

# ***Cleaning Chemicals***

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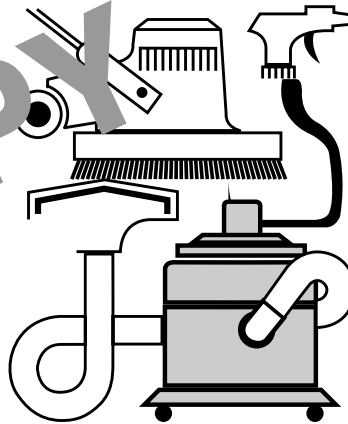
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**CLEANING CHEMICALS**

**Lesson One**

**Using Chemicals  
Safely**

PREVIEW  
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45101

**TPC Training Systems**

**Lesson****1****Using Chemicals Safely****TOPICS**

**The OSHA Hazard Communication Standard**  
**What Is an MSDS?**  
**What Is a Chemical Hazard?**

**Exposure Routes**  
**Controlling Chemical Hazards**  
**Detecting Exposure Hazards**

**OBJECTIVES**

**After studying this Lesson, you should be able to...**

- Identify the goals of the *Hazard Communication* Standard and the agency responsible for writing and enforcing the standard.
- Explain the purpose and basic content of an MSDS.
- Give examples of the health hazard information contained in MSDSs and how it is used.
- Give examples of the physical hazard information contained in MSDSs and how it is used.
- Describe typical MSDS instructions on special precautions and procedures.
- Define *chemical hazard* and name the two categories into which they are divided.
- Name and describe the six kinds of health hazards.
- Name the three basic routes of health hazard exposure.
- Discuss common methods of controlling chemical hazards.
- Explain how to detect exposure hazards and symptoms.

**KEY TECHNICAL TERMS**

**Occupational Safety and Health Administration (OSHA)** 1.01 government agency that works to minimize workplace hazards

**Hazardous chemicals** 1.02 chemicals that can cause health problems or dangerous situations

**Material Safety Data Sheet (MSDS)** 1.04 document containing information about the properties, hazards, and control of a hazardous chemical

**Physical hazard** 1.25 chemical that can cause explosions, fires, or violent chemical reactions

**Health hazard** 1.26 chemical that can make you sick or hurt you if you inhale, swallow, or touch it

**Corrosive** 1.28 chemical that destroys substances, including human tissue

**Sensitizer** 1.30 chemical that causes an allergic reaction with repeated exposure

If you work with hazardous chemicals, you have the right to be informed about the hazards they present. The Occupational Safety and Health Administration (OSHA) spelled out these rights in its Hazard Communication Standard. This standard was written because knowing about chemical hazards can reduce the risk of illness and injury.

In this Lesson, you will read about how this standard can help you protect yourself and others from the hazardous chemicals you might work with. The Lesson will tell you about the information you can find on a Material Safety Data Sheet (MSDS). This Lesson will also help you understand the hazard information available to you. You will study two kinds of chemical hazards in this Lesson—physical hazards and health hazards. The Lesson describes ways in which you can be exposed to chemical hazards, methods for controlling exposure, and clues that can alert you to exposure.

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## The OSHA Hazard Communication Standard

1.01 You have a right to work in safe surroundings under safe conditions. To protect this right, the United States government passed the Occupational Safety and Health Act in 1970. This act established the *Occupational Safety and Health Administration* (OSHA) as a government agency. OSHA writes and enforces standards that minimize hazards in the workplace.

1.02 In 1983, OSHA enacted the *Hazard Communication* standard. This standard defines the rights of employees to know about the hazardous chemicals they use in their jobs. *Hazardous chemicals* are those chemicals that can cause health problems, fires, explosions, or other dangerous situations.

1.03 The main goal of the standard is to reduce illness and injury caused by chemicals in the workplace. The risk of illness and injury is greater when people do not know what a particular chemical is or what effects it can have. Another goal of the standard is to make sure that this information is available to the people who work with these chemicals.

1.04 The standard requires chemical manufacturers and importers to identify and evaluate the hazards of all chemicals. This information is passed along to employers in the form of a *Material Safety Data Sheet* (MSDS). Your employer must make these MSDSs available to you.

1.05 The standard also requires your employer to list all hazardous chemicals in the workplace and make sure that all containers of hazardous chemicals are clearly labeled. This labeling is required so that you can identify the hazardous chemical and learn about the hazards presented by the chemical.

1.06 Figure 1-1 on the following page shows a sample warning label. The name of the chemical, which is the same one that is on the MSDS, is located in the top left corner. Several parts of the label are used to show what kinds of hazards are involved. The label can also tell how the chemical can enter your body and what kind of protective equipment you should use when working with the chemical.

1.07 According to the standard, containers holding chemicals that will be used right away do not need to be labeled. For example, if you pour chlorinated bleach or a cleaning agent into a bucket, you do not have to label the bucket if you are the only one who handles the container or if the chemical is used only during the shift in which it was poured. However, your employer might require that these containers be labeled as well.

### What Is an MSDS?

1.08 Each Material Safety Data Sheet (MSDS) is a technical bulletin for one chemical. The MSDS describes the composition, characteristics, health hazards, and physical hazards of the chemical. It also gives precautions for safe handling and storage of the chemical and any special procedures required. You can use the information on an MSDS to help protect yourself from chemical hazards.

1.09 According to the *Hazard Communication* standard, you have the right to see the information on your company's MSDSs. Your employer must make sure that an MSDS is available for each hazardous chemical used or produced in your workplace.

1.10 MSDSs do not all look the same. For example, the sections might have different titles or might be

Fig. 1-1. Sample warning label

IMPORTANT! READ MATERIAL SAFETY DATA SHEET!

SUBSTANCE IDENTITY (Same as shown on MSDS)		HEALTH <input type="checkbox"/>
APPROPRIATE HAZARD WARNINGS		FLAMMABILITY <input type="checkbox"/>
<b>HEALTH HAZARDS</b> <input type="checkbox"/> TOXIC <input type="checkbox"/> CORROSIVE <input type="checkbox"/> HIGHLY TOXIC <input type="checkbox"/> SENSITIZER <input type="checkbox"/> REPRODUCTIVE TOXIN <input type="checkbox"/> CARCINOGEN <input type="checkbox"/> IRRITANT		REACTIVITY <input type="checkbox"/>
<b>(Immediate &amp; Delayed Target Organ Effects)</b> <input type="checkbox"/> HEPATOTOXINS: LIVER DAMAGE— JAUNDICE, LIVER ENLARGEMENT <input type="checkbox"/> NEPHROTOXINS: KIDNEY DAMAGE— EDEMA, PROTEINURIA <input type="checkbox"/> NEUROTOXINS: NERVOUS SYSTEM DAMAGE—NARCOSIS, BEHAVIORAL CHANGES, DECREASE IN MOTOR FUNCTIONS <input type="checkbox"/> HEMATOPOIETICS: BLOOD DAMAGE— CHANOSIS, UNCONSCIOUSNESS <input type="checkbox"/> PULMONARY DYSFUNCTIONS: LUNG DAMAGE—SHORTNESS OF BREATH, CHEST TIGHTNESS, COUGH <input type="checkbox"/> REPRODUCTIVE TOXINS: BIRTH DEFECTS, STERILITY		PERSONAL PROTECTION <input type="checkbox"/> <small>HMSDP</small> RATINGS: 4-EXTREME HAZARD, 3-MODERATE, 2-SLIGHT AND 1-MINOR HAZARD
<b>ROUTES OF ENTRY</b> <input type="checkbox"/> INGESTION <input type="checkbox"/> INHALATION <input type="checkbox"/> SKIN ABSORPTION <input type="checkbox"/> SKIN OR EYE CONTACT		
<b>PHYSICAL HAZARDS</b> <input type="checkbox"/> COMBUSTIBLE LIQUID <input type="checkbox"/> WATER REACTIVE <input type="checkbox"/> EXPLOSIVE <input type="checkbox"/> COMPRESSED GAS <input type="checkbox"/> UNSTABLE (REACTIVE) <input type="checkbox"/> FLAMMABLE LIQUID/SOLID <input type="checkbox"/> ORGANIC PEROXIDE <input type="checkbox"/> OXIDIZER <input type="checkbox"/> PYROPHORIC <input type="checkbox"/> FLAMMABLE SOLIDS		
COMPANY NAME _____ ADDRESS _____ CITY, STATE _____		
NC-116 CA Printed by LABELMASTER, INC. AMERICAN LABELMARK CO., CHICAGO, IL 60646		

arranged differently. Some MSDSs might be longer than others, but all must provide the information required by OSHA.

**1.11 Chemical identification.** The first section of an MSDS contains the name, address, and emergency telephone number of the preparer of the MSDS. This is usually the manufacturer or importer of the chemical. The first section of the MSDS also identifies the chemical as it is named on the container label and on the workplace list of hazardous chemicals.

**1.12 Physical data.** The PHYSICAL DATA section of a typical MSDS lists the important characteristics of the hazardous chemical. Much of this information can help you detect chemical hazards and protect yourself.

**1.13 Health hazard information.** The chemical named on an MSDS is considered a health hazard if there is any specific information listed in this section.

The HEALTH HAZARD DATA section answers questions like the following:

- What are the exposure limits for a specific chemical?
- What are the effects of overexposure (unsafe exposure)?
- What are the correct first-aid procedures?

**1.14** Exposure limits for health hazards are intended to protect people from unsafe exposure levels. Exposure limits state the quantity of a chemical that can be allowed safely in a given volume of air. In general, a chemical with a higher exposure limit is less hazardous than a chemical with a lower exposure limit.

**1.15** Although observing exposure limits helps protect people from unsafe exposure levels, overexposure to health hazards sometimes still occurs.

Overexposure to a health hazard can cause medical symptoms. Headaches, coughing, difficulty in breathing, skin rashes, lightheadedness, nausea, and fatigue are medical symptoms commonly caused by chemical exposure. The symptoms caused by overexposure to a certain chemical are also listed on its MSDS.

**1.16 Physical hazard information.** MSDSs usually contain two sections that describe physical hazards: the FIRE AND EXPLOSION HAZARDS section and the REACTIVE HAZARDS section. If the MSDS contains specific information in either of these sections, the chemical is a physical hazard.

**1.17** The FIRE AND EXPLOSION HAZARDS section of a typical MSDS describes conditions under which the hazardous chemical burns or explodes. It also includes information on fire-fighting equipment and procedures.

**1.18** The REACTIVE HAZARDS section of an MSDS tells whether a chemical is stable or unstable. An *unstable chemical* can easily undergo changes in chemical structure. These changes can cause a fire, an explosion, or the release of a new chemical hazard into the workplace. If a chemical is unstable, the MSDS will list conditions to avoid. These conditions might include high temperatures, light, or shock.

**1.19** Some chemicals are generally stable but undergo hazardous reactions when brought into contact with *incompatible* chemicals. MSDSs name the chemicals that cause such reactions. When a chemical *decomposes*, it breaks down into simpler chemicals, called *decomposition products*. If the decomposition products are hazardous, the MSDS names the products and the conditions that cause the decomposition.

**1.20** The MSDS will also tell you if a chemical presents a *polymerization* hazard. Under certain conditions, the molecules of some chemicals join to form long chains called *polymers*. Such reactions can be hazardous. The MSDS will tell you what conditions to avoid to prevent polymerization.

**1.21 Special protection information (control measures).** This section of the MSDS specifies the equipment required to protect you from chemical hazards. This section also specifies any special work practices that might be required.

**1.22 Special precautions.** The SPECIAL PRECAUTIONS section of an MSDS identifies precautions for handling and storing the chemical safely. This section sometimes repeats information stated in another part of the form, but might identify precautions not given elsewhere on the MSDS. For example, this section might caution you to keep the container tightly closed whenever the chemical is not in use. This section would also give important instructions on how to clean up spills or leaks to reduce the chance of injury.

### What Is a Chemical Hazard?

**1.23** Even though chemicals are an important part of our world, many of them can be hazardous. Products you use in your home and at work might carry a label that warns you to “Use With Adequate Ventilation.” Breathing this chemical can have harmful effects. Other labels warn you to keep the chemical off of your skin or out of your eyes to keep from hurting them. In some cases you could die if you swallow a chemical. To work safely with chemicals, you must know what the hazards are and how to protect yourself from them.

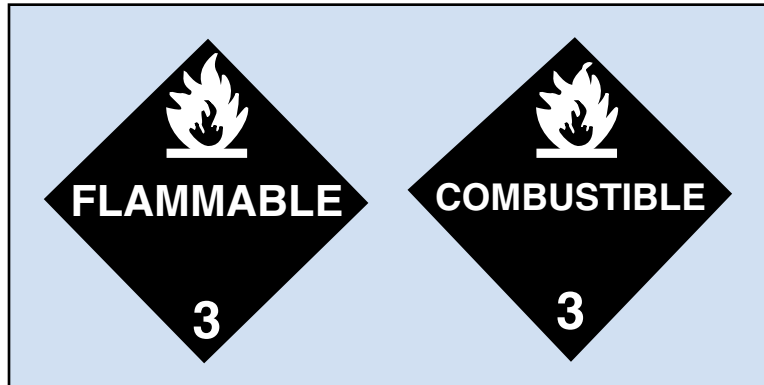
**1.24** A *chemical hazard* is any chemical that can cause illness, injury, or an emergency situation (such as a fire or explosion). Many chemicals used in your job fit this definition in one way or another. Chemical hazards are divided into two kinds—physical hazards and health hazards.

**1.25 Physical hazards.** *Physical hazards* are chemicals that cause explosions, fires, or violent chemical reactions. The only chemicals in this category that you are likely to encounter in your job are those that can cause fires. These can be labeled as either *flammable* or *combustible*. Warning signs for these fire hazards are shown in Fig. 1-2 on the following page. Take note of labels like these if you see them on a chemical container and keep the chemicals away from heat and flame.

**1.26 Health hazards.** *Health hazards* are chemicals that can make you sick or hurt you when you breathe them, swallow them, or touch them. Some of them are covered in the following paragraphs.

**1.27 Irritants** can irritate human tissue on contact. Raw onions and poison ivy, for example, both contain irritants. The irritant in raw onions makes your eyes burn and tear. The irritant in poison ivy causes a skin rash. Similarly, many chemicals irritate the eyes and

Fig. 1-2. Fire hazard warnings



skin. For example, ammonia and chlorine are irritants because they cause blistering or rashes if they contact the skin. Some irritants act inside your body by irritating your lungs and breathing passages. When working with irritants, you might be required to wear gloves, eye protection, and respiratory protection.

1.28 Unlike irritants, *corrosives* can actually destroy or “eat away” certain substances, including human tissue. The warning label for a corrosive chemical is shown in Fig. 1-3. The label cautions you not to let the chemical touch your skin. These chemicals can also hurt the inside of your body. Swallowing a corrosive can damage your mouth and internal organs. Unlike the irritation caused by an irritant, the damage caused by a corrosive will not heal completely, but will scar.

1.29 Many acids are corrosives, which makes them helpful for certain cleaning jobs. To prevent injury when working with acids, use the required personal protective equipment. This equipment might include gloves, goggles, an acid suit, and possibly respiratory protection.

1.30 *Sensitizers* cause an allergic-like response in some people who are exposed repeatedly to a chemical. The first time you are exposed to such a chemical, you might not have any reaction at all, or only a minor one. But repeated exposure can cause a more severe allergic response. If you suspect that you are sensitive to a particular chemical, discuss the problem with your supervisor.

1.31 *Target-organ chemicals* damage specific organs or body systems. These chemicals can enter your body at one point and travel through your body to the target organ. Organs affected can include the lungs, heart, liver, kidneys, and central nervous system. Some

chemicals attack more than one organ or system. Be sure to wear all required protective equipment when working with these chemicals.

1.32 *Reproductive hazards* are chemicals that can cause sterility, fetal death, or birth defects. Chemicals that cause cancer or can cause cancer are called *carcinogens*. Benzene is a carcinogen commonly found in solvents and other commonly used materials. These solvents must be handled carefully. Use them only when necessary, use small amounts, avoid using them in poorly ventilated spaces, and wear protective equipment.

**The Programmed Exercises on the next page will tell you how well you understand the material you have just read. Before starting the exercises, remove the Reveal Key from the back of your book. Read the instructions printed on the Reveal Key. Follow these instructions as you work through the Programmed Exercises.**

Fig. 1-3. Warning label for corrosive chemical



<p>1-1. The federal agency responsible for writing and enforcing the <i>Hazard Communication</i> standard is the _____.</p>	<p>1-1. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)  Ref: 1.01, 1.02</p>
<p>1-2. What is the main goal of the Hazard Communication Standard?</p>	<p>1-2. TO REDUCE ILLNESS AND INJURY CAUSED BY CHEMICALS IN THE WORKPLACE  Ref: 1.03</p>
<p>1-3. Chemical manufacturers pass along chemical hazard information in the form of a(n) _____.</p>	<p>1-3. MATERIAL SAFETY DATA SHEET (MSDS)  Ref: 1.04</p>
<p>1-4. Employers must make sure an MSDS is available for each _____ in the workplace.</p>	<p>1-4. HAZARDOUS CHEMICAL or CHEMICAL HAZARD  Ref: 1.09</p>
<p>1-5. Exposure limits, effects of overexposure, and first-aid procedures are included in the _____ section of an MSDS.</p>	<p>1-5. HEALTH HAZARD DATA  Ref: 1.13</p>
<p>1-6. A chemical that can cause a fire, explosion, or violent chemical reaction is considered a(n) _____ hazard.</p>	<p>1-6. PHYSICAL  Ref: 1.25</p>
<p>1-7. To prevent injury when handling corrosives, you should use _____ equipment.</p>	<p>1-7. PROTECTIVE  Ref: 1.29</p>
<p>1-8. Carcinogens are chemicals than can cause _____.</p>	<p>1-8. CANCER  Ref: 1.32</p>



## Exposure Routes

1.33 You can be exposed to health hazards in three ways:

- swallowing
- skin contact and absorption
- breathing.

1.34 **Swallowing.** Figure 1-4 shows how chemicals can enter your body when you swallow. Swallowing transfers chemicals from the mouth, down the esophagus, and into the stomach. From the stomach, chemicals go to the intestines, where they can be absorbed into the bloodstream and travel through out the body.

1.35 Damage to your body can occur anywhere along this path. Corrosives can burn your mouth, esophagus, and stomach. Other swallowed chemicals do not affect the digestive tract but damage other target organs instead. Certain solvents, for example, damage the liver if swallowed.

1.36 You can swallow chemicals by eating contaminated food. Food or drinks can be contaminated when chemicals in the air settle on them. Chemical dust can settle into your open coffee cup, for example. You can also swallow chemicals if you do not wash them off

your hands before you put something in your mouth (food, cigarettes, chewing gum, or aspirin, for example). Or you might accidentally eat or drink a chemical by mistaking it for a food or beverage.

1.37 To reduce the risk of swallowing chemicals, make sure all containers of chemicals are clearly labeled. Never use chemical containers to hold food or drinks. Keep food, drinks, and cigarettes in closed containers and out of work areas. Wash your hands before touching your mouth or handling anything else you might put in your mouth. Eat and drink only in areas designated for these purposes.

1.38 **Skin contact and absorption.** Although the skin anywhere on your body can be exposed to a chemical hazard, the skin on your hands and arms is most often exposed. When a chemical touches the skin, it can damage the skin itself, be absorbed through the skin, or both, as shown in Fig. 1-5. Surface damage can include rashes, burns, drying, peeling, or cracking.

1.39 Even though the skin acts as a natural barrier to keep some chemicals out of your body, it does not prevent all chemicals from entering. Some chemicals pass through the skin and damage layers of tissue under the skin. Others are absorbed into the bloodstream and travel to other parts of the body where damage occurs.

1.40 Chemicals vary in their ability to be absorbed through the skin. Some solvents are absorbed very easily. Water is not absorbed at all. Easily absorbed chemicals can carry with them other chemicals that would not usually pass through the skin. For example, a solvent might dissolve a chemical dust on your hand. Your skin then absorbs the dust along with the solvent. Because one chemical can increase the absorption of another, a combination of chemicals can be more hazardous than the individual chemicals themselves.

1.41 Damaged skin does not provide as good a barrier as healthy skin. Therefore, if your skin is broken or if you have a rash or other skin condition, get advice from a doctor or your employee health nurse, and ask your supervisor for additional protection.

1.42 Your eyes can also be exposed to chemical hazards. Contact can occur anytime your eyes are open and unprotected by goggles. Because eyes are very sensitive, a chemical that does little or no

**Fig. 1-4. Path of swallowed chemical through the body**

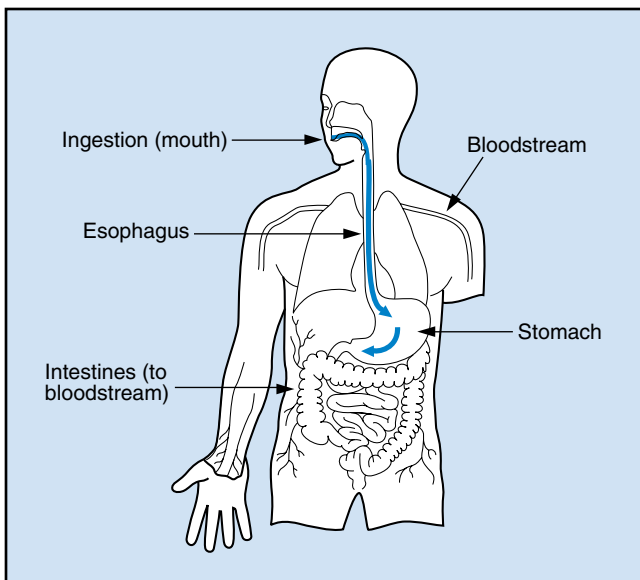
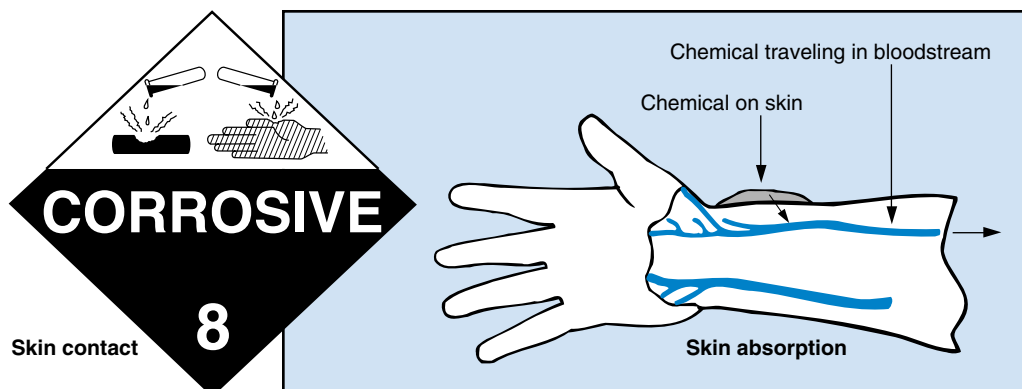


Fig. 1-5. Skin contact and absorption



damage to your skin can severely irritate or damage your eyes.

1.43 **Breathing.** Normally, the act of breathing draws air containing oxygen into your lungs. When airborne hazards contaminate the air you breathe, breathing also draws in the airborne hazards. The chemicals enter your body through your nose and mouth. Once in your lungs, these hazards might collect there, or they might be absorbed into the bloodstream.

1.44 Breathing contaminated air is the most dangerous and common route of exposure to chemical hazards. The danger comes mainly from the ability of the lungs to absorb chemicals in the air. Figure 1-6 shows that a lung contains many branching air passages ending in clusters of spongy, air-filled sacs. Normally, oxygen passes from the air sacs into the blood with each breath. To supply the entire body with oxygen, the lungs contain millions of these air sacs. Thus, the inside surface area of the lungs is very large. Because of this large surface area and the ability of the lungs to absorb chemicals, dangerous amounts of chemicals can be easily absorbed.

1.45 Breathing contaminated air is especially dangerous because exposure often goes unnoticed. Airborne hazards and gases are usually invisible, and you cannot always smell them. For this reason, you can inhale dangerous amounts of a chemical without knowing it. Some chemicals irritate your nasal passages and respiratory system as you inhale them. These chemicals also damage your lungs. Other chemicals are absorbed into the blood through your lungs.

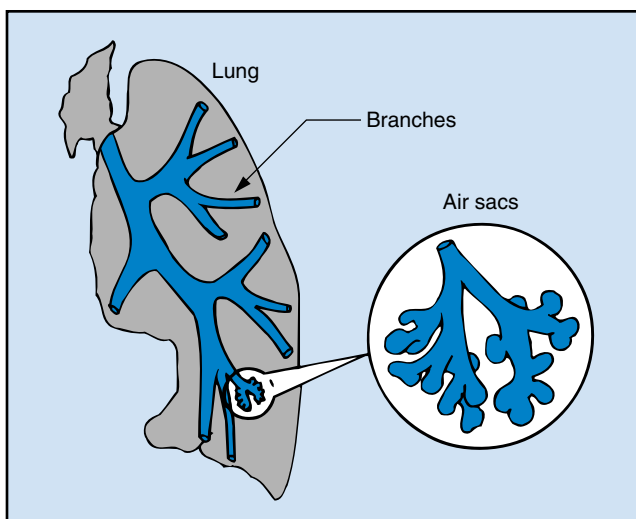
### Controlling Chemical Hazards

1.46 Working safely with chemicals means that you must know not only what the hazards are, but also how to control them. One way of controlling hazards is through *substitution*—replacing the hazardous chemical with one that will still do the job but is less hazardous.

1.47 *Ventilation* is a way of controlling airborne hazards. Ventilation might mean using an exhaust fan in the area. It might also involve mixing contaminated air with clean air in a room or building, then using a fan to draw the mixed air out of the area.

1.48 Substitution and ventilation are ways of making the workplace safer. *Personal protective equipment*

Fig. 1-6. Surface area of the lung



(PPE) protects the worker if the workplace cannot be made safe. PPE puts a barrier between a person and a chemical hazard. Figure 1-7 shows two examples of PPE. The correct equipment to wear depends on the hazard and will vary with the exposure route, the physical form of the hazard, and the degree of hazard. No matter what kind of PPE you wear, make sure it is in good condition. Proper inspection, maintenance, and storage of PPE are essential for your continued safety.

1.49 *Housekeeping* is another way of controlling chemical hazards, one in which you might be directly involved in your job as a custodian. Good housekeeping can remove chemical hazards or prevent them from spreading. For example, using a vacuum cleaner with a high-efficiency filter to clean equipment and floors removes hazardous dust that could otherwise become airborne. Sweeping hazardous dust just spreads it around.

### Detecting Exposure Hazards

1.50 Even though you can do things to reduce the risk of exposure to hazardous chemicals, exposure hazards still exist. Knowing how to detect exposure hazards helps you protect yourself.

1.51 **Sensing chemical hazards.** You can detect some chemical hazards by sight, smell, or taste. Solids and liquids are easy to see, but most airborne chemicals are not. However, you can smell some airborne chemicals that you cannot see. Sometimes breathing

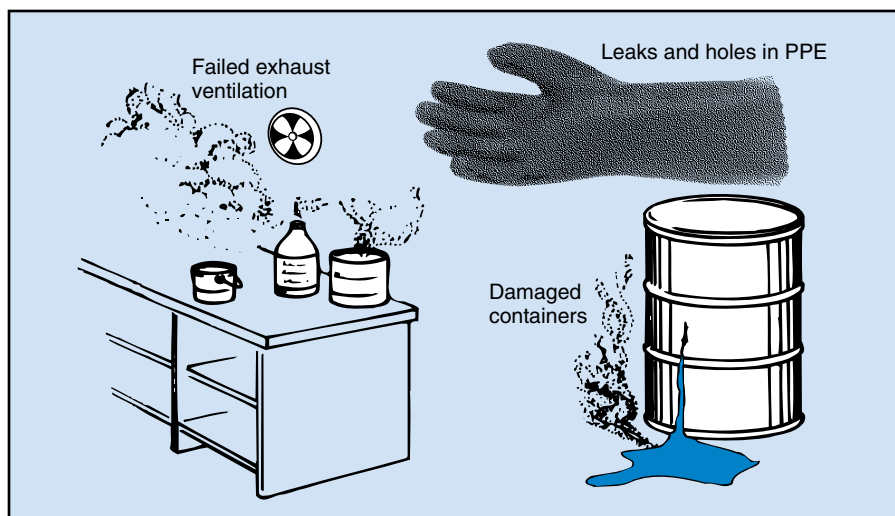
**Fig. 1-7. Personal protective equipment**



contaminated air will leave an odd taste in your mouth. Learn how to detect chemical hazards in your work areas.

1.52 **Spotting equipment failures.** Both protective equipment and chemical containers can fail, as shown in Fig. 1-8. But you can catch failure early and protect yourself from exposure by being alert to the condition of protective equipment and chemical containers. For example, suppose you notice that an exhaust fan is not working as it usually does. Reporting this failure alerts your employer and fellow workers to a possible source of exposure. The condition can then be corrected.

**Fig. 1-8. Equipment failures that cause exposure hazards**



1.53 Early detection of cracked or weakened containers helps correct hazardous situations before anyone is harmed. You should also be alert for punctures in containers of liquids. If you notice a problem with a container, tell your supervisor.

1.54 Make sure you inspect your personal protective equipment before each use. A leak or hole means the equipment will not protect you. A small hole in a glove, for example, can expose your entire hand to a skin contact/absorption hazard. If your equipment is not in good condition, replace or repair it before beginning a job in which it is needed.

1.55 **Recognizing medical symptoms.** Sensing chemical hazards and spotting equipment failures help you stop chemical exposures *before* they produce medical symptoms. Unfortunately, some exposures go undetected. The result might be medical symptoms, such as headaches, nausea, dizziness, or coughing. These symptoms can warn you that exposure has occurred. Sometimes symptoms warn of exposure early enough so that the serious harm that comes from repeated or prolonged exposure can be prevented. Know the symptoms of overexposure to the chemicals you work with and report any of these symptoms you experience.

1.56 How can you tell if a headache or other symptom you get on the job is related to chemical exposure?

The following three conditions suggest that a work-related exposure caused the symptoms:

- A large percentage of your fellow employees experience the same symptoms.
- The symptoms come on suddenly while you are at work.
- The symptoms get worse during the work-week and go away during time off.

To be certain, rely on a doctor to determine whether or not your symptoms are caused by workplace exposure.

1.57 **Identifying accidents and emergencies.** Accidents and emergencies involving chemicals are always potential exposure sources. For example, if a liquid spills, it becomes an uncontrolled hazard. The chemical might come in contact with your skin, or you might breathe its vapors. You can protect yourself from unnecessary exposure by knowing how to clean up chemical spills. MSDSs identify correct chemical spill cleanup procedures. In addition to spills, accidents and emergencies such as fires and explosions can release chemical hazards. MSDSs provide specific information about fighting chemical fires.

## 14 Programmed Exercises

<p>1-9. What are the three ways in which you can be exposed to health hazards?</p>	<p>1-9. SWALLOWING, SKIN CONTACT AND/OR ABSORPTION, BREATHING</p> <p>Ref: 1.33</p>
<p>1-10. You can reduce the risk of exposing yourself to a health hazard through swallowing by eating only in _____.</p>	<p>1-10. DESIGNATED AREAS. Also, be sure to wash your hands before eating.</p> <p>Ref: 1.37</p>
<p>1-11. The skin on your _____ is most often exposed to chemical hazards.</p>	<p>1-11. HANDS AND ARMS</p> <p>Ref: 1.38</p>
<p>1-12. Because they are very sensitive, a chemical that does little damage to your skin can severely damage your _____.</p>	<p>1-12. EYES</p> <p>Ref: 1.42</p>
<p>1-13. The most dangerous and common route of exposure to chemical hazards is _____.</p>	<p>1-13. BREATHING CONTAMINATED AIR</p> <p>Ref: 1.44</p>
<p>1-14. Reducing exposure hazards by replacing a chemical with one that is less hazardous is called _____.</p>	<p>1-14. SUBSTITUTION</p> <p>Ref: 1.46</p>
<p>1-15. Gloves, goggles, and respirators are examples of _____.</p>	<p>1-15. PERSONAL PROTECTIVE EQUIPMENT (PPE)</p> <p>Ref: 1.48, Fig. 1-7</p>
<p>1-16. How often should you inspect your personal protective equipment?</p>	<p>1-16. BEFORE EACH USE</p> <p>Ref: 1.54</p>

Answer the following questions by marking an “X” in the box next to the best answer.

- 1-1. The *Hazard Communication* standard is enforced by the
- a. DOT
  - b. EPA
  - c. NIOSH
  - d. OSHA
- 1-2. The main goal of the *Hazard Communication* standard is to
- a. control the dumping of hazardous chemical wastes
  - b. encourage states to enact laws protecting chemical workers
  - c. prohibit the use of hazardous chemicals in the workplace
  - d. reduce illness and injury caused by chemicals in the workplace
- 1-3. The purpose of an MSDS is to
- a. communicate hazard information
  - b. improve container labels
  - c. make hazard identification unnecessary
  - d. replace state laws
- 1-4. What information would you find in the health hazard data section of an MSDS?
- a. Exposure limits
  - b. Fire and explosion conditions
  - c. Reactivity information
  - d. Storage precautions
- 1-5. A list of chemicals that are physical hazards would include
- a. corrosives
  - b. flammable chemicals
  - c. irritants
  - d. target-organ chemicals
- 1-6. A carcinogen is a chemical that
- a. causes an allergic-like reaction
  - b. causes cancer
  - c. damages specific body systems
  - d. eats away human tissue
- 1-7. When a swallowed chemical reaches your intestines, it is
- a. no longer a hazard
  - b. neutralized by your body
  - c. absorbed into your bloodstream
  - d. a polymerization hazard
- 1-8. The most dangerous and common route of exposure to chemical hazards is
- a. absorption
  - b. breathing
  - c. skin contact
  - d. swallowing
- 1-9. Replacing a hazardous chemical with one that will still do the job but is less hazardous is called
- a. automation
  - b. polymerization
  - c. substitution
  - d. ventilation
- 1-10. How often should PPE be inspected?
- a. Before each use
  - b. Daily
  - c. Monthly
  - d. When your supervisor tells you to

## SUMMARY

The Occupational Safety and Health Administration enacted the Hazard Communication standard in 1983. The standard spells out the right of employees to know about the hazardous chemicals they work with. This knowledge of chemical hazards can reduce chemical-related illness and injury.

OSHA requires all chemical manufacturers and importers to identify and evaluate the hazards of industrial chemicals. They must then provide an MSDS that documents the hazards and ways to control them. Employers who use hazardous chemicals must make sure these MSDSs are available to employees. Employers must label containers of chemicals and list all hazardous chemicals used in the workplace.

The purpose of Material Safety Data Sheets is to communicate hazard information. Your employer must maintain an MSDS for each chemical hazard in the workplace, and these MSDSs must be readily available to you. MSDS information helps you identify a chemical's characteristics. The information also covers health and physical hazards and special precautions and procedures.

Health hazard information helps you recognize the symptoms of overexposure, determine the

correct first-aid procedures, and identify protective equipment required to control the hazard. Physical hazard information helps you prevent fires, explosions, and hazardous reactions. It can also help you fight fires safely. Finally, the MSDS can tell you how to handle and store chemicals safely and how to clean up spills and leaks.

A chemical hazard is any chemical substance that can cause illness, injury, or an emergency situation. Chemical hazards are divided into physical hazards and health hazards. Examples of physical hazards are explosives, flammable and combustible chemicals, and unstable chemicals. Health hazards include irritants, corrosives, sensitizers, target-organ chemicals, reproductive hazards, and carcinogens.

Chemical hazards enter the body through three exposure routes—swallowing, skin contact and/or absorption, and breathing. Controlling chemical hazards can involve substitution, ventilation systems, and personal protective equipment (PPE). Common warning signs of exposure include damaged equipment and PPE; seeing, smelling, or tasting a chemical hazard; and medical symptoms that are directly related to chemical exposure.

## Answers to Self-Check Quiz

- |      |    |   |       |    |   |
|------|----|---|-------|----|---|
| 1-1. | d. | OSHA. Ref: 1.02   | 1-6.  | b. | Causes cancer. Ref: 1.32                  |
| 1-2. | d. | Reduce illness and injury caused by chemicals in the workplace. Ref: 1.03 | 1-7.  | c. | Absorbed into your bloodstream. Ref: 1.34 |
| 1-3. | a. | Communicate hazard information. Ref: 1.04                                 | 1-8.  | b. | Breathing. Ref: 1.45                      |
| 1-4. | a. | Exposure limits. Ref: 1.13  | 1-9.  | c. | Substitution. Ref: 1.46                   |
| 1-5. | b. | Flammable chemicals. Ref: 1.25  | 1-10. | a. | Before each use. Ref: 1.54                |

Contributions from the following sources are appreciated:

Figure 1-1. National Paint and Coatings Association and Labelmaster

Figure 1-7. Siebe North, Inc.