PB274205

BIBLIOGRAPHIC DATA SHEET	1. Report No. NIOSH-77-103	2.

4. Title and Subtitle

MELTING AND POURING DEPARTMENT -- HEALTH HAZARDS IN A FOUNDRY

5. Report Date *Dec. 1976*

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

National Institute for Occupational Safety and Health
4676 Columbia Parkway
Cincinnati, Ohio 45226

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Address

Same as Box 9

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstracts

The potential health hazards in melting and pouring areas of foundries are met dusts and fumes, silica dusts, gases, vapors, noise and vibration, and radiant energy The sources of each hazard and particular hazards arising in aluminum, brass, bronze, iron, and magnesium foundries are described. The clues to overexposure are listed, with the appropriate controls. The actions which workers should take for their own protection include reporting problems, wearing protective equipment, housekeeping, personal hygiene and medical examinations. A list of do's and don'ts for a healthy work environment, and some brief first aid information are given.

17. Key Words and Document Analysis. 17a. Descriptors

Industrial hygiene
Safety engineering
Preventive medicine
Industrial medicine
Industrial atmospheres
Atmosphere contamination
Control
Dust control
Foundry practice
Protective clothing
Noise control

17b. Identifiers/Open-Ended Terms

Personal protective equipment
Control measures

17c. COSATI Field/Group *06/J*

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Release unlimited	UNCLASSIFIED	
	20. Security Class (This Page) UNCLASSIFIED	22. Price PCA03/MFA0

PB-274 205

MELTING AND POURING DEPARTMENT HEALTH HAZARDS IN A FOUNDRY

DHEW (NIOSH) Publication No. 77-103

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
December 1976

SO YOU WORK in a FOUNDRY

Then this book should be of interest and a help to you. It discusses the general health hazards which occur most frequently in foundries. It tells about the hazards in Melting and Pouring Departments that may harm your health if you don't know what they are, and how to watch out for them.

The first section will tell you about the health hazards you might find in particular areas of any foundry. The hazards are listed in the order of importance. Next, each of these hazards is identified and described so that you could spot them, if they exist in your work area. Information is also provided about how exposures can be reduced. The third section describes what you can do to help—by using good work practices and keeping track of your health with medical check-ups. Finally, a list of "do's" and "don'ts" is presented to help you review.

Because operations vary, not all hazards that may be present in your particular foundry are discussed. If, after reading this book, you have questions about the hazards you are exposed to ask your foreman, supervisor, or union representative to explain them to you.

INTRODUCTION

Businessmen, unions, people in government, and workers in industry are working together to become aware of possible health hazards on the job so that the hazards can be eliminated.

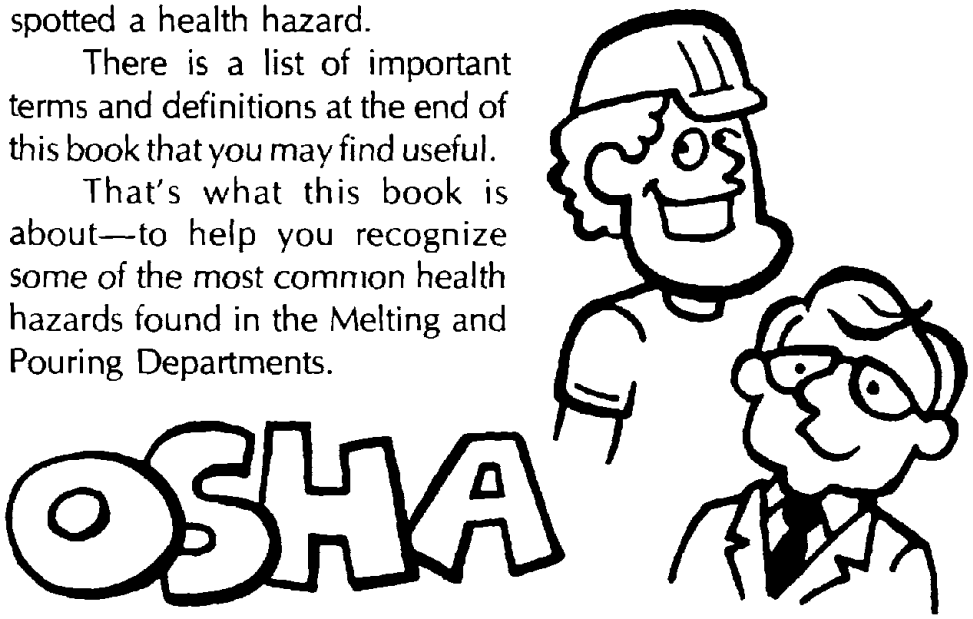
Under the Occupational Safety and Health Act (OSHA), it is management's responsibility to provide healthful working conditions, but you should help management to meet this responsibility. It's *your* responsibility to follow proper procedures and to wear protective equipment where it's required. Because you work in the area where hazards may exist, you are in a better position to spot health hazards and to report them to your supervisor or foreman.

What can you do, as a foundry worker, to identify health problems where you work?

1. Know what health problems may be found in your area.
2. Know how to spot the health hazards.
3. Know the right action to take when you think you have spotted a health hazard.

There is a list of important terms and definitions at the end of this book that you may find useful.

That's what this book is about—to help you recognize some of the most common health hazards found in the Melting and Pouring Departments.



KNOW THE POSSIBLE HEALTH PROBLEMS IN YOUR AREA–

If you work in the melting and pouring areas, you can be exposed to potential health hazards from metal dusts and fumes, silica dusts, gases, vapors, noise, and radiant energy (heat and infrared and ultraviolet radiation).

Metal Dusts and Fumes

Health problems can occur from breathing or swallowing metal dusts and fumes. The degree of hazard varies with the types of metals used. For example, a brass foundry will have metal exposures that are different from those in an aluminum foundry—see page 8.

Sources of fumes are:

1. furnace and cupola operations,
2. inoculating, skimming, and transporting the melt,
3. pouring operations,
4. freshly poured molds.

Mineral Dusts

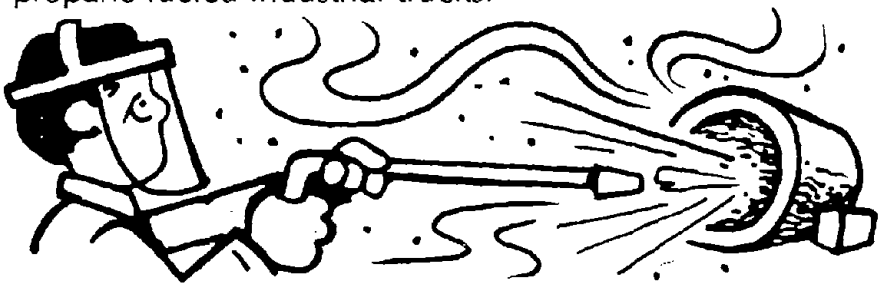
Operations that can cause harmful amounts of asbestos and silica dust in the air are usually not found in your area, except for refractory repair. Other foundry operations like shakeout and sand-handling have this kind of exposure. Asbestos dust may also be present at pouring positions from riser sleeve breakdown.

Organic Dusts

Organic dusts are formed when grease, oil, or rubber on dirty metal scrap are fed into furnaces and burned. Organic dusts can also be formed during pouring from the heat breakdown of organic materials on the mold.

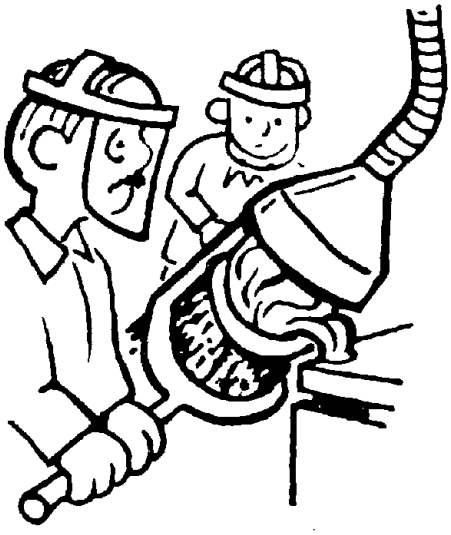
Gases

Carbon monoxide is the most common hazardous gas found in foundries. The gas is given off by furnaces, cupolas, ladle preheaters, salamanders, poured molds, and gasoline or propane-fueled industrial trucks.



Sulfur dioxide, nitrogen dioxide, chlorine, phosgene, hydrogen fluoride, and other gases may also be found at special processes in melting and pouring areas. Sulfur dioxide may also be a product of fuel combustion at furnaces.

Pouring crews may be overexposed to gas and vapor from the heat breakdown of resin-coated sands and core binders. Isocyanate vapors come from cold-box cores. If you become sensitized to isocyanates, you may have an illness similar to asthma, and continued exposure will make it worse. You may not recognize exposures to isocyanates. An industrial hygienist, using special equipment, will need to measure the air to determine your exposure. Other gases and vapors given off during pouring are ammonia, formaldehyde, and phenols which are usually recognized by their odor or by eye and nose irritation.



Vapors

Exposure to harmful amounts of solvent vapors in the melting and pouring areas is not usual because solvents are not used in large amounts. Most solvents are used in foundry pattern and core shops. Special melting or pouring operations may use carbon tetrachloride or ether—see page 16. Be aware of these areas.

Noise and Vibration

Some foundry equipment like furnaces, ladle preheaters, and jack hammers may produce harmful noise levels. Compressors, ventilation systems, and casting cleaning operations may also cause high noise levels.

You could be exposed to a vibration hazard from working with air hammers and pneumatic rams during refractory relining.

Radiant Energy

Heat, infrared radiation, and ultraviolet radiation are the types of radiant energy you may be exposed to. Sources of radiant energy in the melting and pouring areas are:

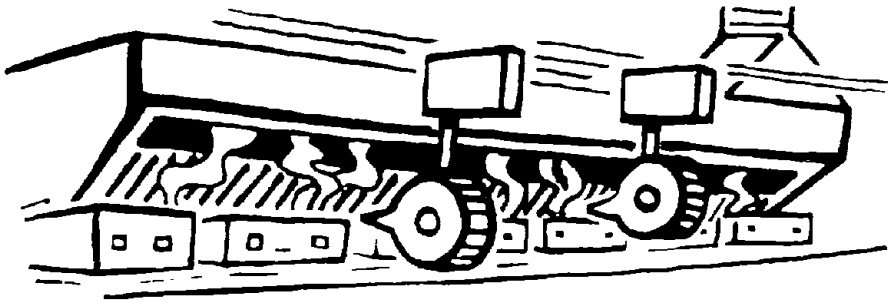
1. cupolas and melting furnaces,
2. ladles,
3. pouring,
4. ladle preheaters.

Infrared and ultraviolet rays are the same type of radiant energy that can give you sunburn. In addition to causing burns to the skin, infrared and ultraviolet radiation can affect your eyes.

Overexposure to heat can cause problems like heat cramps, heat exhaustion, or heat stroke.

HOW TO SPOT POTENTIAL HEALTH HAZARDS IN YOUR AREA

This part of the book is designed to help you identify the health hazards that occur most frequently in your work area.



Metal Dusts and Fumes

Metal dusts are small, solid particles in the air. Fumes are even smaller solid particles given off where molten metals are used. Skimming, stirring, tapping, pouring, charging, or other operations which disturb the melt can cause large amounts of fumes to be given off. Metal fumes are more of a hazard than breathing metal dusts because metal fumes can enter the lungs more easily.

Because foundries use various base and alloy metals, metal dust and fume exposures will vary from foundry to foundry.

The commonly found metal exposures in specific foundries are:

Aluminum Foundries—aluminum, copper, and zinc. Some aluminum foundries use mercury for a special alloy. The furnaces where mercury is added must always have local exhaust ventilation.

Brass Foundries—copper, lead, and zinc. Certain brass alloys require aluminum, manganese, or tin.

Bronze Foundries—copper and tin. Aluminum is sometimes added. A special hazard is white phosphorus in phosphor-bronze alloys. Whenever possible, white phosphorus should be handled under water.

Iron Foundries—iron. Aluminum, chromium, lead, magnesium, manganese, and zinc are common metals that could be added to treat the iron.

Magnesium Foundries—magnesium. Aluminum, manganese, and zinc are common additives to the base metal.

Other metals can be added to the melt for special purposes like degassing and grain refining, or for improving certain properties of the alloy like strength or ductility. These metals include:

Beryllium
Bismuth
Boron
Cadmium
Chromium
Lithium
Niobium
(also called Columbium)
Selenium
Thallium
Zirconium

The early symptoms of poisoning from prolonged overexposure to many metals are general and not easily recognized. These symptoms can include tiredness, weakness, loss of weight, loss of appetite, and pain in the abdomen. Metals that can produce these symptoms upon overexposure include:

Cadmium
Beryllium
Lead
Manganese
Mercury
Phosporus

High exposure to some metal fumes, like cadmium, copper, magnesium, mercury, nickel, and zinc causes metal fume fever which resembles a bad case of the flu. The symptoms are:

Chills	Muscular Pain
Fever	Headache
Nausea	Tiredness
Vomiting	Weakness

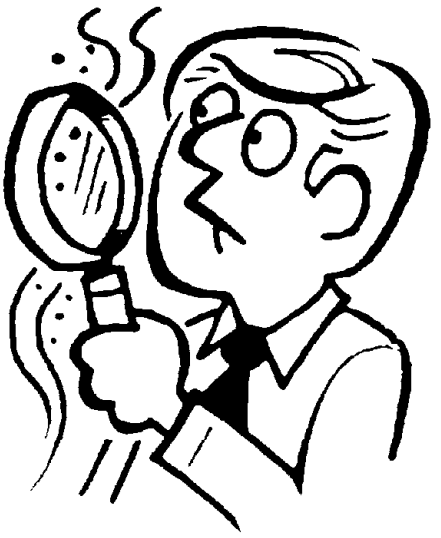
The illness lasts less than a day with no permanent effects, and may occur when you return to work after being away from your job for a few days.

Beryllium and nickel can also produce skin disease (dermatitis) and skin contact with phosphorus can cause burns.

If you think you could have been overexposed to any metal fume or dust, you should report this. Special tests to determine if you have been overexposed may be run. Remember! Tell your doctor about all the materials you work with; even the relatively harmless ones like iron. Breathing iron oxide fume over a long period of time causes a condition called siderosis. This condition is not disabling, but can mask chest x-rays, and interfere with the diagnosis of other lung disorders.

The clues that there may be too much metal dust and/or fume in the air are:

1. no ventilation on furnaces,
2. no ventilation at pouring,
3. clouds of smoke escaping the ventilation system,



4. skimming, stirring, or otherwise agitating molten metal without ventilation,
5. visible haze in the air,
6. transporting melt without covers,
7. symptoms of metal fume fever,
8. white phosphorus handled dry,
9. mercury spills not promptly recovered.

Controls:

1. Use of local exhaust ventilation on furnaces, ladle skimming, and pouring operations.
2. Use of a metal cover on small ladles during transport.
3. Use of NIOSH/MESA approved respirators for short duration exposure to high concentrations of metal fumes and dust. See the respirator section of this book (page 25) for a complete discussion.

Silica Dust:

Foundry sand usually contains silica. If you breathe too much silica dust, you may develop a lung disease known as silicosis. The silica dust particles that cause this disease are so small that you can't see them. The only way to be sure that there isn't a high concentration of silica in the air is by having an industrial hygienist take air samples and evaluate your work area. So, if you see a lot of airborne dust in your area, ask if it's been checked.

The symptoms of silicosis are not easily recognized. This kind of disease usually takes from 5 to 20 years of overexposure to develop, although extreme overexposure has produced symptoms after one year.

If you also work in or near the sand-handling areas of the foundry, or if you think you have been overexposed to silica dust, you should have a thorough examination by a doctor. The examination should include a chest x-ray and breathing tests. If you have silicosis, continued exposure to the dust will make it worse.

The clues that there may be too much silica dust in the air are:

1. dust leaking from enclosures and ducts,
2. build-up of settled dust on window sills, rafters, and equipment,
3. dust escaping the effect of the ventilation system,
4. large amounts of slag wool formed at the cupola,
5. large amounts of black dust caught in your nose,
6. lack of a daily housekeeping program.

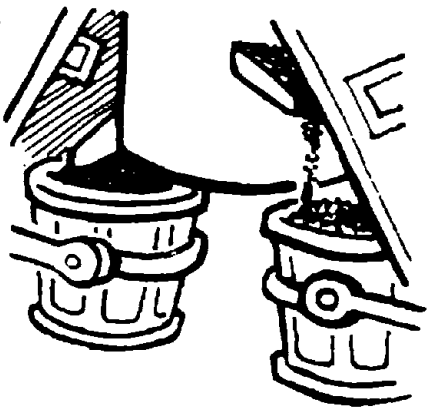
WATCH OUT!—You can be exposed to high levels of silica dust when chipping old furnace or cupola refractories.

Controls:

1. Use of exhaust ventilation on mullers, sand conveyor transfer points, core molding machines, and shakeout operations.
2. Use of NIOSH/MESA approved respirators for short duration exposure to high concentrations of silica dust.

Slag Wool

Slag wool is formed when slag waste hits the air. Slag wool will not cause silicosis. It is called a nuisance dust which causes eye, ear, and nose irritation, and may limit visibility. One way to prevent the formation of slag wool is by letting the slag fall into a container of water.



WATCH OUT!—The pouring crew could be exposed to hexachloroethane dust, which is applied to molds to improve the flow of nonferrous metals during pouring. The dust and fumes can affect your nervous system; they can also cause nose and throat irritation.

Asbestos

Asbestos is frequently used as an insulating material for furnaces and ladles. If you work on a relining crew you may be exposed to asbestos fibers during chipping and re-insulating.

Prolonged repeated exposure to asbestos fibers can cause serious lung disorders. See Books I and III of this series for an expanded discussion of the asbestos hazard.

Controls:

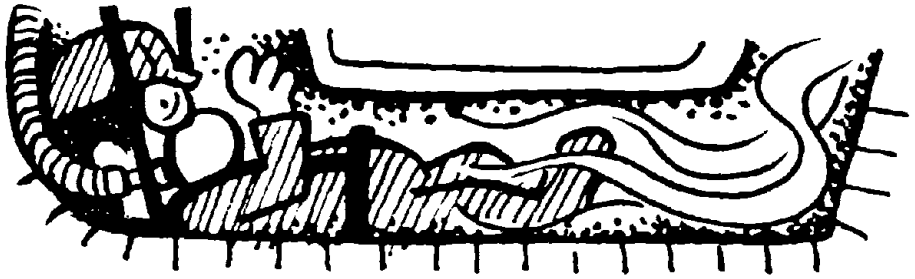
1. Use of NIOSH/MESA approved respirators for protection against short duration exposure to asbestos fibers.

Solvent Gas, and Vapor Hazards

Gases

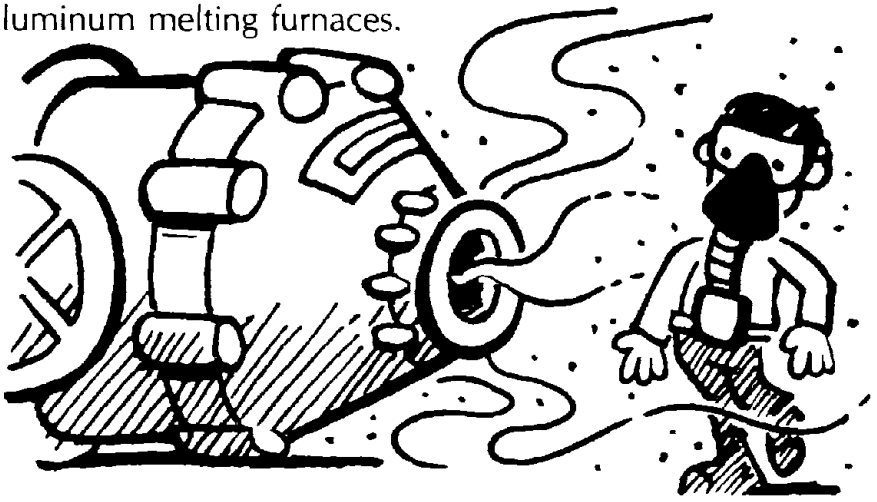
Gases are quick-acting. You may notice effects within a short time. You may tell a gas by its odor, but don't trust your nose alone, since many gases have no odor and others dull your sense of smell.

Carbon monoxide is colorless and odorless, and is given off from cupolas, furnaces, ladle preheaters, salamanders, poured molds, where it produces a blue flame along the top and sides of the flask, and gasoline- and propane-fueled industrial trucks. Magnesium furnace operators can be exposed to carbon monoxide during desulfurization. Overexposure to carbon monoxide can cause headaches, dizziness, lightheadedness, queasy stomach, and blurred vision. Very high concentrations of carbon monoxide will cause death.



WATCH OUT!—Contaminants can build up in confined spaces under furnaces. If you are working there, you may be overexposed unless you are using the right protective equipment.

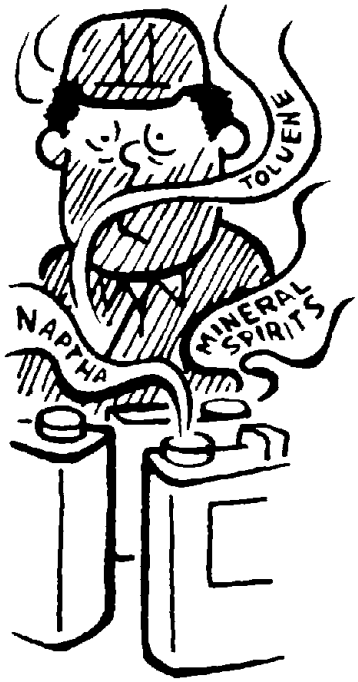
Gases can cause problems to some workers in melting areas. Magnesium foundry melters may be exposed to sulfur dioxide, fluorine, and phosgene. Sulfur dioxide, phosgene, and chlorine gas can cause severe lung damage, and may even result in death, if high enough concentrations are breathed. Fluorine gas is given off from fluorides added to the furnaces for fluxing. Phosgene is given off when carbon tetrachloride, which may be added to refine the grain of aluminum-magnesium castings, breaks down from heat. These gases are very irritating to the eyes, nose, and throat. Fluorides and fluorine can cause lung irritation and sometimes bone problems. Aluminum foundry workers may be exposed to chlorine which is sometimes bubbled through aluminum melting furnaces.



Pouring operations can give off gases and vapors, like ammonia and formaldehyde, from the breakdown of resin-coated core sands. Ammonia has an odor that is very irritating to the eyes, nose, and throat. Formaldehyde has an odor too, but you'll notice its effects first by watery, burning eyes. Magnesium foundry pouring crews can also be exposed to fluorine gas from fluorides added to the molding or core sands.

In some foundries, usually grey iron foundries, where sea coal and other organic compounds are mixed with foundry sand, coal tar pitch volatiles may be generated during pouring. Among other things, coal tar pitch volatiles contain benzo(a)pyrene, which has been implicated as a cause of cancer in recent research reports.

Vapors



Two solvents sometimes used in the melting and pouring areas that may cause vapor hazards are carbon tetrachloride (magnesium foundries) and ether, a solvent for hexachloroethane sprays. Since carbon tetrachloride is usually handled in a closed system, the chances of overexposure are low. Overexposure to carbon tetrachloride can cause liver and kidney damage. Remember, ether is very flammable, so keep it away from open flames.

Solvents can be taken into your body by breathing the vapors or by direct skin contact with the liquid. Continued skin contact can cause skin problems (dermatitis) like dry cracked skin. Breathing high concentrations can cause problems to your nervous system and can have the following effects:

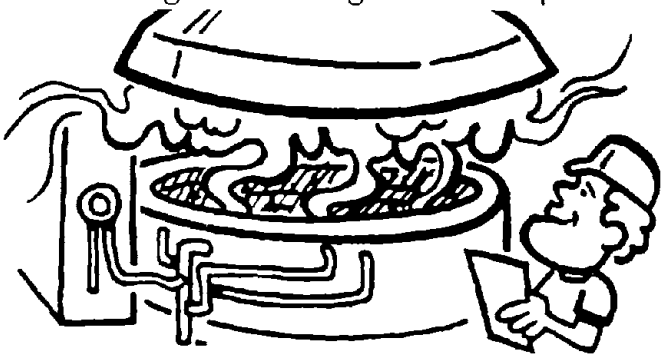
—Dizziness
—Lightheadedness
—Headaches
—Nausea
—Nose and Throat Irritation

The clues which might indicate a gas or vapor hazard are:

1. irritating odors,
2. no ventilation at furnaces, cupolas, or pouring stations,
3. no afterburner on cupolas,
4. a haze in the workroom that gets worse as the shift goes on,
5. clouds of smoke escaping the effect of the ventilation system,
6. salamanders used in confined space,
7. heavy use of gasoline- or propane-fueled industrial trucks indoors.

Controls

1. Use of local exhaust ventilation on furnaces, pouring stations, and skimming operations.
2. Scheduled tune-ups of industrial trucks.
3. Use of all safety equipment specified in the written confined space entry procedure.
4. Use of NIOSH/MESA approved respirators for short duration exposure to high levels of gases and vapors.

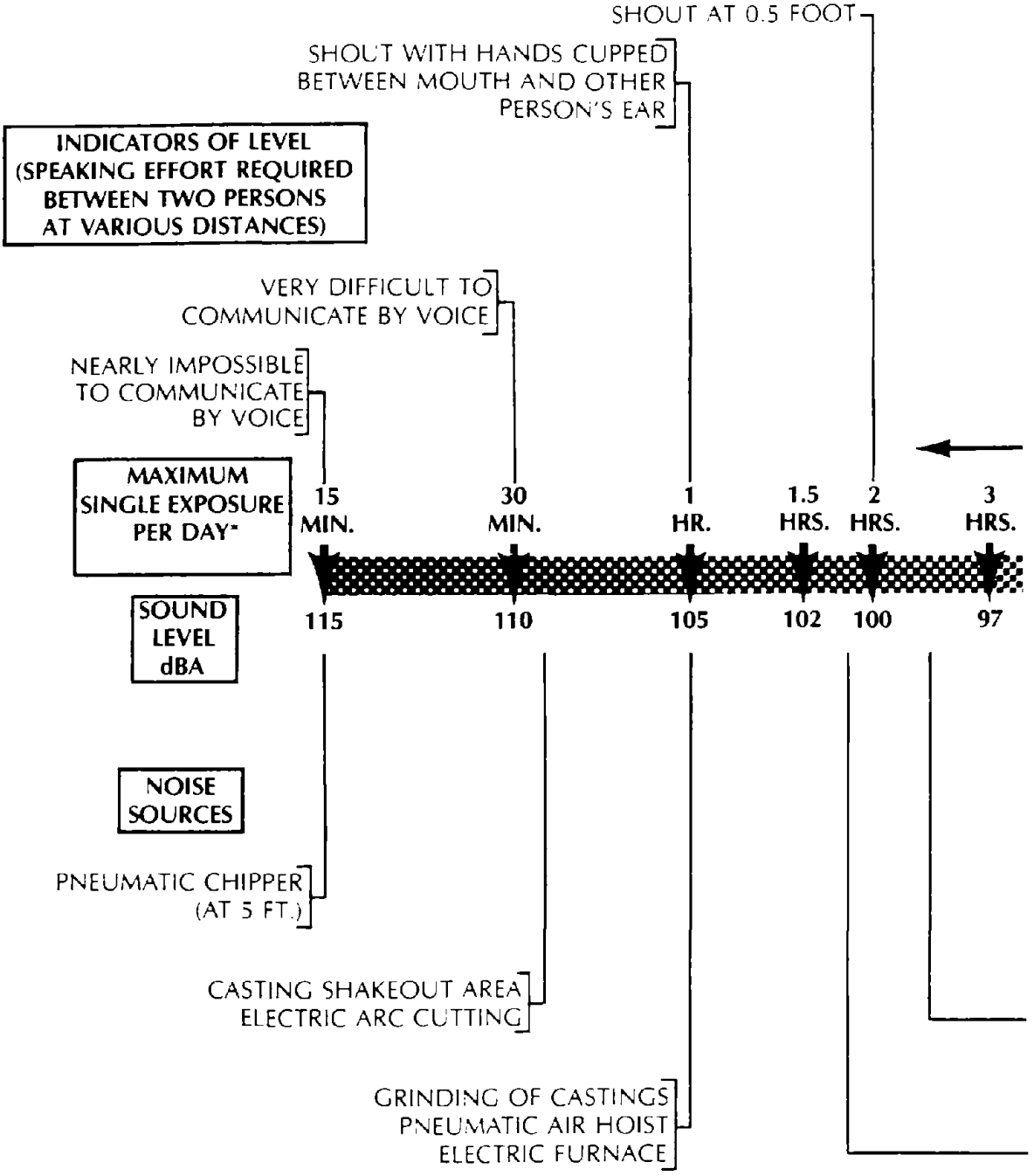


NOISE AND VIBRATION HAZARDS

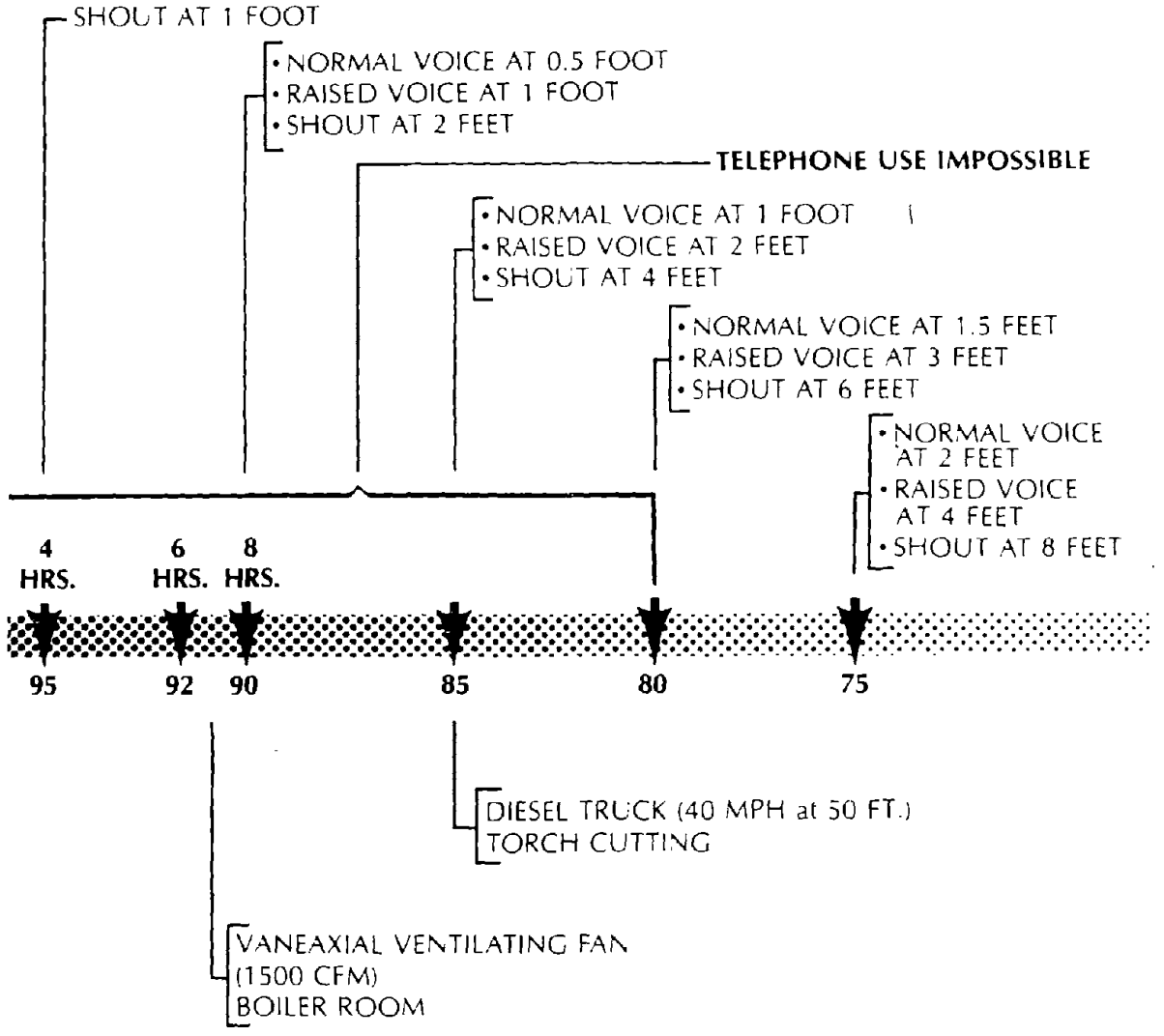
Noise

Furnaces, ladle preheaters, and air hammers can be sources of high noise. Other sources could be compressors, ventilation systems, shakeout, and casting cleaning operations.

PERMISSIBLE NOISE EXPOSURES



*EXPOSURE FOR REMAINDER OF DAY MUST BE LESS THAN 90 dBA



——TUMBLER, 6'×3', SMALL CASTINGS

—— SQUEEZE JOLT MACHINE

Noise may be a problem if:

YOU CAN'T HEAR YOUR BUDDY TALKING IN A NORMAL VOICE AT ARM'S LENGTH.

Too much noise (noise is measured in decibels-dB) over a long period of time will cause a hearing loss. One sign of exposure to too much noise is that you are not able to hear as well for a few hours after leaving a noisy area. Another sign is that people have to talk louder to you and you aren't able to understand every sound you hear!!

Vibration

Work with vibrating equipment like pneumatic hammers can cause vibration illness. Symptoms of vibration illness include cold, loss of color, and numbness in the hands and fingers. Balanced tools help protect against vibration illness.

Clues that there may be a noise or vibration problem are:

Noise

1. temporary loss in hearing,
2. ringing in your ears,
3. can't hear your buddy talking in a normal voice at arm's length.

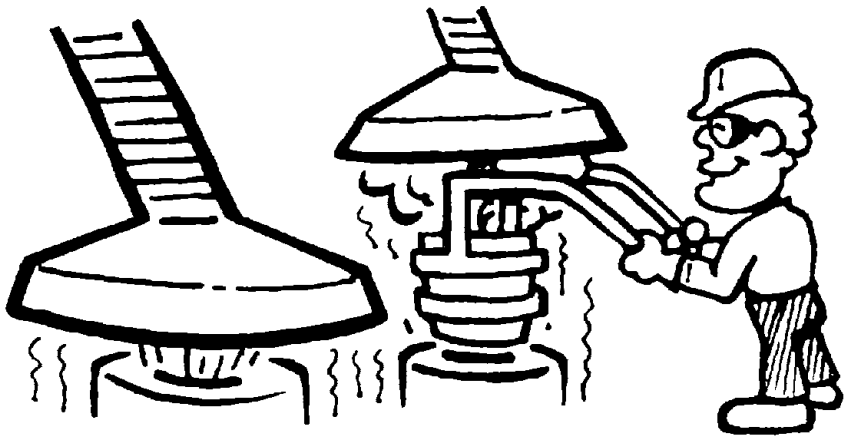
Vibration

1. poorly balanced vibration tools.
2. numbness in the hands and fingers.

Radiant Energy

Heat, infrared radiation, and ultraviolet radiation are types of radiant energy you may be exposed to in the melting and pouring areas. Sources of radiant energy include:

1. melting furnaces and cupolas,
2. tapping of furnaces and transporting the melt,
3. ladle preheaters,
4. pouring.



Infrared radiation and ultraviolet radiation can cause skin burns and eye problems. Mild exposures to infrared may cause eye fatigue and headaches. Eye protection with special dark tinted lenses must be worn to stop radiant energy.

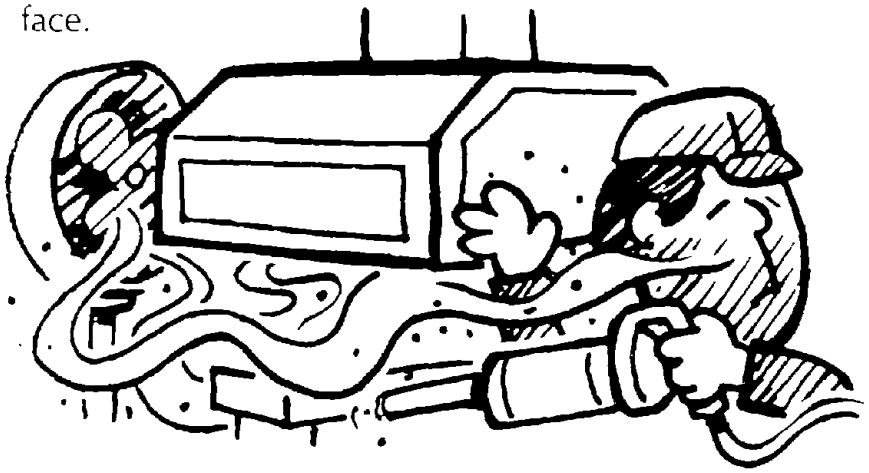
Note: Inoculating the melt in iron foundries when making nodular iron is a big source of radiant energy.

Heat Hazards

Some operations, especially in melting areas, may give off a lot of heat. When you first start working in hot areas, it is best to gradually get used to working around heat. Too much heat can cause illnesses like heat cramps, heat exhaustion,

and heat stroke. This problem is increased in the summer months. During exposure to high heat, drink plenty of water and use fans if they are provided. Check your salt requirements. Take breaks in cool areas.

WATCH OUT!—Make sure the cooling fan doesn't blow contaminant away from the ventilation hood or into your face.



Clues to spot radiant energy problems include:

1. no heat shielding at cupolas or furnaces,
2. skin burns,
3. heat-related illnesses

Controls:

1. Shielding of hot operations such as furnace charging, tapping, and pouring.
2. Use of special garments to be worn during furnace charging, tapping, pouring, and furnace relining.
3. Frequent rest periods.
4. Drinking plenty of water to replace fluids lost due to heat exposure.

Is Your Exposure Dangerous?

You can do your part in spotting what may be a health hazard by noticing symptoms of what might be overexposure in yourself, and by observing conditions and equipment in your work area. If you think that a health problem exists, tell your foreman and/or union representative and ask to have it checked. They'll refer the problem to an industrial hygienist.

The industrial hygienist can provide the answer to the question, "Is there an unhealthy condition that the foundry worker is exposed to?" The industrial hygienist may ask you and your co-workers to wear sampling equipment to measure the amount of contaminant that you come in contact with. It's the industrial hygienist's job to evaluate the hazards that you've spotted.

If possible, observe what the industrial hygienist is doing and ask for an explanation. The results of the study will not be available until the samples are analyzed. Ask to have the results explained to you.

ACTIONS YOU SHOULD TAKE IF YOU THINK A HEALTH HAZARD EXISTS IN YOUR WORK AREA

This book is written to help you spot health hazards in your work area. This book cannot tell you if your exposures are too high—only a qualified person with special training and equipment can determine that.

The following are actions you can take to limit your exposure to health hazards:

1. Report your problem. If you think that you have a health hazard in your area, it is in *your* best interest to report it to your foreman and/or union representative.

2. Use engineering controls. Engineering controls include: local exhaust ventilation, noise reduction devices (such as enclosures), vacuum systems, and special production equipment. The selection of these controls can only be made by management as a result of plant engineering studies.

Indicators that ventilation is needed are:

a. Eye, nose, and throat irritation.
b. Dust and smoke clouds rising from operations.
c. Dust settling over equipment, floors, and other surfaces.
d. Visible haze in the air.
e. Strong solvent or gas odor.

Indications of inadequate ventilation are:

a. all of the above.
b. drafts in doorways-not enough make-up air.
c. dust or smoke clouds not drawn into hoods.
d. poor location of vent hoods.

Note: The hood should be located to pull the air contaminants away from you.

e. vent system in poor repair, leaking, corroded, or stopped-up ducts.

f. exhaust stack of ventilation systems located so that dirty air is returned through windows and other openings.

g. hoods not pulling as well as when initially installed.

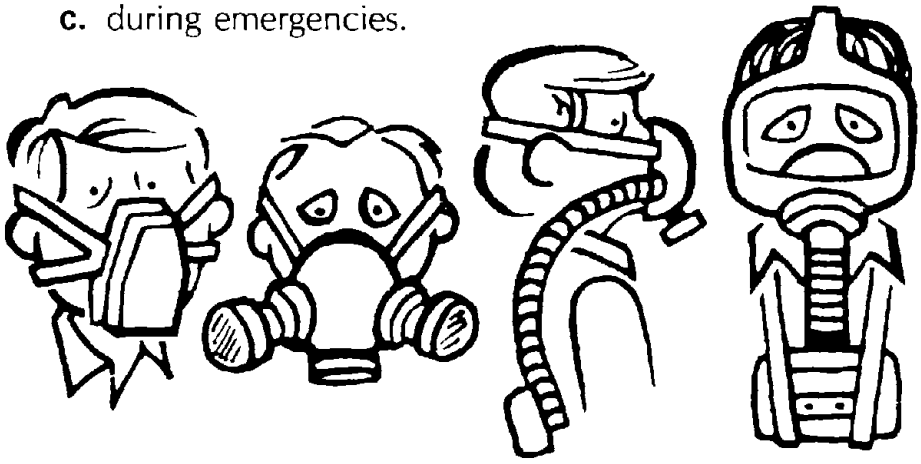
3. Wear protective equipment when required.

Respirators—sometimes respirators aren't comfortable, but they do protect your health, and it is *your* responsibility to wear them:

a. during brief exposures to high concentrations of contaminants when ventilation is not feasible.

b. until effective engineering controls-local exhaust ventilation-can be installed.

c. during emergencies.



All approved respirators have a NIOSH/MESA seal on the side of the box or on the respirator itself which explains what the respirator will filter out. Most respirators will only filter out specific chemicals, which may not include all of the chemicals you are exposed to.

IF YOU ARE EXPOSED TO	YOU SHOULD WEAR
Dust	An approved dust respirator—with mechanical filter.
Metal Fume	An approved dust and fume respirator—with mechanical filter.
Dust and Metal Fume	An approved dust and fume respirator—with mechanical filter.
Gases and Vapors	A chemical cartridge or chemical canister respirator approved for the particular type of gas.

WATCH OUT!—Surgical type masks do not provide adequate protection.

Remember these points:

— Cartridges must be changed periodically, especially if you begin to taste or smell the vapor or gas, if you have difficulty in breathing through them, or if the specified useful lifetime of the cartridge has expired.

— Respirators must be stored in a clean area.

— Respirators must be disinfected daily, especially when you have a cold.

— Respirators must fit properly. Beards and mustaches may interfere with the face seal.

— You must be trained in the proper use and care of the respirators.

IMPORTANT—ENTRY TO CONFINED SPACES

Mechanical filter and chemical cartridge respirators cannot be used for work in low oxygen areas, such as work in confined spaces or in special inert atmospheres. Airline respirators or self-contained breathing apparatus must be used in areas where oxygen levels are low.

The safest procedure for entering confined spaces is to have a written procedure that is always followed. Some of the recommended steps to take are:

— lock out and tag all electrical switches.
— test the air to be sure that it is free of hazardous gases such as carbon monoxide.
— test the air to be sure that there is sufficient oxygen (above 19%).
— wear protective clothing. If there are harmful amounts of gases present, or if there is not a sufficient supply of oxygen, use a respirator that receives outside air through a supply hose, or has its own air supply.
— wear a lifeline attached to a safety harness.
— be sure there is a stand-by person stationed to see you at all times. The stand-by person must be equipped with a self-contained respirator and protective equipment to be able to safely enter the area immediately if a problem comes up,
— check the airline respirator, if it is used, to be sure it has a carbon monoxide filter and a warning device on the air supply line.

Gloves and Barrier Creams —should be used to protect the skin from chemicals such as solvents and epoxies that can cause dermatitis.

Face Shields and Tinted Goggles—must be used at operations where radiant energy can be given off. The lenses of goggles are tinted to stop radiation from passing through to your eyes. Face shields must be worn where molten metal can splatter.

Ear Plugs or Muffs—should be used to prevent hearing loss from high noise exposures while engineering controls are being installed.

Note: Some workers say they can't hear warning bells or other workers when they are wearing hearing protection. You can actually hear better with hearing protection since most of the noise around you is masked out. You may find hearing protectors uncomfortable at first, but after a few days you will get used to them. You may then find noise in your area to be uncomfortable when protectors are not worn.

Remember

— Ear plugs must be properly fitted since one size does not fit everyone.
— Plugs must be washed frequently with warm, soapy water.
— Plain cotton is not effective protection.
— Keep your ears clean.
— The side frames of glasses may prevent ear muffs from giving proper protection. You may have to get glasses with special side frames.

Protective Clothing—Gloves, Aprons, Leggings—For exposures to high levels of radiant energy or from molten metal splatters, heat-resistant gloves, aprons and leggings must

be used. Gloves should be long enough to protect hands and arms. Full protective suits may be required at special operations involving toxic metals. You should receive thorough training in the use and care of these suits, and in emergency procedures.

For protection from vibration, padded mittens should be worn.

4. Housekeeping

Housekeeping in foundries is important! Dust that settles on pipes, rafters, floors, and equipment can be blown into the air by passing vehicles, by drafts from open windows and doors, from sweeping, and from improperly positioned fans. The better job *YOU* do of keeping this dust cleaned up, the better chance you will have of keeping the air you breathe safe.

Naturally, it's best to vacuum, but if you must sweep, do so carefully; don't blow dust off equipment with compressed air.

These are other good practices:

- **a.** have slag waste from cupola fall into a container of water,
- **b.** skim ladles under furnace ventilation,
- **c.** handle white phosphorus under water and do not leave it exposed to the air,
- **d.** cover the melt during transport of ladles,
- **e.** recover spills of mercury promptly.

5. Personal Hygiene

It's tough to stay clean in a foundry. But good personal hygiene is more than just staying clean. It's a way of protecting yourself:

— against health hazards
— against exposure to metals
— from breathing fumes or swallowing dusts
— from skin problems
— from overexposure to heat.

Remember

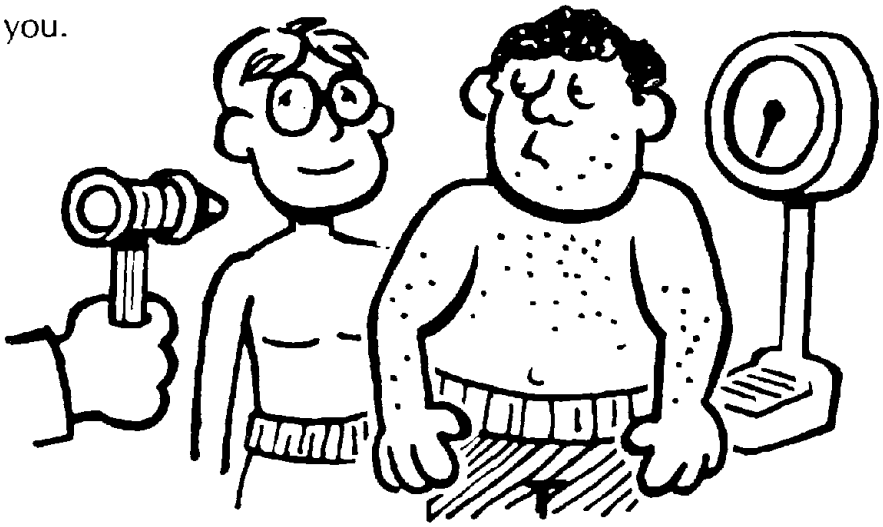
— Wash your hands and face before eating, drinking, smoking, or using the toilet.
— Eat, drink, or smoke only in permitted areas.
— Carry smoking materials in a closed case.
— Store your lunch away from the work area and hazardous materials.
— NEVER heat food on furnaces.
— Don't wear contaminated work clothes home.
— Launder work clothes separate from the family wash.
— NEVER wash with solvents.
— Drink plenty of water to replace liquids you may lose due to exposure to heat. For work in hot areas, increase your salt intake (unless on a low salt diet). Try salting your food a little more than usual.

6. Medical Examinations

In addition to recognition of a hazard through industrial hygiene studies, another way of determining if you are overexposed to some contaminants is through periodic medical examinations—by your company doctor or family physician.

Tell your doctor everything, such as how you feel on and off the job, any health problems, and symptoms, and how

long you've had them. Be sure he knows the things you work with. The more he knows, the better he will be able to help you.



A full-size chest x-ray every two or three years can show if silicosis is developing. Tell your doctor if you work in an iron foundry, because your chest x-rays could be masked because of breathing iron oxide fume. The doctor may also ask you to take a breathing test.

Blood and urine tests can be used to measure your exposure to organic vapors like phenol or to metals like lead, copper, and mercury. The doctor may x-ray your jaw if you work with phosphorus to make sure a problem called jaw necrosis isn't developing.

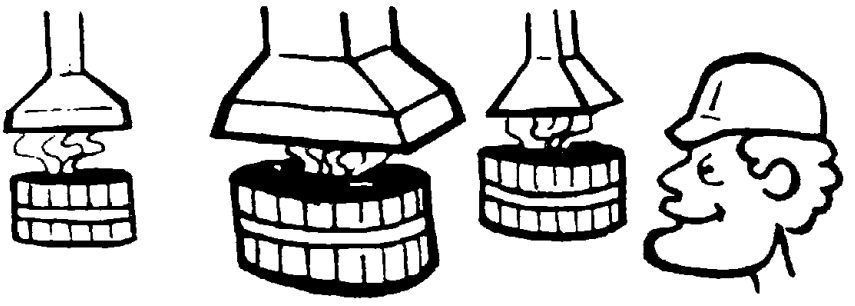
If you work in noisy areas, a hearing test (audiometric test) may be given to you.

These medical records are confidential, and can only be released as requested by law or with your permission. These are meant to document your present state of health and can be used in diagnosing the possibility of future illnesses. Don't be afraid of these examinations—they're meant to be an early warning for any possible health problems as part of a good preventive medical program.

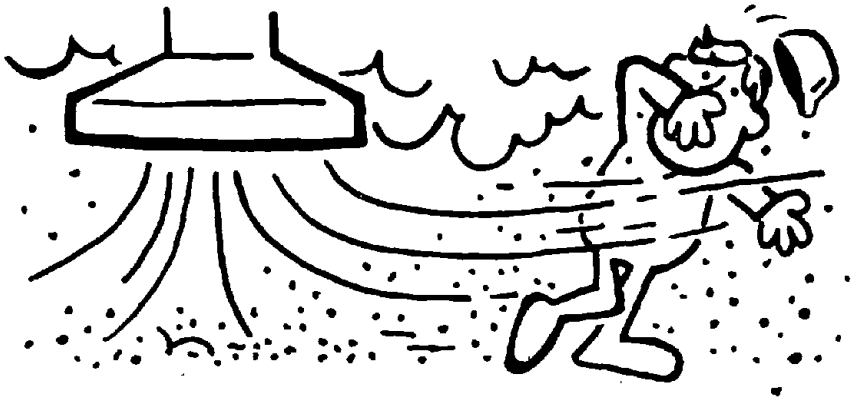
DO'S AND DON'TS FOR A HEALTHY WORK ENVIRONMENT IN THE MELTING AND POURING DEPARTMENTS

Do's

1. Make sure the ventilation system is turned *on* and *operating* properly. Things which may be wrong include:



a. Motor is turning, but belt to fan is disconnected.
b. Fan is reversed; the hood is not working effectively.
c. Floor fans are blowing contaminant away from hood.
d. Hood is too far from source of contaminant.
e. Hoods and ducts are clogged, restricting air flow.
f. Supply air ducts on the roof are drawing air from exhaust ducts.



2. Pour where the ventilation is. Skim and inoculate melt under ventilation.
3. Tell your supervisor of any irritation, discomfort, or rash caused by foundry contaminants.
4. Clean dust off surfaces and equipment above your head. Vacuuming does a better job than sweeping.
5. Cover the melt during transport with lids.
6. Handle phosphorus under water.
7. Wear personal protective equipment when needed:
   a. Dust and fume respirators for dusts and metal fumes.
   b. Chemical cartridge respirator for gases and vapors.
   c. Ear muffs or ear plugs for noise.
   d. Padded mittens for vibration.
   e. Face shields and tinted goggles for protection against nonionizing radiation.
   f. Gloves, aprons, leggings for heat.
   g. Eye protection if there is a possibility of an eye injury from flying particles, chips, or splashes.
8. Practice good personal hygiene.
9. Prevent slag wool from forming by having the slag fall into a container of water.
10. See your doctor or the company doctor for your periodic physical examinations and tests.
11. Discuss industrial hygiene hazards and ways to correct them at your safety meetings.
12. Clean up spills of solvents or chemicals quickly.

Don'ts!

1. Don't use fans if they interfere with the ventilation systems.
2. Don't disconnect parts of ventilation systems or block exhaust hoods or ducts.
3. Don't wash with solvents.
4. Don't eat, drink, or smoke in areas of airborne contaminants.
5. Don't heat food in the work area.
6. Don't misuse personal protective equipment.
7. Don't allow dust to accumulate in aisles, on overhead surfaces, or on equipment.
8. Don't enter confined spaces or atmospheres other than normal air without:
   a. self-contained breathing equipment.
   b. a life line.
   c. a stand-by person to help in an emergency.

First Aid

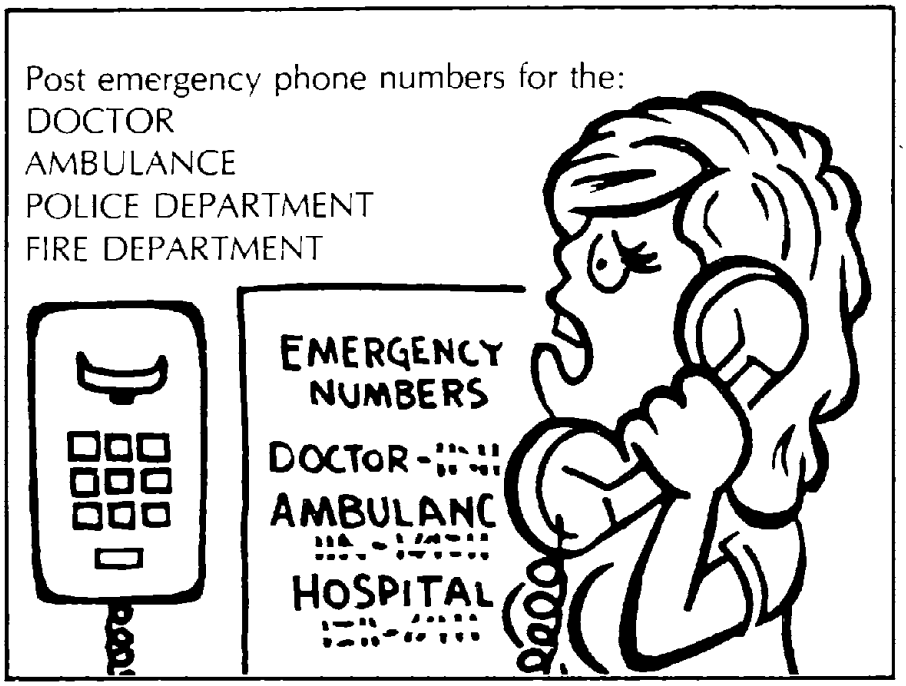
In foundries, the word is fast—FIRST AID.

If something gets splashed into your eyes, immediately flush your eyes with water. Hold the lids open with your fingers to make sure the water washes away all of the material. Send someone for medical help.

Although it is always unexpected, foundry workers may suddenly become unconscious from extreme overexposure to solvent vapor, carbon monoxide gas, or extreme heat.

Remove the victim from the exposure. But—always put on protective equipment first—don't become a "victim" yourself. If you know how to give artificial respiration, you might revive someone who is unconscious and who has stopped breathing. This could prevent death or brain damage.

KNOW WHO THE TRAINED FIRST AIDER IS ON YOUR SHIFT.



You've Finished Reading The Book. . .

Now, what can you do?

Getting rid of health problems in your foundry takes time and it takes people working together to help solve health problems.

If you've identified what you think is a health problem in your area:

- tell your supervisor or foreman
- tell your union representative
- ask to have an industrial hygiene study done in your work area
- ask about the results of the study
- understand what the results mean
- follow the rules and regulations that apply to you.

And, if you have any further questions about health hazards:

- contact the nearest office of NIOSH or OSHA.

LIST OF TERMS

Audiometric Test—a hearing test.

Chemical Cartridge Respirator—a breathing device that is a gas and vapor removing type.

Confined Space—a space with little or poor ventilation into which infrequent entry is made for purposes of maintenance, repair, and/or cleaning.

Decibel—a measurement quantity for sound level.

Dermatitis—inflammation (rash) of the skin.

Dust—small solid particles created by the breaking up of larger particles by processes such as crushing.

Fumes—small solid particles given off from molten metals.

General Dilution Ventilation—ventilation provided from roof or wall fans.

Hood—the shaped inlet of a ventilation system designed to capture contaminated air.

Local Exhaust Ventilation—ventilation designed to remove contaminants at or near the point of origin.

Mechanical Filter Respirator—a breathing device for removing dusts, fumes, and mists.

Metal Fume Fever—an industrial disease of short duration with flu-like symptoms resulting from excessive exposure to fumes of some metals.

Mineral Dust—dusts of substances occurring naturally in the earth such as silica.

Noise—unwanted sound.

Organic Dusts—complex substances that can be formed by the heat decomposition of carbon containing materials like oil and grease.

Siderosis—a non-disabling lung condition from long term exposure to high concentrations of iron dust and fume.

Silicosis—a lung disease resulting from long term exposure to excessive concentrations of silica dust.

Solvent—an organic liquid that dissolves another material.

Vapor—the gaseous form of a substance, normally liquid at room temperature.

Vibration—a back and forth motion of matter.

NIOSH AND OSHA REGIONAL OFFICES

The following pages list NIOSH and OSHA regional offices which 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 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.: 404/881-4474

DHEW, Region V
300 South Wacker Drive
Chicago, Illinois 60607
Tel.: 312/886-3651

DHEW, Region VI
1200 Main Tower Building, Room 1700-A
Dallas, Texas 75245
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
11037 Federal Building
Denver, Colorado 80294
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
JFK Building, Room 1804
Boston, Massachusetts 02203 ----------Telephone: 617/223-6712/3

Region II
U.S. Department of Labor
Occupational Safety and Health Administration
1515 Broadway (1 Astor Plaza), Room 3445
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: 404/881-3573/4 or 2281/2

Region V
U.S. Department of Labor
Occupational Safety and Health Administration
230 S. Dearborn, 32nd Floor
Chicago, Illinois 60604 ----------Telephone: 312/353-4716/7

Region VI
U.S. Department of Labor
Occupational Safety and Health Administration
555 Griffin Square Building, Room 602
Dallas, Texas 75202 ----------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
6048 Federal Office Building, 909 First Avenue
Seattle, Washington, 98174 ----------Telephone: 206/442-5'