm}^{-2}$	
0.304	10^{-2} - 3×10^4	$6 \times 10^{-3} \text{ J} \cdot \text{cm}^{-2}$	
0.305	10^{-2} - 3×10^4	$1.0 \times 10^{-2} \text{ J} \cdot \text{cm}^{-2}$	
0.306	10^{-2} - 3×10^4	$1.6 \times 10^{-2} \text{ J} \cdot \text{cm}^{-2}$	
0.307	10^{-2} - 3×10^4	$2.5 \times 10^{-2} \text{ J} \cdot \text{cm}^{-2}$	
0.308	10^{-2} - 3×10^4	$4.0 \times 10^{-2} \text{ J} \cdot \text{cm}^{-2}$	
0.309	10^{-2} - 3×10^4	$6.3 \times 10^{-2} \text{ J} \cdot \text{cm}^{-2}$	
0.310	10^{-2} - 3×10^4	$1.0 \times 10^{-1} \text{ J} \cdot \text{cm}^{-2}$	
0.311	10^{-2} - 3×10^4	$1.6 \times 10^{-1} \text{ J} \cdot \text{cm}^{-2}$	
0.312	10^{-2} - 3×10^4	$2.5 \times 10^{-1} \text{ J} \cdot \text{cm}^{-2}$	
0.313	10^{-2} - 3×10^4	$4.0 \times 10^{-1} \text{ J} \cdot \text{cm}^{-2}$	
0.314	10^{-2} - 3×10^4	$6.3 \times 10^{-1} \text{ J} \cdot \text{cm}^{-2}$	
0.315-0.400	10^{-2} to 10^3	$1 \text{ J} \cdot \text{cm}^{-2}$	
0.315-0.400	10^3 - 3×10^4	$1 \times 10^{-3} \text{ W} \cdot \text{cm}^{-2}$	
<u>Visible and Near Infrared (see Fig. 4 for graphic representation):^a</u>			
0.4-1.4	10^{-9} - 2×10^{-5}	$5 \times 10^{-7} \text{ J} \cdot \text{cm}^{-2}$	} 7-mm limiting aperture. See Section 8.5 ^a for correction factors.
	2×10^{-5} -10	$1.8 \times 10^{-3} t^{3/4} \text{ J} \cdot \text{cm}^{-2}$	
	10 - 10^4	$10^{-2} \text{ J} \cdot \text{cm}^{-2}$	
	10^4 - 3×10^4	$10^{-6} \text{ W} \cdot \text{cm}^{-2}$	
<u>Far Infrared:</u>			
1.4 - 10^3	10^{-9} - 10^{-7}	$10^{-2} \text{ J} \cdot \text{cm}^{-2}$	} See Table 9 ^a for apertures. See Section 8.6 ^a for correction factors, see also Fig. 5 ^a .
	10^{-7} - 10	$0.56 t^{1/4} \text{ J} \cdot \text{cm}^{-2}$	
	> 10	$0.1 \text{ W} \cdot \text{cm}^{-2}$	

^aThese are references to sections, tables and figures in American National Standard for the Safe Use of Lasers, ANSI Z136.1-1973.

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5 HAZARDOUS MATERIAL

LIQUEFIED HYDROGEN SYSTEMSNEED

Liquid Hydrogen Systems designed, constructed, and used in accordance with accepted Laboratory and Industry Standards.

IMPLEMENTATION OSHA H 1910.103 (c) UCRL-17928 (II.J) UCID-3117 (H)

IMPORTANT

EMPLOYEES INTENDING TO WORK WITH GASEOUS OR LIQUID HYDROGEN SYSTEMS SHOULD BECOME THOROUGHLY FAMILIAR WITH THE CONTENTS OF UCRL-17928 ("RULES AND PROCEDURES FOR THE DESIGN AND OPERATION OF HAZARDOUS RESEARCH EQUIPMENT AT THE BEVATRON AND 184 INCH CYCLOTRON") OR UCID-3117 ("RULES AND PROCEDURES FOR THE DESIGN OF HAZARDOUS RESEARCH EQUIPMENT AT LBL").

Hydrogen containers shall be designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII. Unfired Pressure Vessels - 1968 or U. S. Department of Transportation Specifications and Regulations.

Permanently installed containers shall have substantial noncombustible foundations.

(continued)

LIQUEFIED HYDROGEN SYSTEMS

Steel Supports in excess of 18 inches in height shall be protected with a protective coating having a 2 hour fire resistance rating.

Markings on each container shall be legibly marked to indicate "LIQUEFIED HYDROGEN - FLAMMABLE GAS."

Safety relief devices for stationary containers shall meet the size specification set in CGA pamphlet S-1, Part 3, Relief Devices Standards for Compressed Gas Storage Containers.

Portable liquefied hydrogen containers shall comply with DOT regulations and be equipped with safety relief devices sized in accordance with CGA Pamphlet S-1, Part 1 and Part 2.

Safety relief devices shall be provided in piping wherever liquefied hydrogen could be trapped between closures.

Protection shall be provided to minimize exposure of personnel to piping operations at low temperatures.

Uninsulated piping and equipment which operates at liquefied hydrogen temperatures shall not be installed above asphalt surfaces or other combustible materials.

Valves, gauges, regulators, and other accessories shall be suitable for liquefied hydrogen service.

Containers, piping, and valves shall be readily accessible yet protected against physical damage.

Cabinets or housings containing hydrogen control equipment shall be vented.

Electrical bonding and grounding is required for liquefied hydrogen containers and associated piping.

Storage sites shall be fenced and posted to prevent entrance by unauthorized personnel. Sites shall be placarded as follows:
LIQUEFIED HYDROGEN-FLAMMABLE GAS - NO SMOKING - NO OPEN FLAMES."

Storage containers located inside buildings shall have their safety relief valves vented unobstructed to the outdoors at a minimum elevation of 25 feet above grade.

For further information, call Fire Department, Ext. 6015.

FLAMMABLE LIQUIDS

IMPLEMENTATION OSHA 1910.106 (a, 19)

DEFINITIONS

Flammable liquids shall mean any liquid having a flashpoint below 140°F, and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100°F. These liquids shall be divided into the following classes:

Class I liquids shall include those having flashpoints below 100°F, and may be subdivided as follows:

Class IA shall include those having flashpoints below 73°F and having a boiling point below 100°F.

Class IB shall include those having flashpoints below 73°F and having a boiling point at or above 100°F.

Class IC shall include those having flashpoints at or above 73°F, and below 100°F.

Class II liquids shall include those having flashpoints at or above 100°F, and below 140°F.

For further information call Safety Services, Ext. 5251.

FLAMMABLE LIQUID CONTAINER SPECIFICATIONS

7-1-73

IMPLEMENTATION OSHA 1910.106(d)

Maximum Allowable Size of Containers and Portable Tanks

Container type	FLAMMABLE LIQUIDS				Combustible
	Class IA	Class IB	Class IC	Class II	liquids 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 spec.).....	60 gal.....	60 gal.....	60 gal.....	60 gal.....	60 gal.
Approved portable tanks.....	660 gal.....	660 gal.....	660 gal.....	660 gal.....	660 gal.

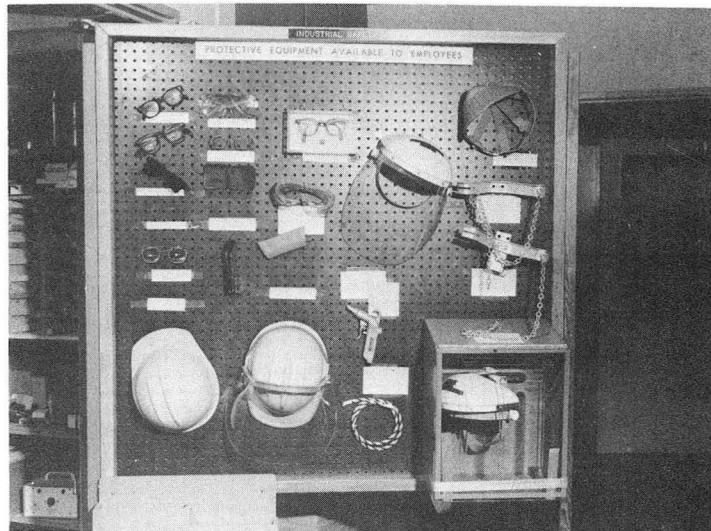
5.504

*For certain exceptions to this rule, see OSHA 1910.106(d) (iii)

For further information, call Safety Services, Ext. 5251.

LBL-2077

PERSONAL PROTECTIVE EQUIPMENT
GENERAL REQUIREMENTS



IMPLEMENTATION OSHA 1910.132(a) Supervisor's Manual Sec. 8.01 (H)

IMPORTANT

Protective equipment (including personal protective equipment for eyes, face, head, and extremities), protective clothing, respiratory devices, and protective shields and barriers shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact.

Lab Coats, Shop Coats and Coveralls

Laboratory policy prohibits furnishing of lab coats, shop coats, coveralls and comparable clothing except when required to protect the health or safety of employees or to provide a sanitary environment. Such clothing shall not be furnished by the Laboratory except in accordance with the following:

Criteria for Issue. Employees who work with hazardous materials or who work in a controlled sanitary environment may be issued protective clothing for wear while performing their work. If an employee's duties change so that the protective clothing is no longer required for the above reasons it shall be returned to the source of issue.

(continued)

Authority for Issue. Coats and overalls required for work with hazardous materials as described above shall be issued only when authorized by Safety Services. Issues shall be to specific individuals; open stocks of such clothing are not allowed.

Renewal of Authorization. Safety Services will maintain a list of employees who have been authorized to use lab coats and overalls. Annual renewal of the justification for issue and use of such clothing is required.

Supervisor's Responsibility. Supervisors are responsible for limiting the use of Laboratory furnished coats and coveralls by members of their group to circumstances which meet the criteria described above.

For further information, call Safety Services, Ext. 5251.

EYE AND PROTECTION

Fig. 1

IMPLEMENTATION OSHA 1910.133(a) ANSI Z87.1-1968
SEE ALSO OSHA 1910.252(e.2)

Safety glasses or their equivalent shall be worn at all times in any area that is posted "EYE PROTECTION REQUIRED." These glasses can be ordered through Environmental Health and Safety, Ext. 5251.

Eye protection areas shall be designated where machines or operations present the hazards of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.

For proper selection of eye and face protection consult the chart (Fig. 1) on page 6.101.

Filter lenses for welding goggles or helmets are issued by the Central Storeroom, Building 7.

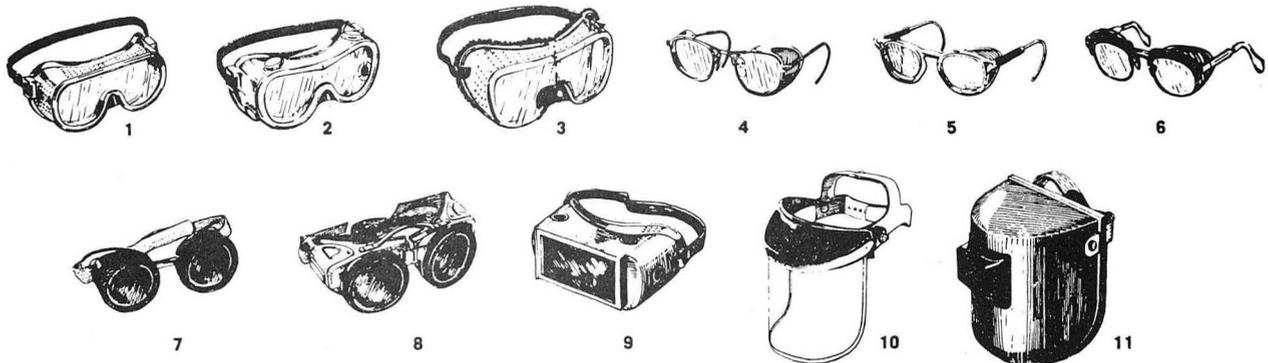
Dirty lenses can cause eye fatigue and become a contributory factor to accidents. Daily cleaning of eye protection is recommended.

Pitted or scratched lenses shall be replaced immediately.

For further information, call Environmental Health and Safety, Ext. 5251.

Selection Chart

Recommended Eye and Face Protectors for Use in Industry, Schools, and Colleges



- 1. **GOGGLES**, Flexible Fitting, Regular Ventilation
- 2. **GOGGLES**, Flexible Fitting, Hooded Ventilation
- 3. **GOGGLES**, Cushioned Fitting, Rigid Body
- *4. **SPECTACLES**, Metal Frame, with Sideshields
- *5. **SPECTACLES**, Plastic Frame, with Sideshields
- *6. **SPECTACLES**, Metal-Plastic Frame, with Sideshields
- 7. **WELDING GOGGLES**, Eyecup Type, Tinted Lenses (Illustrated)
- 7A. **CHIPPING GOGGLES**, Eyecup Type, Clear Safety Lenses (Not Illustrated)
- 8. **WELDING GOGGLES**, Coverspec Type Tinted Lenses (Illustrated)
- 8A. **CHIPPING GOGGLES**, Coverspec Type, Clear Safety Lenses (Not Illustrated)
- 9. **WELDING GOGGLES**, Coverspec Type, Tinted Plate Lens
- 10. **FACE SHIELD** (Available with Plastic or Mesh Window)
- 11. **WELDING HELMETS**

*Non-sideshield spectacles are available for limited hazard use requiring only frontal protection.

APPLICATIONS		
OPERATION	HAZARDS	RECOMMENDED PROTECTORS: <small>Bold Type Numbers Signify Preferred Protection</small>
ACETYLENE-BURNING ACETYLENE-CUTTING ACETYLENE-WELDING	SPARKS, HARMFUL RAYS, MOLTEN METAL, FLYING PARTICLES	7, 8, 9
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	2, 10 (For severe exposure add 10 over 2)
CHIPPING	FLYING PARTICLES	1, 3, 4, 5, 6, 7A, 8A
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	9, 11 (11 in combination with 4, 5, 6 , in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	7, 8, 9 (For severe exposure add 10)
GRINDING-LIGHT	FLYING PARTICLES	1, 3, 4, 5, 6, 10
GRINDING-HEAVY	FLYING PARTICLES	1, 3, 7A, 8A (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	2 (10 when in combination with 4, 5, 6)
MACHINING	FLYING PARTICLES	1, 3, 4, 5, 6, 10
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	7, 8 (10 in combination with 4, 5, 6 , in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	1, 3, 4, 5, 6, 10

Fig. 1

RESPIRATORY PROTECTIONIMPLEMENTATIONOSHA 1910.134(a)ANSI Z88.2-1969NOTICE

Protection from respiratory hazards; dust fumes, sprays etc; shall be accomplished as far as feasible by accepted engineering controls such as enclosure, confinement, or local ventilation. When effective engineering controls are not feasible, or while they are being instituted, or in an emergency, respirators shall be issued to personnel trained in their use. All respirators shall be issued through the Industrial Hygiene Section, Ext. 5829.

Employees issued respirators shall use respirators only in the manner prescribed by the Industrial Hygiene staff.

Respirators used by more than one person shall be cleaned and disinfected after each use. Those used exclusively by one person shall be cleaned and inspected after each use.

Respirators shall be stored in a convenient, clean, and sanitary location.

Wearing of contact lenses in contaminated atmospheres with a respirator is not allowed.

For further information, call Safety Services, Ext. 5251.

COLOR CODES FOR MARKING PHYSICAL HAZARDS

Red			Green
Orange			Blue
Yellow			Purple

NEED

Color code identification of hazards and safety equipment that meets Federal specifications.

IMPLEMENTATION OSHA 1910.144 (a) ANSI Z53.1-1967

Red shall be the basic color for identification of:

Fire protection equipment and apparatus.

Safety cans or other portable containers of flammable liquids having flashpoints at or below 80°F.

Emergency stop bars on hazardous machines.

Stop buttons or electrical switches used for emergency stopping of machinery.

Orange shall designate dangerous parts of machines or energized equipment when guards are removed.

Yellow shall designate caution and for marking physical hazards such as striking against, falling, or tripping. Black stripes may be used as an overlay.

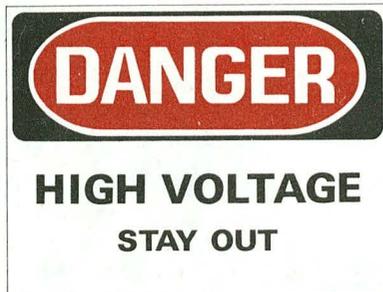
Green shall designate "Safety" and the location of First Aid equipment.

Blue shall designate caution against starting equipment under repair.

Purple shall designate radiation or radioactive material.

Black, white or combinations of these colors shall be used for traffic and housekeeping markings. Stripes or checkerboard patterns may be used.

For further information, call Safety Services, Ext. 5251

ACCIDENT PREVENTION SIGNSNEED

Proper signs to warn workers of hazards in the work area.

IMPLEMENTATION OSHA 1910.145 (c) ANSI Z35.2-1966

Danger signs shall be used where there is an immediate hazard and special precautions are necessary.

Caution signs shall be used only to warn against potential hazards or to caution against unsafe practices.

Safety instruction signs shall be used where there is need for general instruction relative to safety measures.

REPORTING OF OCCUPATIONAL INJURIES

IMPLEMENTATION ERDAM 0502, OSHA 1910,151, 41 CFR 50-204.6,
"Reporting of Industrial Injuries", LBL SAFETY
NEWS, No. 220, March 1977

An occupational injury is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.

An occupational illness of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, indigestion, or direct contact.

Injured employees should report to Medical Services (Bldg. 26) as soon as possible. If the injury occurs between the hours of 6:00 PM to 7:30 AM, the injured employee should report to the Fire House (Bldg. 15) for first aid treatment.

FOR SERIOUS INJURIES requiring an emergency response, call
Extension 5333.

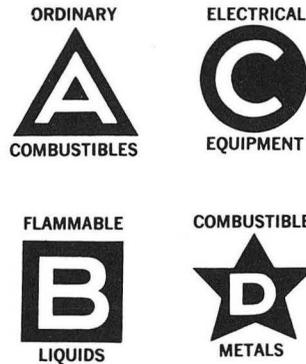
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REPORTING OF OCCUPATIONAL INJURIES

All job incurred injuries or illnesses must be reported to the injured employee's supervisor as soon as possible.

If an employee goes to a private, off-site doctor about a job-incurred injury or illness, inform the doctor consulted that the injury or illness is an industrial case. It is the employee's responsibility to notify Medical Services and his/her supervisor of the injury or illness, and the treatment received.

If the injury or illness results in an absence from work, the employee must report to Medical Services for examination of his/her ability to safely resume work duties.

TYPES OF FIREIMPLEMENTATION OSHA L 1910.156

Fires are divided into the following four (4) categories:

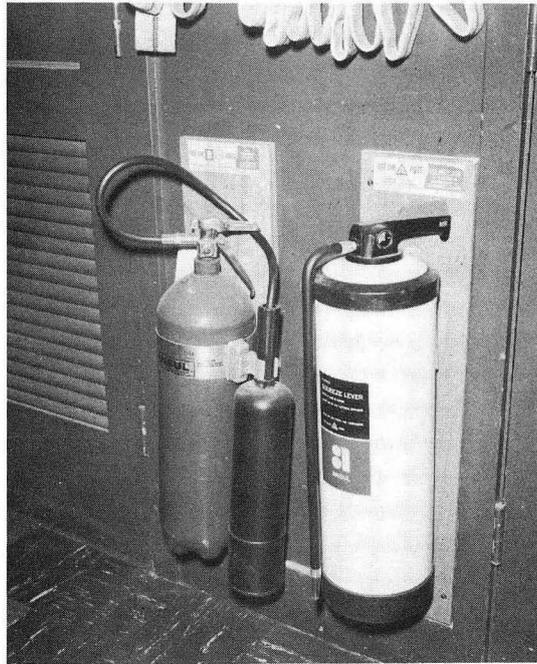
"Class A fires" are fires involving ordinary combustible materials, such as wood, cloth, paper, and rubber.

"Class B fires" are those involving flammable liquids, gases, and greases.

"Class C fires" are fires which involve energized electrical equipment where the electrical nonconductivity of the extinguishing media is of importance.

"Class D fires" are fires involving combustible metals, such as magnesium, titanium, sodium, etc.

For further information call the Fire Department, Ext. 6015

PORTABLE FIRE EXTINGUISHERS

IMPLEMENTATION OSHA 1910.157(a) NFPA 10-1970

Portable fire extinguishers shall be:

Maintained in a fully charged condition.

Kept in their designated places at all times when they are not used.

Conspicuously located where they will be readily accessible and immediately available.

Unobstructed and unobscured from view or have their location clearly indicated by signs.

Clearly identified by the type of fire they are intended to extinguish.

Mounted on hangers, placed in cabinets or installed on wheeled carts.

Visually checked once a month.

Thoroughly inspected and recharged (when necessary) once a year.

Tagged with a durable tag indicating the last date of inspection.

For further information, call the Fire Department, Ext. 6015.

INSPECTION OF COMPRESSED GAS CYLINDERSNEED

Gas cylinder that are free of defects that could cause a serious accident.

IMPLEMENTATION OSHA 1910.166(b)

Each employee shall determine that all compressed gas cylinders under their control are in safe condition.

Cylinders shall be considered defective and removed from service if they contain:

Dents, where the metal deformation is sharp and confined or were they are near a weld.

Cuts, gouges or digs over 3 inches long.

Leaks can be checked by applying a soapy solution to seams and pressure openings. Any leakage is cause for rejection.

Fire damage includes:

Charring or burning of paint

Burning or sintering of the metal

Distortion of the cylinder

Melted out fuse plugs

Burning or melting of valve

(over)

INSPECTION OF COMPRESSED GAS CYLINDERS

Fire damaged cylinders shall be taken out of service and sent back to the supplier for repair or testing.

Cylinders with valves that are noticeably tilted shall be taken out of service.

CARE OF SAFETY RELIEF DEVICES

Fig. 1

NEED

Safe operating pressure relief devices for compressed gas cylinders and portable compressed air tanks

IMPLEMENTATION OSHA 1910.167(b)

Safety relief devices shall be kept in reliable operating condition at all times and should be periodically given a visual inspection.

Channels of the safety relief devices must be free of paint or accumulated dirt. (Fig. 1)

Only qualified personnel shall be allowed to service safety relief devices.

For further information, call Safety Services, Ext. 5251.

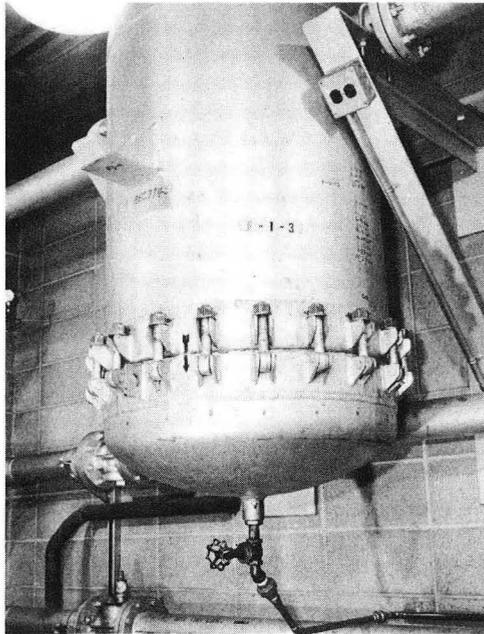
AIR RECEIVERS

Fig. 1

NEED

Safe operating air receivers

IMPLEMENTATION OSHA 1910.169(a), (b)

Air receivers shall be installed so that drains, handholes and manholes are easily accessible.

Underground burial or inaccessible locations of air receivers is not permitted.

A drain pipe and valve shall be installed at the lowest point of every air receiver to provide for the removal of accumulated oil and water. (Fig. 1)

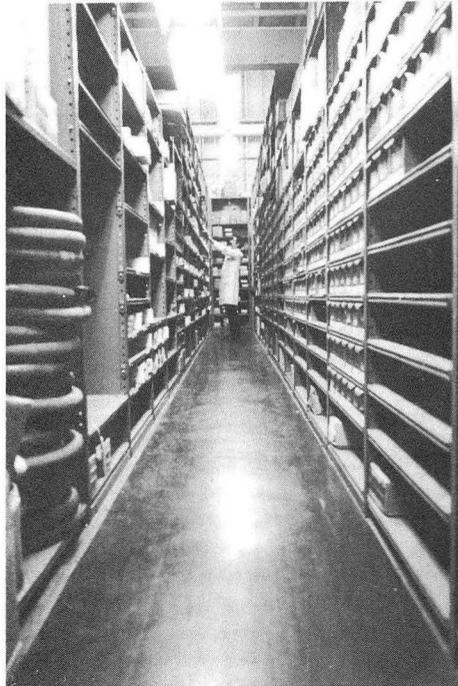
An indicating pressure gage and one or more spring loaded safety valves are required for every air receiver.

No valve of any type shall be placed between the air receiver and its safety valve.

All safety valves shall be tested frequently and at regular intervals to determine whether they are in good operating condition.

For further information, call Safety Services, Ext. 5251.

MATERIALS HANDLING AND STORAGE
GENERAL REQUIREMENTS



NEED

Safe working conditions where materials are stored and handled.

IMPLEMENTATION OSHA 1910.176(a)

Safe clearances at loading docks, through doorways and wherever turns or passage must be made shall be maintained wherever mechanical handling equipment is used.

Aisles and passageways shall be kept clear and in good repair.

Permanent aisles and passageways shall be appropriately marked.

Bags, containers, bundles, etc. stored in tiers shall be stacked, blocked, interlocked, and limited in height so that they are secure against sliding or collapse.

Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage.

Proper drainage shall be provided in storage areas.

Clearance signs to warn of clearance limits shall be provided.

For further information call Safety Services, Ext. 5251.

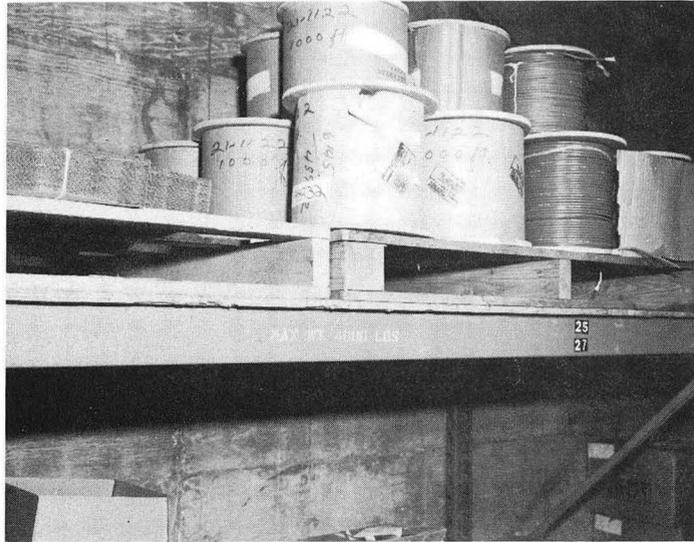
FIRE PROTECTION FOR INDOOR GENERAL STORAGE

Fig. 1

NEED

Indoor storage facilities free from conditions that contribute to the spread of fire.

IMPLEMENTATION OSHA 1910.177(b), (c), (d)

Portable fire extinguishers shall be provided at convenient, conspicuously accessible locations.

Alarm service shall be provided at storage facilities.

Commodities shall be stored, handled and piled with due regard for their fire characteristics.

Hazardous combinations may form due to the contact of two different commodities. Care shall be taken that such commodities are given sufficient separation.

Safe floor loads shall not be exceeded. (Fig. 1)

Automatic sprinklers shall be installed in all warehouses having combustible roof or floor constructions.

Water supplies for hose streams shall be provided to supplement that required for automatic sprinklers.

Liquid fuel heating equipment shall not be located over stored commodities.

Smoking shall be strictly prohibited except in locations prominently designated as smoking areas, and "No Smoking" signs shall be posted in prohibited areas.

For further information, call Safety Services, Ext. 5251.

POWERED INDUSTRIAL TRUCKS

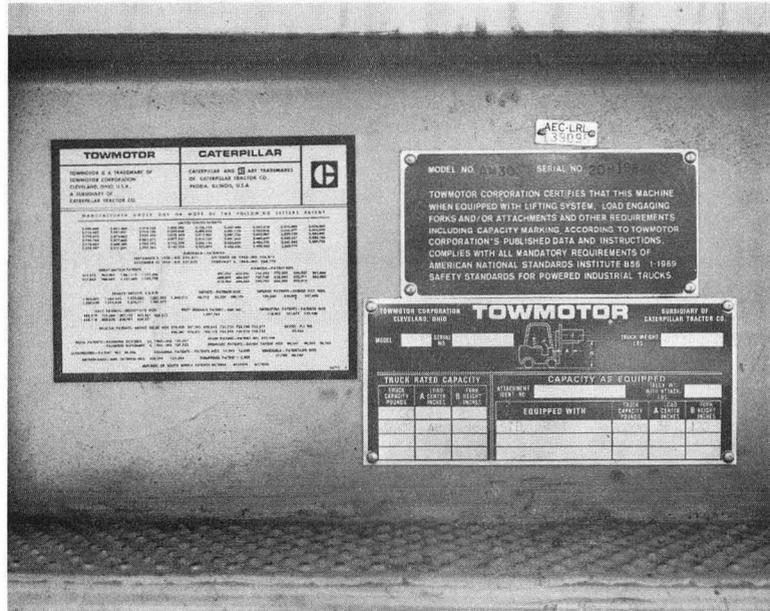


Fig. 1

NEED

Industrial trucks that meet Federal specifications.

IMPLEMENTATION OSHA 1910.178(a) ANSI B56.1-1969

All new powered industrial trucks acquired and used after Feb. 15, 1972 shall meet the design and construction requirements established in "American National Standards for Powered Industrial Trucks, Part II", ANSI B56.1-1969.

Modifications and additions which effect capacity and safe operation shall not be performed without manufactures prior written approval.

Nameplates and markings must be in place and maintained in a legible condition. (Fig. 1)

Overhead guards shall be fitted on High Lift Trucks.

For further information, call Safety Services, Ext. 5251.

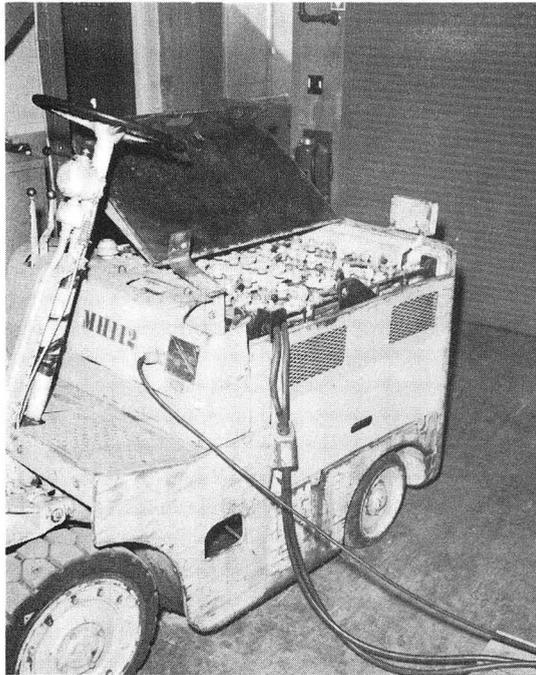
BATTERY POWERED VEHICLES

Fig. 1

NEED

Protection from the hazards involved in wet cell battery charging.

IMPLEMENTATION OSHA 1910.178(g)

Battery charging installations shall be located in areas designated for that purpose.

Facilities shall be provided for flushing and neutralizing spilled electrolyte.

Ventilation adequate enough to disperse fumes from gassing batteries, shall be maintained in the charging area.

Battery support racks shall be made of nonconductive material.

Carboy tilters or syphons shall be provided for handling electrolyte.

Vent caps shall remain in place while charging batteries.

Battery compartments shall remain open during charging operations in order to dissipate heat (Fig. 1)

No smoking in the charging area.

Tools and metallic objects shall be kept away from the top of uncovered batteries.

For further information, call Safety Services, Ext. 5251.

FORKLIFT OPERATIONS

Fig. 1

NEED

Operations involving forklifts that are safe and comply with existing State and Federal regulations.

IMPLEMENTATION OSHA 1910.178(m), (n), (o)

When operating a forklift, never:

Drive up to someone standing in front of a bench or fixed object

Allow a person to pass or stand under the elevated forks

Allow persons to ride on the forklift

Leave a forklift unattended without lowering the forks, turning off the power and setting the brakes.

Wheel chocks shall be used whenever a forklift is parked on an incline.

Safe distances shall be maintained from the edge of ramps or loading docks.

Trucks and trailers shall have their brakes set and their wheels chocked while they are being loaded or unloaded with a forklift.

Spinner knobs shall not be attached to steering wheels unless they are original equipment.

Grades shall be ascended or descended slowly.

(over)

FORKLIFT OPERATIONS

Loads shall be driven upgrade when ascending or descending a grade greater than 10% .

Unloaded forklifts should be operated with the forks pointed downhill ascending or descending.

Forks shall be tilted back and raised only high enough to clear the surface any-time the forklift is moving. (Fig. 1)

Dockboard and bridgeplates shall be secured before they are driven over with a forklift.

Stunt driving and horseplay is prohibited.

Traffic regulations shall be observed at all times.

HAND AND PORTABLE POWERED TOOLS
GENERAL REQUIREMENT

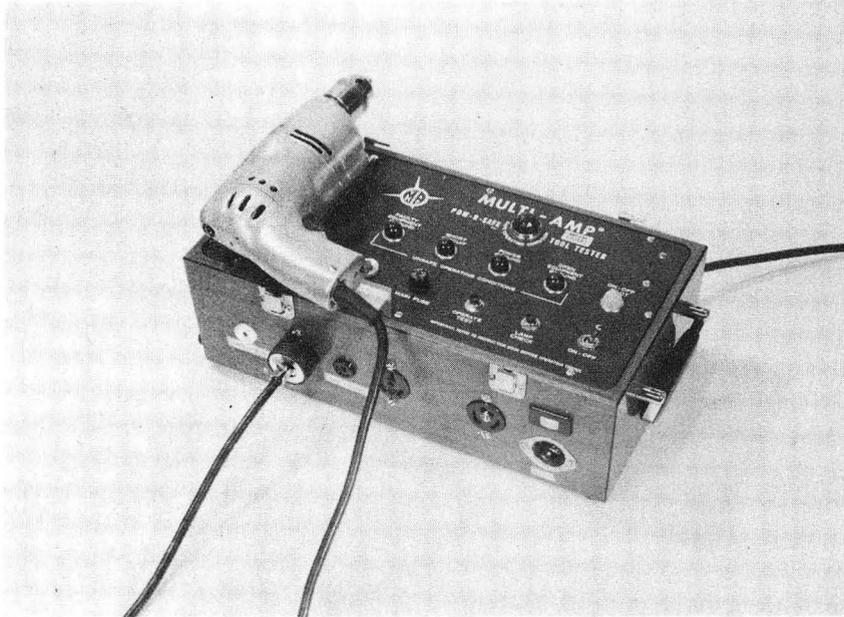


Fig. 1

IMPLEMENTATION OSHA 1910.242 41 CFR 50-204.4, 50-204.8

Each employee is responsible for the safe condition of tools and equipment assigned to him.

All hand held, metal jacketed, portable electric tools shall be tested for shorts and defective grounds at least once a year. (Fig. 1)

Defective and worn tools shall be repaired by a qualified repairman or replaced.

Grounding prongs on three prong power cable plugs shall not be removed.

Compressed air cleaning nozzles shall be of the approved diffuse air stream type.

For further information, call Safety Services, Ext. 5251.

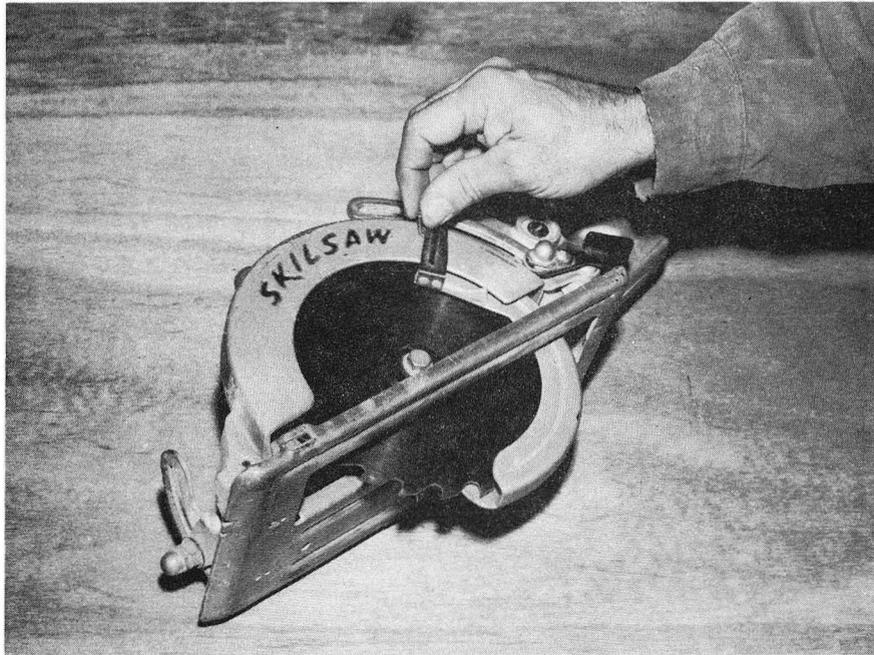
GUARDING PORTABLE POWERED TOOLS

Fig. 1

IMPLEMENTATION OSHA 1910.243(a) ANSI B71.1-19

Portable circular saws having a blade diameter greater than 2 inches shall be equipped with guards above and below the base plate or shoe. The lower guard shall be of the retractable type. (Fig. 1)

"Dead man" switches shall be provided for all hand-held circular saws, percussion tools and chain saws.

Belt sanding machines shall be provided with guards at each nip point and the unused run of the belt shall be guarded.

Cracked saws shall be removed from service.

Abrasive wheels for portable grinders shall be "ring tested" before they are mounted on grinders.

For further information, call Safety Services, Ext. 5254.

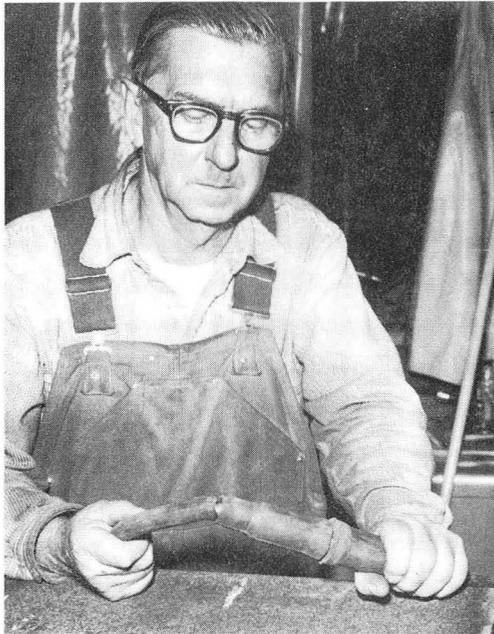
ARC WELDING

Fig. 1

IMPLEMENTATION OSHA 1910.252(b.2) NFPA No. 51-1969
ANSI 249.1-1967

Terminals for welding leads should be protected from accidental contact by personnel or metal objects.

The frame or case of the welding machine shall be grounded.

All d. c. machines shall be connected with the same polarity.

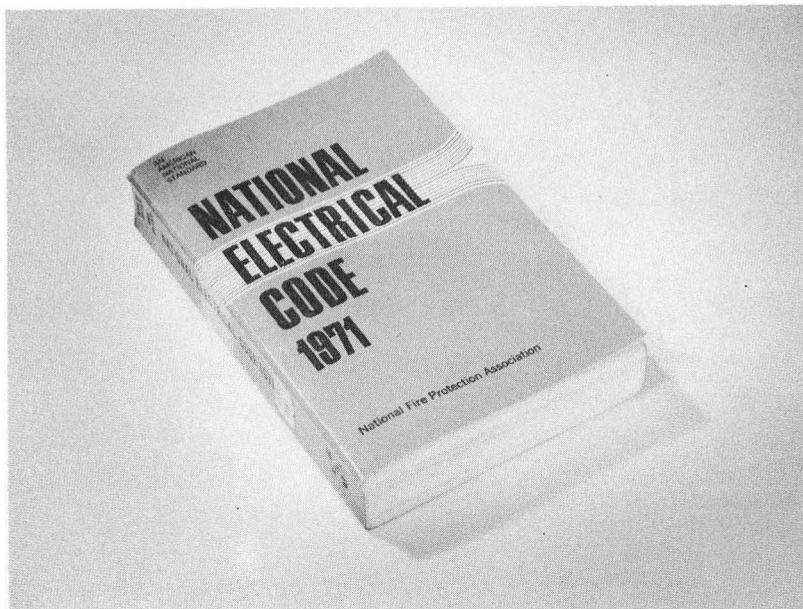
All a. c. machines shall be connected to the same phase of the supply circuit and with the same instantaneous polarity.

Electrode holders when not in use shall be placed where they cannot make contact with personnel, conducting objects, fuel or compressed gas tanks.

Work and electrode lead cables should be frequently inspected for wear and damage. (Fig. 1)

For further information, call Safety Services, Ext. 5251.

ELECTRICAL
GENERAL REQUIREMENTS



IMPLEMENTATION OSHA 1910.308-0.309 ANSI C1-1971

The provisions of the NATIONAL ELECTRICAL CODE (ANSI C1-1971 or NFPA 70-1971) shall be the basic minimum considered necessary for safety.

The purpose of the NATIONAL ELECTRICAL CODE is the practical safeguarding of personnel and of buildings and their contents from hazards arising from the use of electricity for light, heat, or power.

Every new electrical installation and all new utilization equipment installed after March 15, 1972, and every replacement, modification, or repair or rehabilitation equipment installed after March 15, 1972, shall be installed or made, and maintained, in accordance with the provisions of the 1971 NATIONAL ELECTRICAL CODE.

For further information call Safety Services, Ext. 5251.

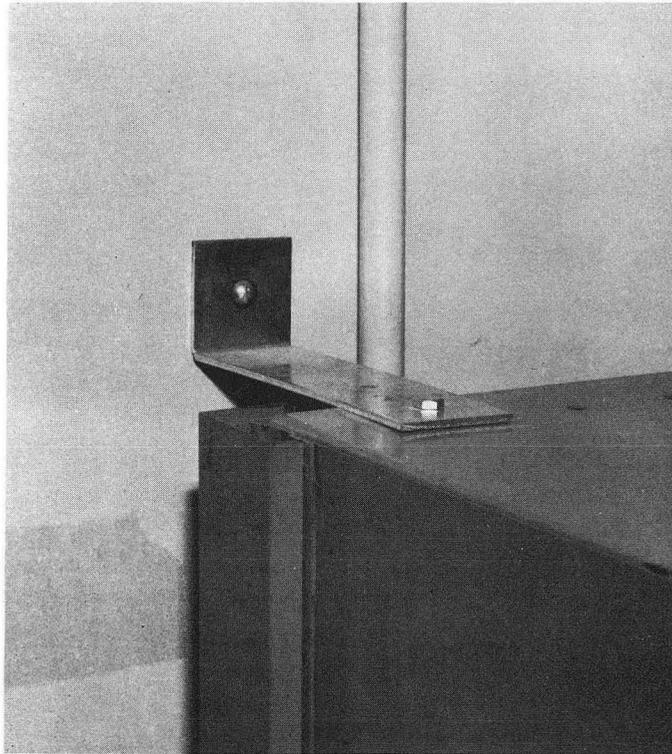
EARTHQUAKE SAFETY MEASURES

Fig. 1

NEED

Protection from falling equipment and other heavy items and to maintain a safe means of egress.

IMPLEMENTATION OSHA E 1910.36, 1910.37

Bookcases 5 feet or greater in height

Remove, shorten, or secure to wall. In particular, move away from persons who may be endangered.

File cabinets 4 feet or greater in height

Remove from proximity to persons or secure to wall. (See Fig. 1)

Electronics racks

Secure to floors or walls.

Storage shelves and bins

General approach to solution: Strap separate units together and secure them to wall at top and bottom.

Electronics racks, tool cases, test equipment, mounted on casters

Install casters with locking wheels. Chain or otherwise secure all mobile equipment when not in use.

(over)

EARTHQUAKE SAFETY MEASURESPaper storage and other heavy items on shelves or on top of cabinets

Store such heavy materials on floor not to exceed 3 feet in height.

Glassware, chemicals and other hazardous laboratory equipment

Store in wall cabinets with secure door latches or in base cabinets. The method of attaching wall cabinets to walls should be examined and improved when necessary. A lip can be attached to the outside edge of shelves to prevent hazardous chemicals from sliding off.

Lead bricks

Miscellaneous loose lead bricks should be stored on the floor or on pallets in a reasonably distributed manner. Stack height should be no greater than $1/2$ the least base dimension. Bricks stacked or built into shielding walls should have containing frames securely anchored against overturning.

Any heavy materials or equipment hanging on walls or stored on shelves

Secure items to walls. Secure shelves or bins against overturning. Store heavy items near floor level. Bins stored outside close to edge of hill tops should be stationed away from the edge.

Seismic Design Criteria for Dispersible
Radioactive Containment Facilities

DEFINITIONS

Critical Areas - Areas containing high-level and intermediate-level sources of dispersible radioactivity.

High-Level Source—High-level sources are those that contain more than 0.1 curie α emitters or more than 5 Ci β - γ emitters (involvement of these quantities of materials in a fire might present a health hazard to persons off-site).

Intermediate-Level Sources—These sources are classified as follows:

- | | |
|-----------------|---|
| Alpha emitters: | less than 0.1 Ci but greater than several μ Ci. |
| Beta emitters: | less than 5 Ci but greater than several hundred μ Ci. |

These sources, if exposed to fire, or otherwise released, would probably not be a health hazard to persons off-site. They could, however, pose a serious health hazard to persons in the same room, such as unprotected fire fighters.

Critical Items—Critical items are those structures, systems, and components whose continued integrity and/or operability is essential to prevent a radioactive release and/or mitigate the consequences of a release should it occur.

Operating Basis Earthquake (OBE)—An earthquake for which design requirements conform to the Uniform Building Code for lateral load or shear at the base of a structure. For the San Francisco Bay Area, (zone 3) this value is 0.2W.

(W = total dead load of the structure)

Design Base Earthquake (DBE)—An earthquake equal to at least twice the OBE in terms of ground acceleration. Lateral loads or shear at the base will have a value of 0.5W.

DESIGN REQUIREMENTS

Critical Items or equipment associated with critical areas of radioactive containment should be designed to withstand a design basis earthquake (DBE). Remaining areas of the structure and its associated equipment should be designed to remain operable under an operating base earthquake. The smaller earthquake—the OBE—is equivalent to approximately one-half the DBE in terms of ground acceleration.

(continued)

Seismic Design Criteria for Dispersible
Radioactive Containment Facilities

Massive Structures such as shielding associated with critical areas should be designed, where practical, to withstand the DBE. If this is impractical, then design must incorporate alternative methods to protect the containment box, such as energy-absorbing frames or other means.

High-Level Sources housed in irradiators are not considered dispersible since sources are doubly incapsulated in welded stainless steel vessels. The stability of each irradiator unit should be evaluated.

Shielded Radioisotope Shipping Containers or Casks may or may not contain dispersible activity. All such shipping containers used for off-site shipments will conform to ERDA 0529 and 49 CFR 170.1 in which is stated, among other specifications, that there will be no radioactive release to the environment when container is subjected to a thirty-foot free fall onto an unyielding surface; and a 1500° F fire for 30 minutes. A complete shipping container assembly will, therefore, provide adequate isotope protection for the DBE.

The Need for Testing Assemblies and/or parts of critical equipment and structures for stability and mechanical integrity is left to the judgment of the design engineer. The shaking table at the Earthquake Engineering Research Center at the University of California Richmond Field Station is available for the purpose of testing large or scale-model structures.

For further information, call Safety Services, Ext. 5251.

SAFE USE OF VEHICLESNEED

Prevention of vehicle accidents.

IMPLEMENTATION AECM 0553 CALIFORNIA VEHICLE CODE
MOTOR CARRIERS SAFETY REGULATIONS (DOT)
LBL SUPERVISORS HANDBOOK, Sec. 1.06

Operation of UNIVERSITY-owned Laboratory vehicles is limited to employees with valid California drivers licenses.

Operation of FEDERALLY-owned Laboratory vehicles is limited to holders of a U. S. GOVERNMENT MOTOR VEHICLE OPERATOR'S IDENTIFICATION CARD whose issuance shall be limited to employees meeting the qualifications outlined in AECM 0553.

Operation of certain classes of government vehicles is limited to employees whose identification cards are endorsed specifically for those classes of vehicles, i. e., scooters, trucks over 1 ton, forklifts, and mobile cranes.

Violators of traffic regulations are subject to citations of University (Laboratory) police. These citations are adjudicated by the City of Berkeley.

The basic speed limit on University property is 25 miles per hour. However, pedestrian traffic, road repair work, wet weather, poor visibility, or other hazards may require speeds below 25 MPH maximum.

(over)

SAFE USE OF VEHICLES

Seat belts, when provided, shall be worn by the driver and all occupants while the Laboratory vehicle is in motion.

Chock Blocks, when provided, shall be placed adjacent to a rear wheel when the vehicle is left unattended.

Mechanical defects noticed by the operator of a Laboratory vehicle shall be immediately brought to the attention of the Motor Pool.

For further information call Safety Services, Ext. 5251.

REPORTING OF VEHICLE ACCIDENTSNEED

Safer driving conditions through the development of accident analysis.

IMPLEMENTATIONAECM 0553CALIFORNIA VEHICLE CODEMOTOR CARRIER SAFETY REGULATIONS (DOT)LBL SUPERVISORS HANDBOOK, Sec. 9.00

All on site vehicle accidents, including those involving pedestrians must be reported to the Laboratory Police Department within one workday of occurrence.

Accidents involving Laboratory vehicles must be reported to the Laboratory Police Department regardless of extent of damage or location of accident.

Drivers of Laboratory vehicles involved in accidents must complete a MOTOR VEHICLE ACCIDENT REPORT FORM (RL-3617) and submit it to the Motor Pool.

The Vehicle Accident Review Board will review all accidents involving Laboratory vehicles with the driver and his immediate supervisor.

Accident investigations revealing driver negligence will be considered a basis for revocation or suspension of the U. S. GOVERNMENT MOTOR VEHICLE OPERATOR'S IDENTIFICATION CARD.

An INVESTIGATION REPORT OF MOTOR VEHICLE ACCIDENT form must be completed by the driver's supervisor whenever the accident results in injuries or damages \$100.00 or greater. This form is submitted to ERDA.

For further information call Safety Services, Ext. 5251

**PART II-HEALTH & SAFETY ORGANIZATIONS,
PLANS, & PROCEDURES**

THE SAFETY REVIEW COMMITTEE

The Safety Review Committee, formerly known as the Hazardous Equipment Safety Review Committee, was originally formed to develop safety standards for hazardous equipment, such as hydrogen targets, found at accelerators. Since its original concept, the committee charter has been expanded to include all areas of safety and currently has three standing subcommittees: Electrical Safety Review Committee, Mechanical Engineering Safety Committee, and Emergency Preparedness Advisory Committee. The subcommittees develop safety standards and procedures in areas where there are no existing codes.

The membership of the Safety Review Committee is appointed by and responsible to the Laboratory Director.

Membership

Rolf H. Muller	Chairman
Gerd U. Behrsing	Secretary
Daniel S. Andes	Security Administration
Charles Schmidt	Medical Services
Donald D. Eagling	Plant Engineering
Robert J. Force	Accelerator Division
Walter D. Hartsough	Associate Director
Edward C. Hartwig	Electronic Engineering
H. Paul Hernandez	Mechanical Engineering
Leal L. Kanstein	184-Inch Cyclotron
Leroy T. Kerth	Physics Division
Robert M. Latimer	Safety Services
Ralph D. McLaughlin	Chemistry Division
Amos S. Newton	Energy and Environment
Ralph H. Thomas	Health Physics

The SubcommitteesMechanical Engineering Safety Committee

The Mechanical Engineering Safety Committee reviews and approves (or disapproves) the design, fabrication, testing operation and emergency procedures of experimental equipment containing flammable fluids. The Committee develops design standards for other hazardous equipment and reviews experimental setups where unusual arrangements of equipment may result in a potential hazard.

MembershipArea of Responsibility

Rod Byrns	All Chemistry, Organic and Inorganic, Materials Research Equipment and Installation. Buildings 62, 70 and 73 areas. Hydrogen Storage areas.
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(continued)

Mechanical Engineering Safety Committee (continued)

<u>Membership</u>	<u>Area of Responsibility</u>
Gerd Behrsing	Bevatron, Mechanical Shops, Building 74 and Campus areas. Bio-Medical.
Bill Pope	All Physics Research Equipment and Installation, Heavy Ion Accelerator - Building 71, 184-Inch Cyclotron, and 88-Inch Cyclotron areas.
Lee Glasgow	Lifting Devices
Jack Gunn	Pressure Vessels

Electrical Safety Review Committee

This Committee reviews all electrical installations at the Laboratory from the standpoint of electrical safety. Each member of the Committee shall review the practices in his area of responsibility and interpret the rules on a day today basis. Equipment that is found to be in variance with these guidelines and which the member feels presents a real hazard shall be shut down. If any disagreement arises, the matter shall be brought to the chairman of the Committee for resolution. When problems are foreseen, a committee member should call on the chairman and one other member to help interpret the rules. Any request for a variance to the rules shall be made to the chairman.

<u>Membership</u>	<u>Responsibility</u>
Ed Hartwig	Chairman
Don Rondeau	Co-Chairman
Charlie Carr	Physics Instrumentation
Phil Frazier	88" Cyclotron
Ross Grazier	HILAC
George Killian	Nuclear Science
Chet Pike	MMRD
Bob Sorensen	184" Cyclotron
Frank Upham	Bio/Med
Ferd Voelker	Bevatron
Hal Vogel	Energy & Environment

Emergency Preparedness Advisory Committee

This Committee collects, updates and refines the emergency plans for each area and building and the over-all plan for the Hill. (See Emergency Plans, page 30.000.) This Committee plans for the coordination of the Director's Office, Medical, Security, Safety Services, Plant Department, and Stores during emergencies.

(continued)

Emergency Preparedness Advisory Committee (continued)Membership

Walter Hartsough Chairman
Bob Latimer
Dan Andes
Igor Blake
Wes Weber
Don Eagling

Appeals

The Safety Review Committee will review all appeals and will report its findings to the Director of the Laboratory for his decision. All appeals must be presented to the Chairman of the Safety Review Committee in writing at least 10 days prior to the next meeting.

VEHICLE ACCIDENT REVIEW BOARD

The Vehicle Accident Review Board was created in 1967 in response to the Atomic Energy Commission's urging that the Laboratory take steps toward reducing the vehicle accidents. The concept was to have a board containing representatives from departments whose personnel did most of the Laboratory driving. Prior to the Board's inception, only the accidents of the professional drivers were reviewed.

The Board's responsibilities include the following:

- (a) Review and recommendation for corrective action on all potential vehicle accident conditions; recommendations concerning driver training, vehicle inspection and vehicle equipment; and studies and recommendations regarding road patterns and traffic flows will be made to the Business Manager.
- (b) Review of all reported accidents involving Laboratory-owned or Laboratory-operated vehicles.
- (c) Determination of the preventability of all accidents by the standards established for National Safety Council Safe Driver Award Program and reference to the Business Manager for disciplinary action or collection of costs on those cases where intentional or gross negligence is established.
- (d) Assurance that driver's records are maintained, as required by ERDA.
- (e) Certification of those drivers eligible to participate in the Safe Driver Award Program.

Membership

R. M. Latimer	Chairman
D. C. Bernsten	Security
H. J. Browne	Safety Services
W. D. Hartsough	Director's Office
D. V. Nielsen	Supply Administration
A. C. Mitchell	Transportation Services

MEDICAL SERVICES

Since 1948 a program of occupational health has been maintained at the Berkeley facilities, with emphasis on special problems peculiar to the Laboratory's research activities. The mental and physical well-being of an employee, visiting scientist, or guest is the responsibility of Laboratory management, and is achieved through cooperation of the patient-employee himself and his private physician with the Laboratory effort. In the areas of radiation exposure or contamination, the Laboratory takes a major role in prevention, diagnosis, and — where required — treatment.

Preplacement, periodic, and special examinations are conducted, and suggestions or restrictions are made in the best interest of the employee's medical status. Emergency services are provided at the level of a community hospital emergency ward. Decontamination facilities and radiological accident preparedness are maintained. Diagnosis and treatment of nonoccupational illness or injury is limited to minor first aid, emergencies, and special situations for which treatment is in the best interest of the Laboratory, the patient-employee, and his private physician.

Potential occupational exposures to hazardous situations or agents will be investigated on a continuing basis by Medical Services in cooperation with Industrial Hygiene, Industrial Safety, and other divisions of Safety Services.

Facilities

The physical plant consists of Building 26, (Ext. 6266), with space for medical services, bioassay laboratory, special examining room, and Industrial Hygiene and Toxicology (Safety Services). The medical services facilities include a first aid room, clerical and filing space, two examination rooms, three doctor's offices, x-ray and dark room, lavatories, a two-bed holding ward, a decontamination room, and a clinical pathology laboratory. The Medical Department is equipped to function on the same basis as a hospital and emergency room, with the added facilities for routine physical examinations and decontamination area.

A large decontamination room with provision for containment of radionuclides during personnel decontamination procedures is an integral part of the medical facility. The decontamination room provides ample space for effecting a broad spectrum of decontamination procedures and emergency primary aid.

HEALTH PHYSICS

Since the late 1940's the Health Physics Department has been responsible for the protection of persons from radiation fields and radioactivity produced by accelerators and other machines generating x-rays or nuclear radiation.

The Health Physics Department works with the Medical Department and the Safety Services Department in interpreting radiation hazards and making decisions on observation and treatment in cases of radiation exposure. It also works closely with accelerator operations groups at the Laboratory to minimize personnel exposures, and with the experimental physics groups to support their programs, particularly in the field of shielding studies. The Department participates in the planning for new radiation-producing machines and for proposed changes in existing machines, and is required to review all such plans. Specific areas of responsibility are shielding calculations, safe target handlings, and controlling beam-loss patterns, thereby minimizing induced radioactivity and radiation damage.

The Health Physics Department's Major Responsibilities Are To:

1. Provide personnel-monitoring services.
2. Be responsible for making all radiation surveys necessary to control personnel exposures caused by the operation of particle accelerators and x-ray equipment.
3. Be familiar with the operation of and the experimental program at every accelerator.
4. Evaluate changes in operation and shielding of every machine.
5. Recommend and advise the establishment of radiation safety rules, interlock systems, and any other protective devices and techniques.
6. Provide proper instruments and detectors for personnel monitoring and protection of individuals.
7. Evaluate exposure from lasers.

Facilities

Building 72 is the Health Physics headquarters, (Ext. 5006); it contains offices and laboratory space for calibrating and analyzing data from radiation detectors. The personnel radiation monitoring section is also in this building.

Both portable and fixed radiation-monitoring equipment are located at every accelerator. This equipment detects all hazardous accelerator radiation and transmits radiation-level information to Building 72. Radiation equipment is used in the control of access to certain areas, and various groups at the accelerators refer to it to make judgments on a day-to-day basis on personnel access and permissible work times.

The radiation produced by the accelerators is monitored at four locations on the boundary of the Laboratory.

SAFETY SERVICES

The Safety Services Department is a multi-disciplined group charged with delineating, advocating, assisting in, and, as indicated, enforcing safe practices in the fields of radioisotope control, industrial safety, industrial hygiene, fire safety, earthquake safety, and the safety aspects of building design and construction. (Note: the radioisotope control function is to be distinguished from accelerator radiation exposure control, under Health Physics.)

The Department operates through two groups: the Health Chemistry Operations Group and the Safety Technology Group.

The Health Chemistry Operations Group contains personnel with responsibilities in the following disciplines:

1. Monitoring and assistance for researchers that use radioisotopes surveillance of operations and equipment for safety considerations.
2. Transportation of radioisotopes.
3. Storage of radioisotopes.
4. Disposal of radioactive waste and hazardous materials.
5. Decontamination of contaminated material.
6. Procurement and shipment of radioactive material.
7. Emergency response for fire and accidents.
8. Fire prevention.
9. Inspection and servicing of LBL fire alarms and fire suppression systems.
10. Reactor irradiation scheduling.

The Safety Technology Group is composed of the following sections:

1. Equipment Design
2. Industrial Hygiene
3. Industrial Safety
4. Environmental Control

Additional services include the following:

Safety Glasses

All LBL personnel are eligible for free safety glasses. Anyone wishing to order a pair should phone Safety Services, Ext. 5251, for an appointment. Persons requiring corrective lenses must furnish their own prescription.

Safety Shoes

Safety Shoes in a variety of styles for both men and women can be purchased at reduced prices through Safety Services. Phone Ext. 5251 for shoe store hours.

Safety Services (continued)Government Drivers License

LBL personnel intending to operate any type of government vehicle must obtain a Government Operator's I. D. Card. (See page 20. 000.) Safety Services is responsible for issuing all operators I. D. Cards and conducting any examinations that may be required (scooters, forklifts, etc.).

Safety Equipment and Safety Signs

Safety equipment such as portable safety barriers, emergency blowers, and portable power tool testers are available from Safety Services. A wide variety of warning signs are also kept in stock.

Facilities

The main administrative offices of Safety Services are at Building 4, as are the engineering and drafting offices, enclosure fabrication, machine shops, and development and assembly areas (Ext. 5251).

The Fire Department's facilities are the Fire House (Building 15) and the Apparatus House (Building 45), which contains three fire engines and one ambulance. (Ext. 6015; EMERGENCY phone: Ext. 5333).

Facilities for decontamination of equipment and disposal of solid and liquid radioactive wastes are at Building 75. Here also are office and laboratory spaces of the environment surveillance and ventilation section, and laboratories for preparation of environmental samples.

The tritium facility for preparation of packages for use in laboratories from main stock is also in Building 75.

Safety Coordinators

<u>Safety Coordinators</u>	<u>Buildings</u>
Raymond Aune	6, 9, 10, 47, 58, 80
Eldred Calhoon/Kenneth Biscay	51, 55, 63, B63, 64
Suzanne Hargis	1, 3, 57
Elio Giusti	14, 29, 40, 41, 54, 70, 70A
Donald Gregerson	7, 12, 17, 27, 53, 69, 78, 79, 901
Harry Harrington	46, 65, 88
William Hemphill	62, 72, 73, 74
Harry Jelonek	25, 25A, 75
Robert McCracken/Bette James	50, 50A, 50B, B50A
Bette Shipley	71, 81
Edward Reiloux/Richard Harvey	37, 61, 76, 77, 90
George Towns/Bert Kidd	B1, 4, 5, 15, 16, 26, 44, 45, 52
Glenn Garabedian	Off shift hours

PLANT DEPARTMENT

The Plant Department responsibilities are carried out by four major groups:

Plant Engineering, Building 90 (Ext. 5495). The group includes architects, civil, mechanical and electrical power engineers, designers, inspectors and contract administrators.

They are responsible for the design of new construction and alterations for all physical plant facilities at the Laboratory including buildings, utilities and site facilities. They are also responsible for administration of professional, construction, and service subcontracts required to fulfill design requirements. Plans and other contract documents and construction activities originating with Plant Engineering are reviewed for all safety functions by Safety Services.

Plant Maintenance, Building 76 (Ext. 5481). The group includes Maintenance Machinists and Area Supervisors responsible for servicing, maintaining, and operating all physical plant facilities at the Laboratory and for administering service type subcontracts for the same general purpose. This group also provides similar support services to program facilities on a recharge basis and coordinates with Safety Services to handle emergencies as needed.

Plant Custodial Group, Building 75 (Ext. 5481). The group includes Custodians and close supervision responsible for janitorial services within Laboratory buildings. Sanitary cleanliness and wax thickness on floor surfaces in radiation areas are maintained to standards specified by Safety Services.

Plant Construction, Building 76 (Ext. 6011). The group includes Building Trades, Electricians, Carpenters, Steamfitters, Plumbers and Laborers. They are responsible for in-house construction activities and for program support, all on a recharge basis. They are available to meet Laboratory emergencies as requested.

Supervising Plant Construction personnel are responsible to see that continuing construction [type] workers in payroll accounts 9100-9106 receive a minimum of 30 minutes safety training per month.

BUILDING MANAGERS

Each building at the Laboratory has a person designated by the Directors Office as manager of that building. Normally this person is the senior administrator in the building. Building Managers have the responsibility and authority to:

1. Prepare and maintain emergency plans for their buildings or areas as requested by the Emergency Preparedness Advisory Committee. See page 21.000.1
2. Maintain safe working conditions in their buildings and areas as outlined in the Health and Safety Regulations (LBL-2077) and participate in the LBL Internal Safety Inspection Program. See page 28.000
3. Prepare Operational Safety Procedures when requested by Safety Services or Health Physics. (All specially hazardous equipment such as accelerators and irradiators require Operational Safety Procedures.) See page 29.000

The current list of Building Managers follows on page 27.000.1.

BUILDING MANAGERS

<u>Building</u>	<u>Name</u>	<u>Building</u>	<u>Name</u>
B1	Robert L. Fulton	52	Robert V. Pyle
1	Igor R. Blake	53	Robert M. Main
3	Paul M. Hayes	54	Thomas P. Hitchcock
4	Robert M. Latimer	55	Igor R. Blake
5	Robert V. Pyle	57	Igor R. Blake
6	Leal L. Kanstein	58	Warren W. Chupp
7 1st Floor	Richard A. Lanzit	61	Trancuilo Canton
7 2nd Floor	Gerald V. Wilson	62	Rolf Muller
9	Leal L. Kanstein	63	Robert J. Force
10	Leal K. Kanstein	B63	Robert J. Force
12	Richard A. Lanzit	64	Robert J. Force
14	Ronald I. Wallace	65	Vacant
15	Elmer J. Silva	69	David V. Nielsen
16	Robert V. Pyle	70, 70A	George W. Kilian
17	David V. Nielsen	71	Elmer L. Kelly
25, 25A	Donald R. Bliss	72	Ralph H. Thomas
26	Mary C. Wales	73	Richard C. Schmidt
27	Gerald V. Wilson	74	Robert W. Springsteen
29	Frederick S. Goulding	75	Robert M. Latimer
37	Trancuilo Canton	76	Trancuilo Canton
40	Ronald I. Wallace	77	Donald W. Stallings
41	Ronald I. Wallace	78	Richard A. Lanzit
44	Robert M. Latimer	79	Richard A. Lanzit
45	Elmer J. Silva	80	Leal L. Kanstein
46	Jack V. Franck	81	James V. Davey
47	Warren W. Chupp	88	David L. Hendrie
50 Complex	Robert L. Hinckley		(Alt.) Matthew Renkas
	(Alt.) P. Wes Weber	90	Donald G. Eagling
51	Robert J. Force	901	David V. Nielsen

LBL INTERNAL SAFETY INSPECTIONS

The Internal Safety Inspection Program provides comprehensive safety inspections on a formalized basis and is administrated by Safety Services. The program insures that all buildings at LBL receive a detailed inspection at least once a year in each of the following disciplines: Occupational Safety, Industrial Hygiene, Radiation Safety, Fire Safety, Earthquake Safety and Electrical Safety.

In order that all of the Laboratory is adequately covered by inspections, the total area has been divided into separate areas. Each area is assigned to a Safety Services representative known as the Area Safety Coordinator (see page 25.000.2) who is responsible for the safety inspections, corrective follow-ups, and reporting for that area. Within any area there are one or more Building Managers. Each Building Manager is responsible for the proper upkeep of all the buildings in his charge.

A Safety Inspection team normally consists of the following people:

1. The Building Manager (or his/her representative); responsible for the correction of unsafe conditions or practices found during the inspections of his/her building(s).
2. Specialists; responsible for performing a detailed inspection of an area for safety problems in their particular expertise, such as electrical safety or fire safety.
3. The Area Safety Coordinator; responsible for inspection scheduling, report writing, record keeping, and follow-up. Also, the Safety Coordinator may assist the Building Manager in correcting minor safety problems.

Construction Safety Inspection

Safety Services Occupational Safety section performs periodic inspections of all construction sites in order to verify that all safety stipulations contained in Laboratory subcontracts are complied with. In addition, Safety Services Safety Coordinators spot-check construction work taking place in their assigned areas.

OPERATIONAL SAFETY PROCEDURES

Certain research facilities at the Laboratory present sufficient hazards to warrant special, individual safety manuals. These manuals are called OPERATIONAL SAFETY PROCEDURES (OSP). Among the facilities requiring an OSP are included large accelerators high-level gamma irradiators, and virus laboratories. The Safety Review Committee makes the final decision on the need for an OSP.

The three principal purposes of an OSP are to: (1) identify special hazards associated with a research facility or apparatus, (2) establish rules and procedures that insure safe operation of a facility or apparatus and maintain environmental conditions that meet minimum standards established by the Laboratory, and (3) establish emergency procedures that will supplement the Building Emergency Plan (see page 30.000).

Although all OSP's will have certain similarities in format, the actual text will depend on the hazards involved with a particular research facility or apparatus. It is therefore important that the task of drafting an OSP be assigned to a person or persons thoroughly familiar with the operation of a facility and the equipment involved.

Safety Services has been assigned the responsibility of editing, publishing, and distributing OSP's. The department is also available for advice and consultation during the drafting phase (ext. 5251).

EMERGENCY PLANS

An important part of the Laboratory's Emergency Planning Program are the Building and Facility Emergency Plans. These plans supplement the Laboratory's Master Emergency Plan.

Each building and facility has its own published Emergency Plan. Each employee should have a copy of the plan for his/her building and be familiar with its contents.

The Building Managers (see page 27.000) are responsible for the distribution and updating of the emergency plans of the buildings under their jurisdiction.

Each building or facility Emergency Plan should contain the following information.

1. The name, Laboratory extension number and home phone number of the Building Manager and his/her alternates. (A telephone calling chain is suggested.)
2. The names and extension numbers of those persons who have specific duties during an emergency, and a description of their duties. As an example, specific people should be assigned to supervise evacuation procedures and to carry out a rapid search of the area (assuming this can be done safely).
3. A building plan showing evacuation routes.
4. A building plan designating the location of shutoff switches and valves for the utility systems (water, gas, electricity).
5. A building plan showing the locations of emergency equipment and supplies (including medical).
6. Designation of a primary assembly point for evacuees-- well away from the building. An alternative site should also be designated in the event the first choice is involved in the emergency situation.
7. A procedure for carrying out a head count at the assembly area to insure that no one was left behind.
8. Re-entry procedures.
9. Description and location of special hazards or hazardous devices.
10. Description of emergency detection and warning systems.

(over)

EMERGENCY PLANS (Continued)

11. Location of "shelter" areas.
12. Procedures for emergency training and testing of emergency equipment.

A copy of the most recent plan should be on file with the Director's Office and Safety Services.

ERDA requires that the scene of a serious (Type A) accident be preserved to the greatest extent possible until an ERDA investigating team has reviewed the scene.

A Type "A" accident is one in which there is:

1. Any fatal or imminently fatal injury or occupational illness involving an ERDA or ERDA contractor employee or a member of the public due to an accident or fire associated with an ERDA or ERDA contractor operation,
2. Any other disabling injury or occupational illness of five or more persons as a result of one occurrence in an ERDA or ERDA contractor operation, or
3. Estimated loss or damage to ERDA or other property amounting to \$100,000 or more or estimated costs of \$100,000 or more required for cleaning (including decontamination), renovating, replacing, or rehabilitating structures, equipment, or property.

ERDA regulations require that in any of the above situations, the following actions must be taken:

1. Securing of the accident scene, mobile or fixed, to preclude disturbance or alteration by anyone until the ERDA investigation team has reviewed the scene,
2. Prevention of equipment or articles involved in the accident from being operated, moved, or otherwise altered, except as essential to rescue action, until the ERDA investigation team has made its examination (it may be necessary to impound equipment or articles until the examination can be initiated), and
3. Photographing (color) of the accident scene; equipment involved in the accident, e.g., motor vehicles, ladders, tools, shipping containers, etc.; and transient evidence such as pool of liquid, spilled material, tire marks, etc., immediately following the notification of the accident. (Care should be exercised to avoid disturbance of the accident scene by the photographers.)

EMERGENCY PLANS (Continued)

If there is a question as to whether the incident should be treated as a Type A accident, the scene is to be preserved until Laboratory management makes an official determination. In such an event, one or more of the following shall be called:

1. A.M. Sessler - 5111
2. E.K. Hyde - 5222
3. G.L. Pappas - 5131
4. W.D. Hartsough - 5511
5. R.M. Latimer - 5251

In the event of a known Type A accident, one or more of the above people are to be notified as soon as possible.

Ref
LBL-
2077

July 12, 1976
GET:;63:76

MEMO

TO Holders of Health and Safety Manual
(LBL-2077)

FROM: George E. Towns, Safety Services

SUBJECT: Safety Manual Revisions

REPLACE

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25.000

25.000.1

ADDITIONS

25.000.2

27.000

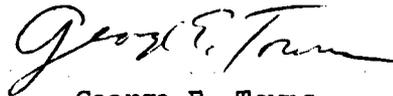
27.000.1

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30.000

30.000.1



George E. Towns
Safety Services

GET:pj

Enclosures