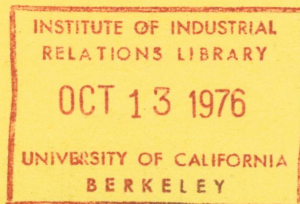


Occupational Health And Safety For Foundry Workers:

an instructors' guide

by Sidney Weinstein with
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The Labor Occupational Health Program is part of the Center for Labor Research and Education, Institute of Industrial Relations, University of California, Berkeley. LOHP conducts research and education on safety and health for labor groups and workers in Northern California.

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OCCUPATIONAL HEALTH AND SAFETY FOR
FOUNDRY WORKERS

An Instructors' Guide

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AN INSTRUCTOR'S GUIDE TO TEACHING OCCUPATIONAL HEALTH
AND SAFETY

These materials have been prepared for use by Apprentice Instructors to accompany Occupational Health and Safety: A Manual for Foundry Workers

COURSE OBJECTIVES

Apprentices should understand (1) the potential hazards of their trade; (2) how to measure and control these hazards; and (3) how to recognize actual hazards in their own workplace.

To the Instructor:

These materials have been prepared to accompany Occupational Health and Safety: A Manual for Foundry Workers. The suggested teaching methods, lesson plans, and study questions are to help you bring out important points covered in each chapter. The manual itself probably contains much more material than you need cover in the classroom. However, it should be used as the basic text by instructor and apprentices.

You will probably find 2 teaching methods--lecture and discussion--most useful to achieving your goals. Chapter 7 - Hazard Identification is particularly adaptable to class participation and discussion. The accompanying lesson plans indicate specific goals for each chapter. The lesson plan for Chapter 3 - Chemical Hazards is more detailed than the others, and illustrates how you might present a lecture based on the manual material. The study questions can be used at the end of a presentation to measure your students' grasp of the material.

Whether you use the enclosed instructor's aids as is, modify them, or substitute your own, your classroom presentations should enable the apprentices to: (1) recognize potential health and safety hazards affecting their trade, (2) understand how to measure and control or prevent hazards, and (3) identify actual hazards at their own workplaces.

TEACHING BY LECTURE

Lecturing can be very effective for quickly presenting new information. To greatly increase students' involvement and retention, you can add visual aids such as slides, video tape, film, and transparencies. Don't feel you have to cover all the information in the manual. In your lectures, cover only the most important ideas and enough material to accomplish the chapter objectives.

Following are suggestions for successful lecturing. We have used material from Chapter 3--Chemical Hazards to illustrate our points.

1. Outline your MAIN POINTS at each lecture's beginning. This enables students to understand what material you are going to cover, and to take organized notes. Likewise, always begin the course with an overview (Chapters 1 and 2) and discussion of the Manual's Table of Contents, Appendices, and Glossaries.

The following can help you decide on your main points: the OBJECTIVES outlined in the lesson plans; the study questions; and the way material is organized in each chapter. For example, the MAIN POINTS to be covered in Chapter 3 are:

- (a) four classes of chemicals affect foundry workers:
dust, gases, vapors, and fumes.

- (b) Chemicals enter and affect the body either by being breathed in (dusts, vapors, fumes, and gases), by coming in contact with the skin (fumes and vapors, and the substances from which they evaporate), or by being ingested while eating (dusts, fumes, and vapors, and the substances from which they evaporate).
- (c) These substances' effects on the body, the body's defenses or warnings against them, and the main exposure sources in the foundry are listed in Table I on the following page.
- (d) If you think you're being exposed to dangerous substances in your workplace, these substances can be measured using the following two kinds of monitoring equipment:
 - (i) self-reading such as pump and detector tubes
 - (ii) requiring laboratory analysis such as personal sampling pumps used to measure silica levels in the air.
- (e) Worker exposures to dangerous airborne chemicals can be controlled in three ways:
 - (i) at the substance's source--for example, by ventilation or modifying machinery or work processes;
 - (ii) in the substance's path--for example, by increasing worker's distances from the substance's source;
 - (iii) at the receiver (worker)--for example, by rotating workers or having them use respirators.

2. Before beginning the lecture list and define KEY TERMS on the blackboard (see Lesson Plans for examples).

TABLE I. FOUNDRY EXPOSURES

EXPOSURE SOURCES	EFFECTS ON BODY	BODY'S DEFENSES AND WARNINGS
DUSTS		
Silica--molding sand, mold release, blasting sand, grinding wheels	Slowly developing lung diseases silicosis (from silica) talcosis (from talc) asbestosis (from asbestos)	Nose (mucus and hairs) air tubes (mucus and cilia-- "muco-ciliary escalator")
Talc--mold release		lungs (special white blood cells that remove all but smallest particles to "muco-ciliary escalator")
Asbestos--riser sleeves	Cancers (from asbestos) of lung, large intestine, stomach, rectum Mesothelioma (from asbestos)	
GASES		
Carbon Monoxide--cupolas, fork lifts, pay loaders, front end loaders, slamanders, burning of materials in core and mold sand	Suffocation by reducing the amount of oxygen in the blood	
Hydrogen Chloride and Ammonia--resin process	Strong irritant (skin, eyes, nose, throat, and lungs); unconscious- ness (high levels); pulmonary edema (filling of lungs with fluid).	coughing, tearing eyes smell
Nitrogen Dioxide and Flourine--Welding		
VAPORS		
Binding oils and resins, and their decomposition products from bake and no-bake molds and cores	irritation (skin eyes, lungs), allergic reactions, kidney and liver damage	coughing, tearing eyes smell
FUMES		
Molten metal in melting, pouring and welding operations (iron oxide, lead, zinc oxide, cadmium)	metal fume fever--zinc and iron oxides irritation (nose, skin, lung, eyes) damage to liver, kidneys and nervous system pulmonary edema (filling of the lungs with fluid)	irritation (eye, skin, nose) (however, some fumes are not irritating)

3. If at all possible, always tie in already-presented information with newly presented material. Also use this information as background.
4. Keep all examples concrete. Use examples from your own experience to explain MAIN POINTS.
5. Make sure your students are following your lecture and are interested. Watch for signs of boredom and sleepiness.
6. Break up the presentation and involve students by asking questions, summarizing your presentation thus far, giving examples from your own experience, or showing slides, films, or other audiovisual aids.
7. Never cover too much information at once. You may want to break some of the chapters, especially Chapter 5--Safety Hazards and Chapter 7--First Aid, into several sessions.
8. Keep your presentation focused on the material.
9. Encourage students to take notes.
10. At the end of each lecture, either give students a short test or go over your MAIN POINTS in a discussion. You can use our study questions or your own. Break students into small groups to discuss the study questions. Go over the answers with the entire group.

TEACHING BY DISCUSSION

Involving the apprentices in discussion can be most effective, particularly if the material has already been presented, either in a lecture, or assigned reading. You will especially want to

use this method for discussing Chapter 7--Hazard Identification.

Following are suggestions for using the discussion method to present material. To illustrate our points, we have used examples from Chapter 3--Chemical Hazards.

1. Make sure your questions clearly indicate the kind of answer you want--fact, opinion, or justification.

fact--What is the most widespread dust hazard in foundries?

opinion--Is silica a problem in your foundry?

justification--Why do you think silica is a problem in your foundry even though there's not much visible dust in the foundry atmosphere?

2. Make sure your questions allow participants to re-examine their own beliefs. For example, when discussing how to control exposures to dangerous substances by installing ventilations systems over operations, one mulling operations apprentice says:

There is a ventilation system over the mulling operations in my foundry. Thus, I feel sure I'm being protected.

You might respond by the following questions:

Are you sure the system is working correctly? How can you tell? Have you ever asked whether the system is adequate for its purpose? (Ventilation systems are discussed at the end of Chapter 3)

In this case, you have taught the apprentice what conditions are necessary for the ventilation system to insure his/her safety.

3. Be sure apprentices have enough information to answer your questions, either from their reading, lectures, previous discussions, or their own experiences.
4. Encourage apprentices to ask questions and bring up information from their own experience.
5. If you want the class to answer problem-solving questions, be sure they first understand what you're asking. Then have them:
 - examine all relevant facts
 - propose an answer/solution
 - explain (justify) their answers based on the available factsfor example,

PROBLEM: On Monday, two new workers on the pouring floor of a small brass foundry (50 workers) complained of flu symptoms--weakness, headache, nausea, fever. Their community had no known flu epidemic at that time. No other foundry workers except one welder returning from a two-week vacation complained of such symptoms that week. Their symptoms lasted about two days, after which time they felt perfectly well.

QUESTION: Do you think these workers were suffering from the flu, a work-related condition, or something else?

RELEVANT INFORMATION: From reading Chapter 3--Chemical Hazards and the charts at the end of that chapter,

apprentices should be able to come up with the following points:

- (a) workers newly exposed to fumes from such metals as zinc, or those exposed after a significant time away from their work, can develop an allergic reaction with flu-like symptoms. This condition is called "metal fume fever."
- (b) "metal fume fever" symptoms usually last only 24-72 hours without apparent long-term health effects.
- (c) welders and pourers are exposed to metal fumes on their jobs
- (d) brass foundries produce zinc fumes

ANSWER AND JUSTIFICATION FOR ANSWER: Metal fume fever:

the three workers with flu symptoms were newly exposed; their work processes produced zinc fumes; no other workers in that foundry were suffering similar symptoms; there was no flu epidemic in the community; finally, the workers were sick for only two days, without further symptoms or weaknesses.

LESSON PLAN--Chapters 1 and 2

TOPIC: Introduction to Occupational Health and Safety
Introduction to Foundry Hazards

OBJECTIVES: each apprentice should know

1. The 2 federal agencies primarily responsible for carrying out provisions of the OSH Act
2. 1 of the 3 unions actively involved in occupational health and safety
3. 2 public interest or scientific groups involved in occupational health and safety
4. The most hazardous foundry operations
5. 3 hazards generally affecting most foundry workers
6. 1 example of hazards affecting workers in each operation--molding, and coremaking (1), melting (1), pouring (1), shake-out (1), knockout (1), and finishing (1)

TEACHING AIDS: Manual material, chapters 1 and 2. No study questions are provided for these chapters. Verbal quizzing to establish that apprentices have met the chapter objectives should be sufficient.

METHODS: Since the material contained in the first 2 chapters is primarily intended to give the apprentice a feel for the scope of occupational health and safety problem these chapters should be assigned as outside reading.

LESSON PLAN--Chapter 3

TOPIC: Chemical Hazards

OBJECTIVES: each apprentice should know

1. The difference between acute and chronic health effects
2. The difference between local and systemic effects
3. The 4 major categories of chemical hazards in the foundry environment, 2 examples of each, and their effects on the body
4. The body's defenses against inhaled dust particles, fumes, gases, and vapors
5. The 3 ways a hazardous substance can enter the body
6. The foundry hazard most likely to exceed Federal standards
7. 2 major hazards associated with baked and no-bake core and mold making
8. The 2 basic types of sampling setups or instruments and an example of each
9. The 3 points where chemical hazards can be controlled and an example of each method
10. The most effective method for controlling airborne hazards, and 2 requirements of such a control system
11. The 2 basic types of respirators, and 2 problems associated with respirator use

Key Terms: (write key terms and definitions on blackboard before beginning lecture)

acute	sensitization
chronic	TLV
systemic	mesothelioma
local	metal fume fever
dust	fume

gas	vapor
ferrous	air-purifying respirator
nonferrous	air-supplied respirator

METHODS: Show slides to illustrate points on body's defenses and how it can be broken down. Using lesson plan, go through manual material. Present material by lecture method. Break apprentices into small groups to discuss the study questions. Review answers to the questions with the entire group. (Note: This chapter has been outlined in much greater detail than the others as an example of how to pull information from the manual and organize it into an effective presentation.)

The main points that should be covered in the lecture follow.

1. Most hazardous substances in the foundry are airborne. That means they enter the body by being breathed in. Materials may also be absorbed through the skin or ingested with food, drink, or cigarettes. Some substances directly affect the skin itself.
2. In foundries, the 4 main categories of airborne chemical hazards are dusts, fumes, gases and vapors. The body's defenses against these substances are:

Dusts and Fumes: hairs and mucus in the nose; mucus and cilia (hair-like fibers) in the air tubes ("muco-ciliary escalator"); and special white blood cells (phagocytes) in the lungs. These defenses are most effective against dusts.

Vapors and Gases: eyes, nose, and throat irritation and substance's characteristic or offensive odor.

3. If the body's defenses are ineffective or break down, resulting health effects may be:

Acute: require high doses over short periods of time. For example, hydrogen sulfide can cause unconsciousness or death within minutes,

or

Chronic: require long exposure to fairly low doses. For example, silicosis can develop from exposure to low concentrations of silica over a number of years.

4. A chemical's state (gas, fume, vapor, dust, liquid or solid) and its special properties determine not only how it will affect the body, but where it will cause effects. The location of these effects may be:

Local: effects are seen where the chemical contacts the body. For example, solvents cause reddening and cracking (local effect) when they come in contact with the skin (point of contact).

or

Systemic: the chemical's effect is at some point other than the point of contact. For example, carbon monoxide enters the lungs (point of contact) but, by lowering the oxygen content of blood, affects all organs and systems of the body (systemic effect). Most fumes are quite soluble in the lung fluids and

may not only affect the lungs directly (local effect) but may also pass into the blood stream and cause systemic effects.

5. The major foundry exposure sources for each category of chemical hazard are:

Dusts: Silica - the foundry contaminant most likely to exceed standard; causes silicosis, a disabling lung disease
Asbestos and Talc - cause asbestosis or talcosis, both disabling lung diseases; asbestos may also cause lung, large-intestine or rectal cancer, and mesothelioma (cancer of the abdomen or chest lining).

Fumes: Iron Oxide - major fume exposure in iron (ferrous) foundries; causes metal fume fever, an (allergic) flu-like condition; does not seem to cause longterm disabling lung disease.

Lead - produced in noniron (nonferrous) foundries; causes blood, kidney, and nervous system damage.

Gases: Carbon Monoxide - produced by cupolas, salamanders, fork-lifts, pay or front-end loaders; binds to hemoglobin, the oxygen carrier of the blood, more tightly than oxygen; causes oxygen starvation which shows up as headache, dizziness, unconsciousness, coma, and possibly death.

Vapors: Acrolein - a decomposition product for core binding oils; extremely irritating to the skin, throat, nose,

and eyes; vapors are also highly explosive.

Resins from shell and no-bake mold and core making processes; allergic reactions, skin, lung, throat, nose, and eye irritation; and kidney and liver damage (refer to manual for other effects).

Note to instructor: supplement with manual material in Chapter 3 and with charts at the chapter's end.

6. There are Federal standards limiting worker exposure to many airborne chemical hazards (see charts at end of Chapter 3 and Appendix A).
Most standards are for exposures averaged over an 8-hour period.
7. The work environment should be regularly monitored (air measurements taken) to determine worker exposures to hazardous substances (an employer responsibility). Commonly used sampling instruments or setups are:
 - Direct-reading: such as hand-operated pumps and detector tubes or explosive gas meters.
 - Requiring Lab Analysis: such as a pump and filter set-up used to sample for silica. These systems require analysis by a laboratory, and are generally more accurate.
8. Airborne chemical hazards can be controlled at three (3) points:

Source: (The most effective point to control exposures)

Ventilation systems - must be designed for the particular operation, pull contaminants away from workers' breathing zone (nose and mouth area), have high enough air speed to capture the substance, and have filters, dust traps, etc. changed regularly

Modifying machinery or process

Substituting a safer material

Path: Isolating workers in control booths

Receiver: Personal Protective Equipment (respirators)- should be used only in emergencies or while controls are being engineered

Limit Exposure Time through breaks or job rotation

9. Respirators are approved by NIOSH and MESA. There are two main types:

Air-cleaning (air-purifying) draw air through a filter pad or chemical cartridge or canister to remove dust, fumes, gases or vapors. The canisters or cartridges are color coded (see ANSI Standard, Table 3-5 in manual) and should only be used for substances for which they are certified. Filter-type respirators should only be used for dusts-- not all filters are approved for asbestos exposure!

Air-supplied must be used for exposures to highly toxic materials, for concentrations above those recommended for air-cleaning respirators, or in oxygen-deficient atmospheres. Types are:

Air-line: an outside air source supplies clean, pressurized air to a face mask

Air-hose: air is supplied by 1-inch diameter hose to mask, hood or suit under normal or slightly positive pressure

Self-contained breathing apparatus: completely contained system with tank carried on back

10. There are Federal OSHA guidelines for setting up a respirator program (Table 3-6 in manual) - discuss what such a program should include.
11. There are problems associated with using respirators. They may:
 1. leak
 2. make breathing difficult
 3. obstruct vision
 4. be misused
 5. be inadequately tested
 6. make working difficult - they are often heavy or cumbersome

STUDY QUESTIONS: Chapter 3

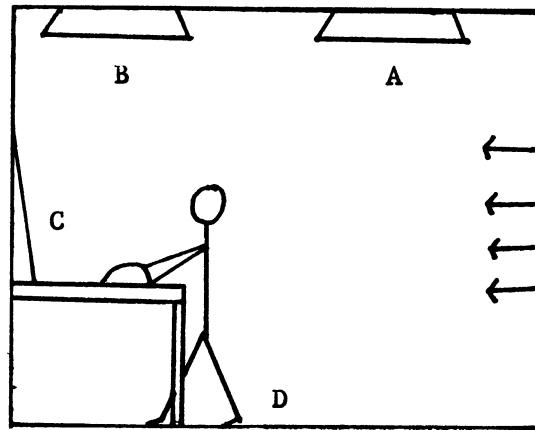
1. Most hazardous substances in the workplace enter the body by being:
 - a. absorbed through the skin
 - b. eaten
 - c. injected
 - d. breathed in
2. Damage to the body which develops quickly after exposure to high concentrations of a substance is:
 - a. minor
 - b. chronic
 - c. local
 - d. acute
3. An effect which develops at a location other than point of contact is:
 - a. chronic
 - b. local
 - c. systemic
 - d. minor
4. Particles small enough to get past the nose are trapped in the airtubes in:
 - a. mucus
 - b. trachea
 - c. pus
 - d. none of the above.
5. The major dust generated by foundries is:
 - a. asbestos
 - b. silica
 - c. talc
 - d. none of the above
6. Dusts which reach the lungs may be:
 - a. surrounded by special white blood cells
 - b. sealed off with tissue
 - c. both a and b
 - d. none of the above

7. Mesothelioma is a rare form of cancer caused primarily by exposure to:
 - a. talc
 - b. silica
 - c. asbestos
 - d. molybdenum
8. Solid particles formed by the condensation of vaporized materials, primarily metals, are:
 - a. dust
 - b. smoke
 - c. mists
 - d. fumes
9. A condition caused by exposure to metals such as zinc and magnesium and producing flu-like symptoms is:
 - a. metal fume fever
 - b. byssinosis
 - c. talcosis
 - d. anemia
10. Gaseous forms of substances normally liquid or solid at room temperature are:
 - a. mists
 - b. fumes
 - c. smoke
 - d. vapors
11. Compounds used in urethane resins and causing an asthma-like lung condition are:
 - a. isocyanates
 - b. vegetable oils
 - c. amines
 - d. alcohols
12. Some gases have no warning properties. One such colorless, odorless gas is:
 - a. ammonia
 - b. chlorine
 - c. hydrogen sulfide
 - d. carbon monoxide

13. BCMF (bis-chloromethyl ether) is formed when hydrogen chloride combines with a vapor released during resin curing. The vapor is:
- a. Acrolein
 - b. Melamine
 - c. Urea
 - d. Formaldehyde
14. The best place to take an air sample is usually:
- a. by the worker's ears
 - b. in the breathing area
 - c. in the middle of the foundry
 - d. by the ventilation system
15. Samples should be taken as close to a certain number of hours as possible. How long?
- a. 2 hours
 - b. 4 hours
 - c. 6 hours
 - d. 8 hours
16. One of the simplest and least expensive air monitoring units for measuring levels of hazardous gases is:
- a. explosive gas meter
 - b. personal dust sampler
 - c. detector tubes and pump
 - d. impingers
17. The most effective method for removing air contaminants at their source is through:
- a. local exhaust ventilation
 - b. fans
 - c. blowers
 - d. dust traps

18. In the figure below, which is the best location for a system to remove air contaminants?

- a. A
- b. B
- c. C
- d. D



19. There are 2 major types of respirators, air-cleaning and:

- a. air-purifying
- b. gas masks
- c. cartridge
- d. air-supplied

20. The color code for cartridges used to remove organic vapors and acid gases is:

- a. purple
- b. green
- c. white
- d. yellow

21. When oxygen supply is limited, an air-supplied respirator must be worn: It may be an air-line respirator, an air-hose respirator, or a:

- a. life-support system
- b. self-contained breathing apparatus
- c. gas mask

LESSON PLAN--Chapter 4

TOPIC: Physical Hazards - (A) Noise, and (B) Heat and Radiation

OBJECTIVES: each apprentice should know

(A) NOISE

1. The 2 defining characteristics of noise (sound), and the units in which they are measured
2. The federal standard (legal exposure limit) for exposure to noise over an eight-hour day.
3. 3 foundry operations often producing noise levels that exceed the federal standard
4. How the ear hears, and how noise affects hearing
5. How temporary noise-induced hearing losses become permanent
6. What the following are used for: sound level meter and audio-meter

(B) HEAT AND RADIATION

1. How the body acclimatizes to heat
2. 2 ways excess heat can affect the body, and which is the most serious
3. 3 methods to control worker exposures to excess heat, 1 example of each, and which is the most effective
4. 2 sources of ionizing radiation in the foundry
5. 2 effects of chronic exposure to ionizing radiation
6. 2 methods of controlling exposure to ionizing radiation
7. 2 forms of nonionizing radiation found in foundries and 1 source of each in the foundry
8. 1 effect each of exposure to UV and IR radiation

9. 1 method each of controlling exposure to UV and IR radiation

KEY TERMS: (write key terms and definitions on blackboard before beginning lecture)

(A) NOISE

Loudness

Frequency

Decible

Hertz

Permanent noise-induced hearing loss

Temporary noise-induced hearing loss

Sound level meter

Audiometer

Audiogram

Hearing threshold shift

(B) HEAT AND RADIATION

Acclimatization

Heat stress value

Ionizing radiation

Nonionizing radiation

Ultraviolet radiation (UV)

Infrared radiation (IR)

MATERIALS: Manual, lesson plan, study questions, slides, and information from the apprentices' own experiences

METHODS: Put key terms (and definitions) on the board. They should become clear as you present and discuss the material. At the session's end, be sure your students can define the terms.

Follow manual material and organize your presentation by the manual. Give special attention to foundry exposure sources, especially by drawing on the apprentices' own experiences. Break into small groups to discuss study questions and answers.

STUDY QUESTIONS: Chapter 4, Physical Hazards

(A) NOISE

1. Loudness of noise is measured in:
 - a. cycles per second
 - b. amperes
 - c. watts
 - d. decibels
2. Frequency is measured in:
 - a. joules
 - b. cycles per second
 - c. rems
 - d. megatons
3. A casting shakeout area at 110dB is how many times louder than ordinary speech at 60dB?
 - a. 100
 - b. 1,000
 - c. 10,000
 - d. 100,000
4. The current standard for noise exposure averaged over an 8 hour day is:
 - a. 90dB
 - b. 85dB
 - c. 80dB
 - d. 75dB
5. The body's three smallest bones are located in the ear. They are located in which part of the ear?
 - a. external
 - b. middle
 - c. inner
 - d. none of the above
6. A permanent noise-induced hearing loss is:
 - a. correctable by surgery
 - b. correctable with hearing aids
 - c. not correctable

7. The basic instrument for measuring continuous noise is:
 - a. impact noise meter
 - b. oscilloscope
 - c. octave-band analyzer
 - d. sound level meter
8. If you are exposed to loud noise you should have an annual hearing test, called:
 - a. pulmonary function test
 - b. electrocardiogram
 - c. cytology
 - d. audiometric test
9. The first dip on a hearing test indicating a noise-induced hearing loss shows up at:
 - a. 4,000 Hz.
 - b. 2,000 Hz.
 - c. 1,000 Hz.
 - d. 500 Hz.
10. The most effective point to control noise is at the:
 - a. receiver
 - b. path
 - c. source
 - d. none of the above
11. The least effective point to control noise is at the:
 - a. source
 - b. path
 - c. receiver
 - d. none of the above.

(B) HEAT AND RADIATION

1. To cope with excess heat your body becomes:
 - a. acclimatized
 - b. saturated
 - c. heavier
 - d. lighter
2. The most serious heat disorder, which is usually fatal unless treated promptly, is:
 - a. heat syncope
 - b. heat cramps
 - c. heat exhaustion
 - d. heat stroke

3. To determine a worker's heat stress value, you must know the worksite temperature and:
 - a. air moisture
 - b. workload
 - c. rate of air movement
 - d. all of the above
4. The effects of ionizing radiation depend on:
 - a. dose
 - b. type of radiation
 - c. none of these
 - d. a and b
5. Chronic effects of ionizing radiation include leukemia, shortened life span and:
 - a. genetic damage
 - b. teeth loss
 - c. increased number of red blood cells
 - d. garlic breath
6. Protection against radiation exposure in foundries can be achieved by:
 - a. shielding castings with lead
 - b. drinking milk
 - c. roping or barricading inspection areas
 - d. a and c
7. Ultraviolet radiation can cause:
 - a. cataracts
 - b. welder's arc eye
 - c. bone damage
 - d. arthritis
8. Infrared radiation can cause the lens of the eye to become cloudy, hampering vision. This condition is called:
 - a. astigmatism
 - b. conjunctivitis
 - c. bursitis
 - d. cataracts
9. To protect exposed individuals, employers should provide:
 - a. tinted goggles
 - b. gloves
 - c. protective clothing
 - d. all of the above
 - e. a and b only

LESSON PLAN--Chapter 5

TOPIC: Safety Hazards

OBJECTIVES: each apprentice should know

1. How health hazards interact with safety hazards to cause accidents
2. Two potential injuries resulting from manually handling materials;
two methods to control or prevent such injuries
3. Two common accidents related to handling materials by machine;
two methods to control such accidents
4. Two injuries resulting from machine hazards; two methods to
prevent such injuries
5. One hazard associated with each of the following cupola
operations: charging, tapping, dropping the cupola bottom,
repairing the cupola. At least one method for preventing
accidents associated with each operation
6. Two hazards associated with ovens; two prevention methods
7. Three frequent housekeeping problems in foundries; one possible
injury associated with each hazard; and one method to control
each hazard

KEY TERMS: (Write key terms and definitions on blackboard before beginning
lecture.)

Accident

Materials Handling

Cupola

Refractory Material

Charging

Tapping

Crucible Furnace

Flues

Firebox

Overexertion

MATERIALS: Manual material, lesson plans, study questions and answers

METHODS: Follow manual material and divide discussion into the four main topic areas: Materials Handling, Machine Hazards, Furnace and Oven Operations, and Housekeeping.

Break apprentices into small groups to discuss study questions.

Review questions and answers with entire class.

STUDY QUESTIONS--Chapter 5, Safety Hazards

A. Multiple Choice

1. The most common injury reported for foundry workers is:
 - a. cuts
 - b. crushing injuries
 - c. burns
 - d. back injuries
2. To prevent falls, stairways must:
 - a. be covered
 - b. have roll-bars
 - c. have approved railings
 - d. be properly labeled
3. Fork lifts should:
 - a. be operated only by trained personnel
 - b. have horns and back-up signals
 - c. have lift capacities marked
 - d. all of the above
4. Forklifts, pay loaders and front-end loaders emit a colorless, odorless gas which may dull reflexes. It is:
 - a. carbon monoxide
 - b. carbon dioxide
 - c. sulfur dioxide
 - d. hydrogen sulfide
5. Overhead cranes should:
 - a. have lift capacities marked
 - b. have warning signals
 - c. never be overloaded
 - d. all of the above
6. The best protection against being caught in a mold or core blower is:
 - a. a muffler
 - b. a red light that flashes when the machine is on
 - c. two-handed operating controls
 - d. none of the above

7. To eliminate explosions in furnaces:

- a. break open all scrap materials to eliminate moisture
- b. spray metal with an extinguishing material
- c. fill scrap with refractory material

B. Short Answers and Fill in the Blanks

1. Two ways to eliminate back injuries are:

(i) _____

(ii) _____

2. Conveyor systems should be _____ on all sides.

3. To insure that machines won't be operated while they are being repaired, employers should establish a _____ procedure.

4. Two ways to eliminate accidents during charging of a cupola are:

(i) _____

(ii) _____

5. One method to eliminate accidents associated with tapping is:

6. Standard procedures for opening the cupola bottom should include:

(i) _____

(ii) _____

(iii) _____

(iv) _____

7. Emergency procedures for opening the cupola should include:

(i) _____

(ii) _____

(iii) _____

(iv) _____

8. Two hazards associated with entering cupolas for repair are:
- (i) _____
 - (ii) _____
9. Standard procedures for repairing cupolas can eliminate the above hazards. Standard entry and working procedures should include:
- (i) _____
 - (ii) _____
 - (iii) _____
 - (iv) _____
10. One hazard associated with crucible furnaces is:
- _____
11. This hazard can be eliminated by:
- _____
12. Flash back from fire boxes in core and mold drying ovens can be eliminated by:
- _____
13. To reduce levels of dust, gas, and smoke around ovens,
- _____ should be installed.
14. Burns, tripping, slipping, and falls are frequently the result of poor housekeeping. List one way to eliminate each of these:
- (i) Burns _____
 - (ii) Tripping _____
 - (iii) Slipping _____
 - (iv) Falls _____

LESSON PLAN--Chapter 6

TOPIC: Hazard Identification

OBJECTIVES: each apprentice should know

1. The three classifications of hazards--obvious, questionable, and hidden--and one example of each found in the foundry
2. At least 10 possible foundry hazards
3. One symptom of health problems affecting each of the following; skin, ears, eyes, nose, throat, lungs, nervous system

KEY TERMS: (Write key terms and definitions on blackboard before beginning lecture.),

Obvious

Questionable

Hidden

MATERIALS: Manual material, lesson plan, slides, 7 Steps to Hazard Identification (optional)

METHODS: The previous sections of the manual have focused on potential hazards in foundries. This section's main purpose is to help apprentices identify actual hazards in their own workplaces. Therefore the discussion method is suggested.

Encourage apprentices to take notes and make lists of hazards. These notes can be especially useful for later discussing Chapter 10--Documentation. (You might find the LOHP workbook 7 Steps to Hazard Identification useful.)

To discuss the material; break it down as follows:

1. Go through the three types of hazards--Obvious, Questionable, Hidden. Ask apprentices for examples of each. Put their examples on the blackboard.

2. Go through the seven questions in Chapter 6 of the manual.
As you discuss each one, ask apprentices for examples. Put their examples on the blackboard.
3. Use the categories found in Chapter 6 to discuss what hazards are actually present in their workplaces.
4. Finally, go through the symptoms listed in Chapter 6. Discuss the various substances that can cause these symptoms. Ask apprentices if they have ever experienced these symptoms.

LESSON PLAN--Chapter 7

TOPIC: Medical Screening

OBJECTIVES: each apprentice should know

1. The three major parts of a medical examination, and how a job-related medical exam differs
2. The difference between a complete and specific examination
3. Four things to consider when evaluating a laboratory screening program
4. One example of each of the following laboratory tests:
blood test, cytology (cancer) test, urine test
5. What a pulmonary function test (spirogram) is, and what it is used for

KEY TERMS: (Write key terms and definitions on blackboard before beginning lecture.)

Medical history

Physical examination

Specific physical

Complete physical

Occupational history

Symptom

Laboratory tests

Laboratory screening program

Blood test

X-rays

Lung function test

Cytology test

Urine test

Electrocardiogram (EKG) test

MATERIALS: Manual materials, lesson plans, and study questions and answers

METHODS: Use lecture method to go through the manual material. Discuss with apprentices their experiences with physical examinations when they thought they had a work-related illness. Break into small groups to answer the study questions. Discuss the answers with the entire group.

STUDY QUESTIONS--Chapter 7, Medical Screening

1. Medical examinations consist of a physical examination and
 - a. psychiatric interview
 - b. medical history
 - c. laboratory or x-ray tests
 - d. b and c
2. Complete examinations look at:
 - a. only the part of the body affected
 - b. the heart and lungs
 - c. the eyes
 - d. all parts of the body
3. What are two things to consider when evaluating laboratory tests you may have?
 - (i) _____
 - (ii) _____
4. Give an example of a blood test _____
5. Give an example of a cytology test _____
6. Give one type of urine test _____
7. Briefly explain what a lung function test is, and why it might be used: _____

LESSON PLAN--Chapter 8

TOPIC: First Aid

OBJECTIVES: each apprentice should know

1. What first aid is
2. Basic principles for immediate care of: cuts, shock, broken bones, eye injuries, poisoning, burns, and electrocution
3. How to give artificial respiration and heart resuscitation

KEY TERMS: (Write key terms and definitions on blackboard before beginning lecture.)

First Aid

Artificial Respiration

Cardiac (Heart) Resuscitation

Shock

Fracture

Amputation

Burns (first, second and third degree)

Electrocution

MATERIALS: Manual material, lesson plan, study questions and answers,
Red Cross First Aid Manual, demonstration.

METHODS: This chapter covers some basic principles for emergency care of accident victims. It is not a course in giving first aid. The

Red Cross first aid course is suggested as an appropriate sequel to this introduction.

Discuss each section in the chapter. You may want to take several sessions to cover the material. Demonstrate basic principles, or have apprentices do so. Discuss with apprentices what they would do in case of potential workplace accidents. Use examples from the accident-producing hazards discussed in Chapter 5--Safety Hazards and Chapter 6--Hazard Identification.

Break apprentices in small groups to answer the study questions.

Discuss answers with the entire group.

STUDY QUESTIONS-- Chapter 8, First Aid

1. Briefly explain what first aid is: _____

2. Briefly explain basic principles for emergency care of:
 - (i) cuts _____

 - (ii) shock _____

 - (iii) broken bones _____

 - (iv) eye injuries _____

 - (v) poisoning _____

 - (vi) burns _____

 - (vii) electrocution _____

3. Describe briefly how you would give artificial respiration: _____

4. What do you do in case of suspected back, neck or head injury if victim has also stopped breathing? _____

LESSON PLAN--Chapter 9

TOPIC: Occupational Safety and Health Legislation

OBJECTIVES: each apprentice should know

1. What the OSH Act is; who is covered by the Act; the main agencies responsible for carrying out the provisions of the Act.
2. Employee rights and responsibilities
3. How to file a complaint
4. The methods used for an inspection; what should happen as a result of the inspection (citation posting, appeal rights, etc.)
5. What a CASPA is; how to file one
6. What is considered discrimination; how to file a discrimination complaint

KEY TERMS: (Write key terms and definitions on blackboard before beginning lecture.)

OSHA

NIOSH

CASPA

Citation

Penalty

Compliance Officer (Inspector)

Discrimination Complaint

MATERIALS: Manual material, lesson plan, study questions and answers.

METHODS: Review manual material, stressing employee rights and responsibilities.
Break class into small groups to discuss study questions. Review
questions and answers with entire group.

STUDY QUESTIONS--Chapter 9

1. The Federal Agency responsible for carrying out provisions of the 1970 safety and health act is:
 - a. DOT
 - b. PHS
 - c. DIS
 - d. OSHA
2. The department set up under the 1970 law to conduct research and recommend standards is:
 - a. NIOSH
 - b. ERDA
 - c. EPA
 - d. CASPA
3. The Occupational Safety and Health Act does not provide coverage for:
 - a. public employees
 - b. private employees
 - c. employees in small businesses
 - d. all of the above
4. The purpose of the Occupational Safety and Health Act is to protect:
 - a. employers
 - b. employees in dangerous occupations only
 - c. property
 - d. working men and women
5. Complaints can be filed:
 - a. on a complaint form
 - b. in a letter
 - c. by phone
 - d. all of the above
6. If a complaint is filed there must be an inspection or the employee filing the complaint must be notified as to why there will be no inspection within:
 - a. 9 days
 - b. 6 days
 - c. 3 days

7. If there is not authorized representative of employees during an inspection, the compliance officer must:
 - a. refuse to conduct the inspection
 - b. have the employer appoint an employee representative
 - c. talk to a reasonable number of employees
8. If inspectors discover hazardous situations that may immediately cause death or serious physical harm, they must:
 - a. give the employer a citation on the spot
 - b. ask an employee to correct the situation
 - c. fine the employer
 - d. post a notice of imminent danger
9. Citations resulting from an inspection must be posted:
 - a. at or near the violation
 - b. prominently
 - c. for a minimum of two days
 - d. all of the above
10. If an employee is dissatisfied with the way a state is performing its responsibilities under a state health and safety law, he or she should file a:
 - a. CASPA
 - b. worker's compensation claim
 - c. complaint with the Department of Health
 - d. OSHAC
11. If workers are demoted, suspended, threatened with discharge, or fired for filing a complaint, they should:
 - a. file an application for adjudication of claim
 - b. file a worker's compensation claim
 - c. file a discrimination complaint
12. OSHA standards are found in:
 - a. The Reader's Digest
 - b. The Federal Register
 - c. The Law Digest

LESSON PLAN--Chapter 10

TOPIC: Documentation

OBJECTIVES: each apprentice should know

1. Two reasons why keeping a health and safety record is important
2. The five major areas where documentation is useful and necessary
3. At least two of the areas that should be documented in personal health and safety records
4. Basic information necessary for filing an OSHA complaint
5. Three ways health and safety records can be used.

KEY TERMS: (Write key terms and definitions on blackboard before beginning lecture.)

Pre-employment physical

Periodic physical

Personal health and safety records

Workplace monitoring

Safety hazard

Health hazard

OSHA complaint

Discrimination complaint

Worker's Compensation

MATERIAL: Manual material, lesson plan

METHODS: Discuss the material with the entire class. Focus on how they

might use personal health and safety records, and what these records should include. Tie into discussion of Chapter 6--Hazard Identification.

LESSON PLAN--Appendix C *

TOPIC: Worker's Compensation

OBJECTIVES: each apprentice should know

1. What an industrial injury is--the three possibilities
2. When an injury is work-related
3. Who is covered by worker's compensation
4. The compensation benefits
5. What permanent and temporary disability payments are,
and under what conditions they are paid and for how long
6. When to file a claim
7. What to do if dissatisfied with the company doctor or the
benefits received

KEY TERMS: (Write key terms and definitions on blackboard before beginning session.)

Worker's compensation

Industrial injury

Permanent disability

Total disability

Temporary benefits

Permanent benefits

Compromise and Release

Worker's Compensation Appeals Board

Application for Adjudication of Claim

* This material was not prepared under the contract with OSHA, DOL.

MATERIAL: Manual material, lesson plan, study questions and answers

METHODS: Go through manual material. Discuss study questions with entire class.

STUDY QUESTIONS: Appendix C, Worker's Compensation

1. An industrial injury is any injury or disease:
 - a. caused by working or working conditions
 - b. aggravated by work or working conditions
 - c. both a and b
 - d. none of the above
2. An injury may be work-related if:
 - a. it arises while worker was performing a work-related service or function
 - b. the employment is a contributing factor
 - c. worker was going to or from work
 - d. all of the above
3. Worker's Compensation does not cover:
 - a. apprentices
 - b. public employees
 - c. minors
 - d. volunteer workers
4. Compensation benefits include medical care to cure the injury, and:
 - a. rehabilitation services
 - b. cash payments for lost wages
 - c. permanent disability payments
 - d. all of the above
5. Temporary disability payments cannot be made for more than:
 - a. 120 weeks
 - b. 150 weeks
 - c. 200 weeks
 - d. 240 weeks
6. The maximum temporary disability payment is:
 - a. \$75 per week
 - b. \$85 per week
 - c. \$100 per week
 - d. \$119 per week
7. Unless an injury has caused 100 percent disability payments can last no more than:
 - a. 150 weeks
 - b. 200 1/2 weeks
 - c. 450 weeks
 - d. 621 1/4 weeks

8. Normally, death benefits for totally dependent survivors are:
 - a. \$20,000
 - b. \$30,000
 - c. \$40,000
 - d. \$50,000
9. You should file a claim with the Workmen's Compensation Appeals Board:
 - a. as soon as you sustain an injury or think you have a disease
 - b. as soon as the company says you have a disease
 - c. neither a or b
10. You can choose your own doctor within how many days after reporting a disease or injury?
 - a. 15 days
 - b. 20 days
 - c. 25 days
 - d. 30 days
11. You should file an Application for Adjudication of Claim if:
 - a. you are dissatisfied with the company doctor
 - b. you are dissatisfied with benefits received
 - c. a and b
 - d. none of the above.

Answers to Study Questions

Chapter 3 Chapter 4 Chapter 5

- | | | |
|-------|-------|-------------------------------|
| 1. d | (A) | (A) |
| 2. d | 1. d | 1. d |
| 3. c | 2. b | 2. c |
| 4. a | 3. d | 3. d |
| 5. b | 4. a | 4. a |
| 6. c | 5. b | 5. d |
| 7. e | 6. c | 6. c |
| 8. d | 7. d | 7. a |
| 9. a | 8. d | |
| 10. d | 9. a | (B) |
| 11. a | 10. c | 2. guarded |
| 12. d | 11. c | 3. Lock-out or tag-out |
| 13. d | | 13. Local exhaust ventilation |
| 14. b | | |
| 15. d | (B) | |
| 16. c | 1. a | <u>Chapter 9</u> |
| 17. a | 2. d | |
| 18. c | 3. d | 1. d |
| 19. d | 4. d | 2. a |
| 20. d | 5. a | 3. a |
| 21. b | 6. d | 4. d |
| | 7. b | 5. d |
| | 8. d | 6. c |
| | 9. d | 7. c |
| | | 8. d |
| | | 9. d |
| | | 10. a |
| | | 11. c |
| | | 12. b |

Appendix C

1. c
2. d
3. d
4. d
5. d
6. d
7. c
8. d
9. a
10. d
11. b
12. b

Chapter 7

1. d
2. d