

PB 266 261

a prescription for Battery Workers



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Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

Division of Technical Services
National Institute for
Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, Ohio 45226

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A Prescription for Battery Workers

**U.S. DEPARTMENT OF HEALTH, EDUCATION,
AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
Division of Technical Services
Cincinnati, Ohio
March 1976**

For sale by the Superintendent of Documents, U.S. Government
Printing Office, Washington, D.C. 20402

HEW Publication No.(NIOSH) 76-153

Like most industrial workers, you can use materials and processes that may cause cuts, bruises, or harmful health effects. You can avoid injury and stay healthy by LEARNING and FOLLOWING simple health and safety rules.

The purpose of this book is to:

- describe the hazards that may exist in lead acid storage battery plants.
- describe the illness or injuries that may be caused by these hazards.
- point out what you, the worker, should do if you recognize the existence of a hazard.

The United States Department of Labor through the Occupational Safety and Health Administration (OSHA) requires employers to provide healthful and safe work places by:

- using materials and processes that are not dangerous, or
- installing equipment that will control the hazard, or
- reducing the time that you are exposed to the hazard, or
- requiring that you use personal protective equipment until one of the above actions can be taken.

Your employer is required to provide a healthful and safe workplace.

However, everyone must work together to accomplish this. This book will help you to understand the health and safety practices and controls needed to make your plant a safe place for you to work.

THESE ARE YOUR RESPONSIBILITIES:

- Obey health and safety rules.
- It is required that your employer provide personal protective equipment, protective clothing, and respiratory devices where there may be a need to protect against recognized hazards. It's also required that YOU use them.
- Report hazards that are created by accidents, damage, or normal wear — you will probably be the first one to see them, and could be the one to get hurt.
- Do not engage in "horseplay".
- Practice good housekeeping — keep your plant safe.
 - Keep aisles and exits clear.
 - Put trash where it belongs.
 - Put tools, equipment, and materials in their places.

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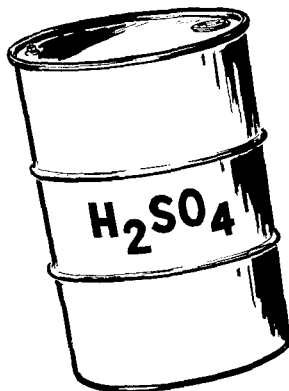
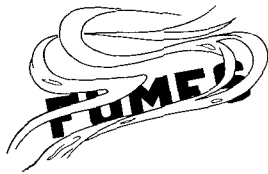
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HEALTH HAZARDS
FROM
LEAD DUST AND FUMES,
SULFURIC ACID,
HEAT,
NOISE,
UNSANITARY
CONDITIONS



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LEAD DUST AND FUMES

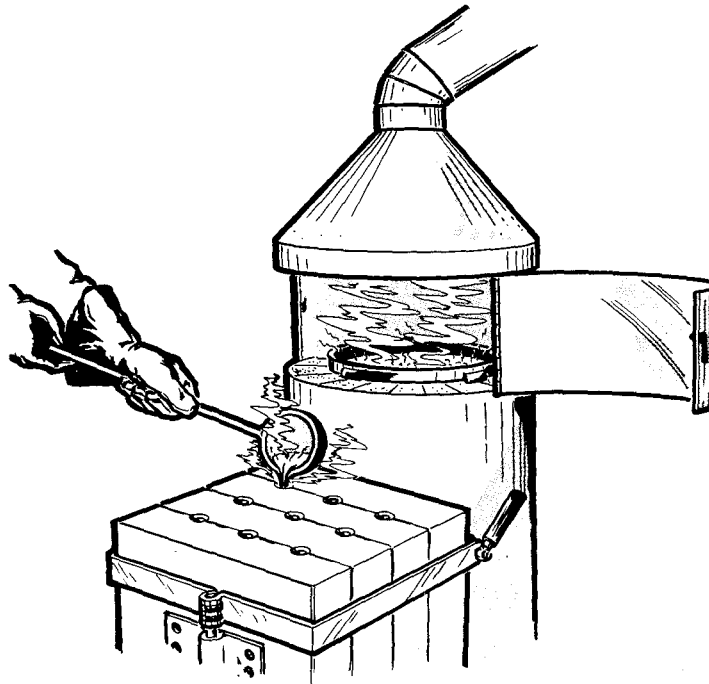
LEAD IS A HAZARDOUS SUBSTANCE

You can work safely with lead by obeying the following common-sense rule:

- **Avoid, whenever possible, inhaling (breathing) or ingesting (taking in through the mouth) lead dust or fumes.**

Sources of lead in your plant are:

- Lead and lead oxide dusts from the lead oxide mills, receiving, paste mixing, pasting, and grinding areas.
- Lead fumes from molten metal in the melting, casting, and burning areas.



**AVOID INHALING OR INGESTING LEAD
LEAD POISONS BY GETTING INTO YOUR BLOOD
FROM YOUR LUNGS OR STOMACH**

Chronic poisoning comes from exposure to small amounts of lead over a long time and may cause either temporary or permanent damage.

Early signs of poisoning are:

- easily tired
- uneasy stomach
- irritability
- poor appetite
- metallic taste
- sleep loss

Acute poisoning comes from the accumulation of a large amount of lead in the body in a short time and may do permanent damage.

Later signs:

- constipation
- vomiting
- severe illness
- blue line on the gums
- weak wrists
- premature loss of teeth
- loss of weight
- yellowish skin

If these signs occur:

Report the fact to your supervisor.

See the company doctor or your own doctor.

Your company must take the following measures to reduce the hazard of lead:

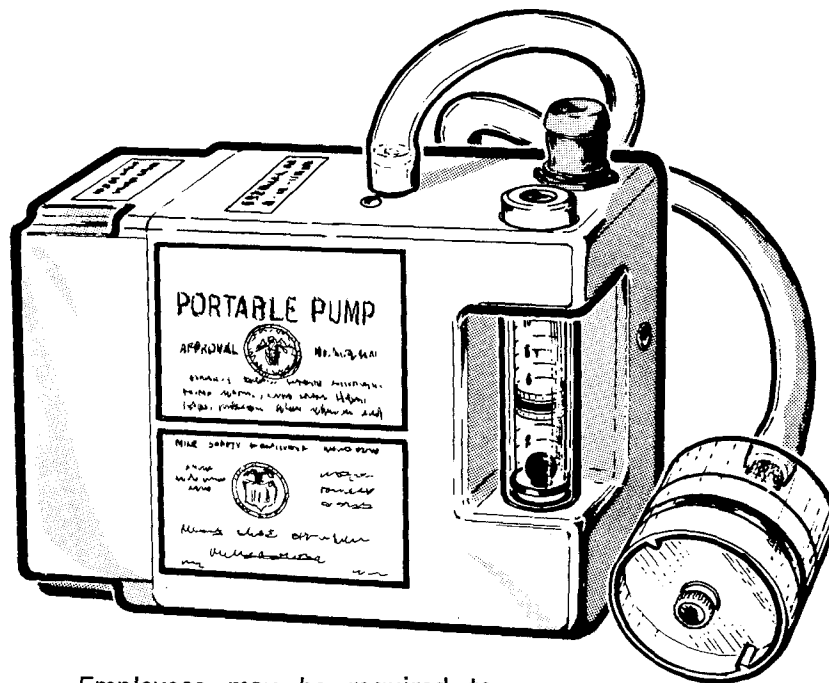
- provide ventilation (if necessary) to reduce the concentration of lead dust or fumes in the air to acceptable levels or limit employee exposure time (administrative control).
- provide respirators for hazardous areas if engineering or administrative controls are not feasible or during the implementation of controls.
- set up and enforce good housekeeping and work practices to prevent the spread of lead dust.
- provide proper washing facilities.
- determine the exposure of employees to lead (or any other toxic material).

Your company should:

- provide medical examinations to determine the lead level in your blood or urine as a check to be sure that you have not taken in a dangerous amount of lead.
- provide lunchrooms away from work areas.

You can help if you:

- use the ventilation system.
- use the respirator where required.
- follow good housekeeping practices and keep your work area clean.
- practice good personal hygiene — **always** wash your hands before eating anything.
- cooperate with any plant medical testing program.
- never eat or drink in a work area.



Employees may be required to occasionally wear devices for breathing zone sampling.

CHELATING AGENTS

In some cases of lead exposure, drugs are used as a method of treatment. The drugs called chelating agents work to prevent buildup of lead in the blood, or to lower already high levels to acceptable limits. **Chelating agents are to be used only in unusual circumstances, and not as a general control for lead exposure. Their use is generally not recommended.**

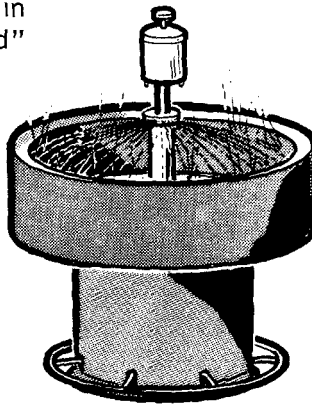
These drugs can be effective if you are exposed to a large amount of lead over a short time period (acute exposure). The chelating agents can remove the excessive amount of lead from your body.

However, chelating agents must not be used as a substitute for engineering controls for long-term exposure. If the drugs are taken over a long period of time, they may cause serious, harmful health effects. In addition to removing the lead from the body, they may also remove the other metals such as zinc, copper, and iron which the body needs. The drugs may cause a chemical imbalance in the body, and may cause damage to the nerves, blood, and kidneys. If taken over a long period of time, the chelating agents may actually lower the body's ability to handle lead exposure and exposure symptoms may return.

If you do take chelating agents for lead exposure, or if you have any questions on the use of these drugs, you should discuss this with your employer, your doctor, or an OSHA or NIOSH office.

WHAT YOU MUST DO

- Wash well and often, **always** before eating or smoking.
- Keep cigarettes or smoking material in a dust-proof container. Smoke **only** in the "Smoking Allowed" areas.



- **Don't** bring food or beverages into the work area. Store them in the designated place. Eat and drink them in the lunchroom only.

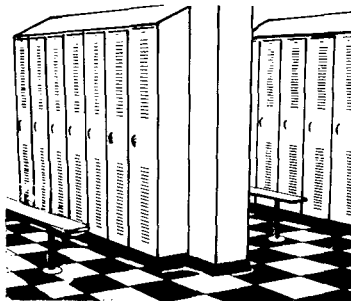


KEEP YOUR CLOTHES LEAD-FREE

After the shift you should shower and change into clean clothes. Work clothes that have picked up visible amounts of lead dust should not be taken home for washing. Leave them at the plant for cleaning or take them to an industrial laundry.

Keep your street clothes in a separate locker, or away from your work clothes.

Wipe off your shoes, or change them too, before going home.



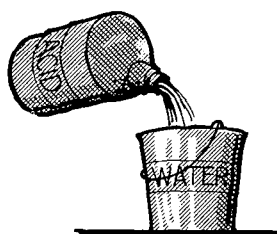
ACID AND ELECTROLYTE

DILUTION AND MIXING

Always dilute concentrated or strong acid by slowly adding the **ACID to WATER** while mixing.

DO NOT add the water to acid as the reaction is violent and can splash acid over a large area.

When concentrated acid is added to water it is normal for a large amount of heat to be generated and for the solution to become very hot.



ALWAYS ADD ACID TO WATER

The "acid" used in lead-acid storage batteries is SULFURIC ACID. Commonly used acid concentrations are:

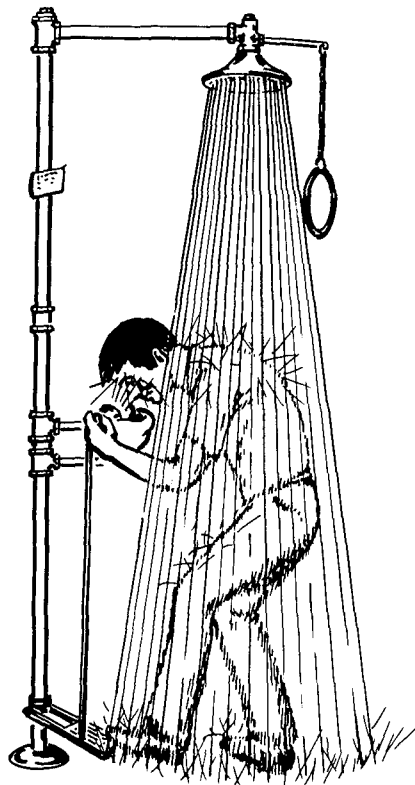
Name	Specific Gravity	Percent by weight
Concentrated	1.8	93-95
Strong	1.4	50
Battery Electrolyte	1.1-1.3	14-39

Be sure you know the type of acid you are working with. The higher the concentration, the greater the hazard, and the greater the need for care in handling it.

CONCENTRATED AND STRONG SULFURIC ACID

Concentrated and Strong Sulfuric acid are extremely dangerous, corrosive substances. **They must be handled with a great deal of care.** These acids rapidly destroy skin and cause severe burns. Destruction of eye tissue can happen quickly and a total loss of vision may occur. Speed in removing spilled acid is essential. **DO NOT DELAY!** Immediately rinsing with large amounts of running water is urgent.

Your employer is required to provide suitable facilities for quick drenching and flushing of the eyes and body for emergency use within any work area where corrosive materials are handled. Know the location of the nearest eye wash and shower. When working with concentrated acid wear all the protective equipment provided.



RESPIRATORS

Since breathing of high levels of acid mists may cause damage to the lungs, you may need to wear a respirator. Respirators approved by NIOSH (National Institute for Occupational Safety and Health) or MESA (U.S. Bureau of Mines) for the particular contaminant (e.g. lead or acid mist) must be used. Look for the approval marking on the box.



BATTERY ELECTROLYTE

Battery electrolyte (14-39% Sulfuric acid) is not as hazardous as higher concentrations of acid but it should still be handled with care. The greatest hazard from battery electrolyte is splashing it into the eyes. Be sure to wear safety glasses **and** a face shield when pouring electrolyte.



Keep eyelids spread open.

If acid should splash into the eyes, always rinse them immediately with running water for at least 15 minutes. Then see a doctor. While skin contact with battery electrolyte may cause irritation or local reddening, serious burns can be avoided if it is rinsed off promptly with plenty of running water. **Protective equipment provided for working with electrolyte must always be worn.** Depending on the particular job, this could include: eye protection, face shield, boots, aprons, or gloves. Contact lenses should never be worn by workers handling acid. Acid mists can arise in battery charging areas and acid mixing areas. Breathing these mists can cause sneezing and coughing, so always wear an approved respirator.

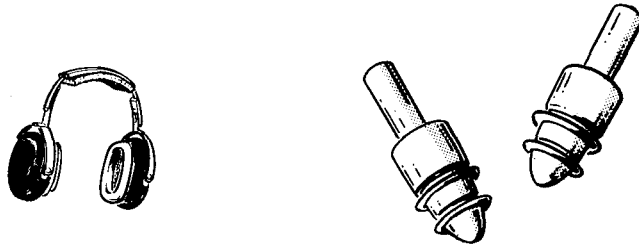
NOISE

Excessive noise can cause a loss of hearing which may lead to deafness. A temporary hearing loss may indicate you are over-exposed and can lead to permanent damage.

How badly your hearing may be affected depends on:

- how loud the noise is
- the pitch or tone of the noise
- the length of time you are exposed to the noise.

If the noise in your work area is greater than that allowed in the following table, your employer must reduce it. Either engineering controls such as enclosing noisy operations, or administrative controls, such as limiting the time you are exposed can be used. While these controls are being developed, you will have to wear personal protective equipment such as ear muffs or ear plugs.



PERMISSIBLE NOISE EXPOSURES

Sound Level (dBA)	Maximum Exposure Per Day	Indicators of Level (Speaking effort required between two persons)
115	15 min	nearly impossible to communicate by voice
110	30 min	very difficult to communicate by voice
105	1 hour	shout with hands cupped between mouth and other person's ear
100	2 hours	shout at 1/2 foot
95	4 hours	shout at 1 foot
90	8 hours	normal voice at 1/2 foot raised voice at 1 foot shout at 2 feet
TELEPHONE USE IMPOSSIBLE		
85		normal voice at 1 foot raised voice at 2 feet shout at 4 feet

CONTROL OF NOISE HAZARDS

There are two things you can do to reduce the effects of noise:

- Wear ear muffs or plugs as prescribed by the company's rules.
- Do not stay near the source of the noise any longer than you have to.

If your plant has a hearing conservation program, take part in it. Have the hearing tests when they are required. If your ears hurt, or you believe that your hearing is less than it was, see a doctor.

HEAT STRESS

The conditions in your plant are normally within the range that your body's heating/cooling system can handle. The range limits may be exceeded on the hot side, however, when doing hard work during hot weather in such areas as casting or melting.

The early symptoms of heat stress are:

- weakness
- nausea
- feeling hot
- extreme fatigue
- headache
- dizziness
- thirst

More advanced symptoms are:

- arm, leg, and stomach muscle spasms
- extreme thirst
- irregular or increased heart beat
- fainting

Further exposure to heat may result in unconsciousness.

HEAT STRESS CONTROLS

- Wear proper clothes. Reflective body cover will help to protect you.
- Replace water and salt lost in perspiration. Drink plenty of fluids and increase your intake of salt. Lack of water reduces cooling through sweating; lack of salt interferes with the proper functioning of the body's systems.
- Get as much cool air as possible; open windows, keep the ventilation passage clear.

WHAT TO DO IF SYMPTOMS DEVELOP

If you note early signs of heat stress, notify your supervisor.

The immediate treatment is to:

- rest in a cool place
- drink small amounts of cool water, frequently
- if symptoms continue get medical help.

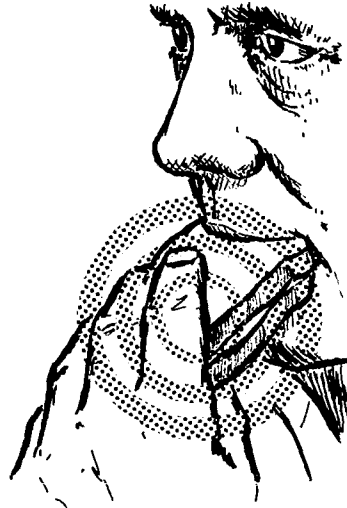
If your body is allowed to accustom itself to heat stress areas gradually — that is, a short period the first day, a longer period the second day, and so on — within a week or so you will be able to stand a full shift of hard work in a hot area with few ill effects. Keeping in good physical condition will help the body to adjust.

SANITATION

GOOD SANITATION IS A MUST IN THE BATTERY INDUSTRY

GOOD SANITATION IS A MUST IN THE BATTERY INDUSTRY.

All surfaces may be contaminated with lead or acid:
the floor and work tables
the tools you use
your clothes and gloves
your face, hands, and hair
the drinking fountain



BE CLEAN CONSCIOUS

1. Wash your hands thoroughly before eating or smoking. Be particularly careful if you work with or around chemicals.
2. Do not bring any food or drinks into the work area.
3. Store your lunch in a locker — not where you work.
4. Do not eat in the work area.
5. Cooperate in keeping the plant clean.
6. Place trash in wastebins, not the floor!
7. Before you drink from a fountain let the water run for a few seconds. If cups are provided, use a fresh one each time.
8. Keep your respirator clean — don't lay it down on dirty surfaces.



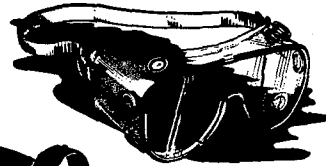
PERSONAL PROTECTIVE EQUIPMENT

PROTECTING YOURSELF

Always wear all the protective equipment provided for the job.

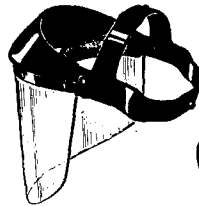
Goggles

Cup type with impact-resistant glass or plastic lenses



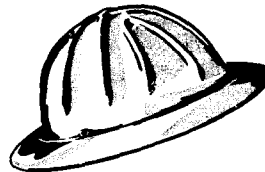
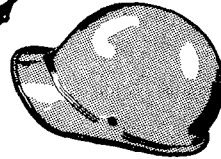
Face Shield

8" minimum — may be worn in addition to goggles



Head Protection

Hard hat or soft-brimmed hat or cap that protects against leaks or splashes or where there is a hazard of falling objects



Safety Glasses

With side shields where there is danger of flying chips, sparks, dusts, glare



Respirator

Approved type



Gloves and Sleeves

Gloves should cover entire forearm; sleeves protect upper arm



Apron

Should be ankle-length



Acid-Proof Boots

Should be made of rubber or plastic



USE PERSONAL PROTECTIVE EQUIPMENT — IT HELPS PREVENT INJURY!

Three "MUSTS" for personal protective equipment:

1. It **MUST** be used in hazardous areas.
2. It **MUST** be of a type approved by the National Institute for Occupational Safety and Health or the Bureau of Mines for the contaminant involved.
3. It **MUST** be kept in good condition.

In most plants, you will be issued personal protective equipment. The company will inspect the equipment periodically and return it to you.

Respirators must be collected for inspection and sanitizing and re-issued after each shift or each use if they are not worn daily. Respirators or their boxes must be marked to indicate approval by NIOSH or the Bureau of Mines for the type of work you are doing or the type of material you are handling.

FIRE

**THE UNITED STATES ANNUAL FIRE LOSS IS 12,000 LIVES AND
\$1.7 BILLION**

DON'T BE A PART OF IT

Your plant has everything a fire needs

FUEL

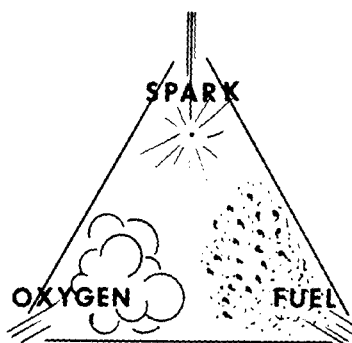
Fuel, gas, hydrogen generated during charging operations; Packing and cleaning materials; Paint and solvents; Sealing compounds, plastics, trash.

OXYGEN

Oxygen for burning; Liquid oxygen; Air.

IGNITION SOURCE

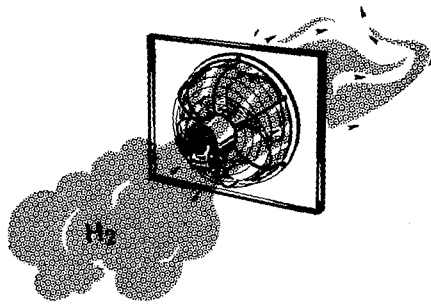
Flame; Spark; Heat; Hot metal; Spontaneous sources; Electrical.



IF THESE ESSENTIALS COMBINE, A FIRE WILL START!

PREVENT FIRES

Prevent fuels, liquid and gas, from escaping from their systems. Notify your supervisor of leaks or incorrect operation immediately. Follow start-up and shut-down procedures to the letter.

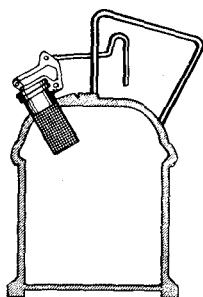


The greatest source of hydrogen occurs during charging of batteries. Prevent hydrogen from accumulating. Good ventilation to prevent hydrogen build-up is needed in battery charging and plate forming areas. Be sure the ventilation system is working properly. Notify your supervisor immediately if it is not.



Put trash in waste-bins, not on the floor. Handle flammables according to plant rules.

STORING FLAMMABLE MATERIALS



- Flammable materials must be stored only in accordance with plant rules.
- Keep flammable liquids in safety cans or sealed containers.
- Don't let ignition sources — sparks, flame, heat, or hot surfaces get near flammable materials.
- Oil-soaked or greasy rags may ignite spontaneously unless stored in air-tight metal containers.
- DON'T SMOKE when working around or with flammable materials.

HANDLE OXYGEN WITH CARE

- Follow the operating instructions for any oxygen system carefully. Report leaks to your supervisor.
- Do not use oxygen in place of compressed air.

HEALTH AND SAFETY HAZARDS AND THEIR CONTROLS



A SUMMARY OF HAZARDS AND CONTROLS

Hazards:

Controls:

- | | |
|--|---|
| 1. Lead fumes or dust, acid mist | 1. Good housekeeping practices such as cleaning up spilled oxide paste and broken grids immediately. Adequate ventilation or respirators |
| 2. Molten lead splashes | 2. Protective clothing and equipment |
| 3. Burns from acids or caustics | 3. Use of proper protective equipment: gloves, sleeves, aprons, boots, goggles, face shields, etc., eye wash fountains and deluge showers |
| 4. Heat stress | 4. Drinking sufficient water, rest periods in cool areas, and acclimitization |
| 5. Noise | 5. Limiting exposure time, hearing protection devices |
| 6. Falls, slips, and trips | 6. Good housekeeping practices, proper footwear (boots, etc.), and non-skid flooring |
| 7. Falling objects | 7. Proper stacking, hard hats, and foot protection |
| 8. Shearing, pinching, or rotating machine parts | 8. Adequate machine guarding |
| 9. Fire | 9. Proper storage and handling of flammables and combustibles, good housekeeping |
| 10. Lifting strains | 10. Correct method when lifting by hand, use of hoists for heavy loads |

FIRST AID

First aid is immediate, temporary treatment given before the doctor or other trained medical help gets to the scene of the accident. In most cases, you will have done all you can and should when you have removed the victim from the immediate danger, made him comfortable, and called for HELP.

In the absence of an infirmary, clinic, or hospital in near proximity to your workplace, your employer must provide one or more employees on each shift who are adequately trained in first aid procedures.

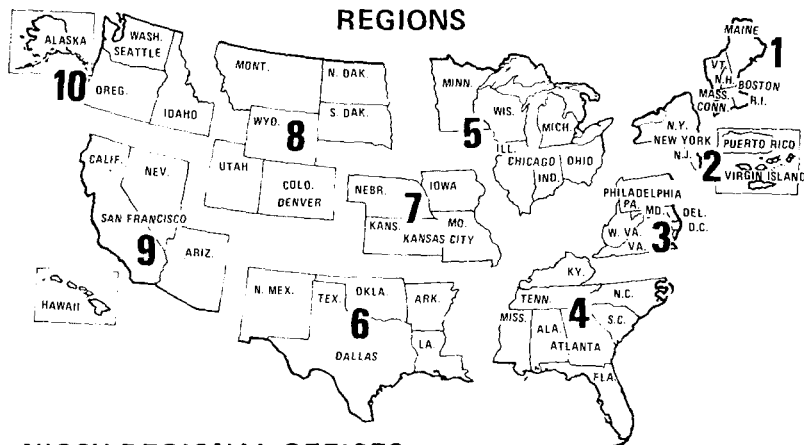
Approved first aid kits, containing sufficient supplies for the type of emergency you may encounter must also be provided and be readily available.

Emergency telephone numbers should be posted near the phone.



NIOSH AND OSHA REGIONAL OFFICES

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



NIOSH REGIONAL OFFICES

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

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

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

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

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

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

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

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

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

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

OSHA REGIONAL OFFICES

Region I

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

Region II

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

Region III

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

Region IV

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

Region V

U.S. Department of Labor
Occupational Safety and Health Administration
230 S. Dearborn Street
Chicago, Illinois 60604 Telephone: 312/353-4716/7

Region VI

U.S. Department of Labor
Occupational Safety and Health Administration
7th Floor, Texaco Building, 1512 Commerce Street
Dallas, Texas 75210 Telephone: 214/749-2477/8/9 or 2567

Region VII

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

Region VIII

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

Region IX

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

Region X

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

EMERGENCY INFORMATION

FIRE

Telephone Fire Department _____

Nearest Alarm Box at _____

CRIME

Telephone Police _____

INJURY/ILLNESSES

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

Doctor _____

Office _____ Tel. _____

Residence _____ Tel. _____

Hospital _____

Address _____ Tel. _____

Ambulance _____

Address _____ Tel. _____

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

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

1. Name _____ Office Tel. _____

Address _____ Res. Tel. _____

or

2. Name _____ Office Tel. _____

Address _____ Res. Tel. _____

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
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HEW Publication No. (NIOSH) 76-153