6050.5.W

DEPARTMENT OF DEFENSE FEDERAL HAZARD COMMUNICATION TRAINING PROGRAM

STUDENT'S WORKBOOK

APRIL 1988

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
(FORCE MANAGEMENT AND PERSONNEL)

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ASSISTANT SECRETARY OF DEFENSE

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RCE MANAGEMENT
AND PERSONNEL

FOREWORD

This publication is issued under the authority of, and in accordance with DoD Instruction 6050.5, "Hazardous Material Information System, " January 25, 1978. This publication, "Department of Defense Federal Hazard Communicat ion Training Program, Student 'Workbook, " when used with "Department of Defense Federal Hazard Communication Training Program, Trainer's Guide" and the associated 90-minute videotape provides training resources to help DoD comply with the training requirements of the Occupational Safety and Health Admini strat ion's Hazard Communication Standard (29 C.F. R. 1910. 1200).

The student workbook is your personal reference on the recognition and control of chemical hazards in your work area. It is intended *to* help you understand the potential hazards of the chemicals with which you work. Informat ion in this workbook correlates with the material that you wi ll see in the videotape and supplementary information tinat will be presented by your trainer. This workbook is yours to keep and use during the training session, and afterwards may be used as a reference in your work area. You are encouraged to answer the questions and make notes directly in the workbook. Your trainer will be able to answer your quest ions or refer you to the appropriate sources for additional inf ormat ion.

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Acting

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The Federal government is working to reduce the risk of injury or illness caused by hazardous chemicals in the workplace. Accomplishing this goal requires information and communication. Everyone needs-to know about the hazardous chemicals they work with — whether the material poses a risk to safety or health, and how to minimize or eliminate any such risks.

The Hazard Communication Standard was issued by the Occupational Safety and Health Administration (OSHA) in 1983 and revised in 1987. Executive Order 12196 of 1980 and 29 CFR Part 1960 provide the authority for implementing this Standard within the Federal sector. The Hazard Communication Standard helps protect your right to work in a safe and healthful environment. It requires that you be:

- informed about hazardous chemicals in your workplace; and
- trained to work safely with these materials.

With respect to Federal civilian employees, this is an excellent opportunity for labor and management to work together in the presentation of the program. A joint effort will assure the success of the program because it involves the participation of everyone.

Working safely with chemical materials is a team effort. This workbook is part of a Federal training program designed to make you a knowledgeable member of the team. Your safety and health, as well as that of your co-workers, depends on your active participation in this program.

Learn about chemical materials, what forms they take, what safety and health risks they present, how they can enter your body and affect your health. Learn to recognize hazards, and learn how to control these hazards. Then, put your learning to work and help make your workplace safer and more healthful for everyone.

Course Overview

This course consists of the following seven lessons:

- Lesson 1: The Federal Hazard Communication Standard

  This lesson introduces you to the Standard issued by OSHA, as it applies to the Federal agencies. Then it identifies the goals of the Hazard Communication Standard and describes each of the actions required.

■ Lesson 2: Chemical Forms and Exposure Hazards

This lesson describes the forms that chemical materials can take. It helps you recognize potential sources of exposure to chemicals in the workplace. It also describes how chemicals can enter your body when exposure occurs.

■ Lesson 3: Types of Physical and Health Hazards

Chemical materials can present hazards, either to your physical safety or to your health. This lesson describes specific types of chemical hazards in each category and helps you understand the risks associated with each type.

❑ Lesson 4: Controlling Chemical Hazards

This lesson introduces you to the ways in which chemical hazards can be controlled. It describes engineering/mechanical controls, types of personal protective equipment, and various administrative/procedural controls. Then it tells you about ways that you can detect uncontrolled chemical hazards in your workplace and what to do about them.

■ Lesson 5: Introduction to MSDSS and MSDS Physical Hazard Information

Material Safety Data Sheets (MSDSs) are required by law to identify chemical materials, describe important physical properties, report known hazards, and identify required controls. This lesson shows you how to use those sections of the MSDS that identify chemical materials, physical properties, physical hazards, ways of controlling physical hazards, and correct procedures to follow if a fire, spill, or leak occurs.

■ Lesson 6: MSDS Health Hazard Information

This lesson shows you how to use information on the MSDS that describes health hazards and protective equipment required to guard against exposure to these health hazards. It also covers special precautions given on the MSDS, such as correct procedures for handling and storing the material safely.

■ Lesson 7: Using Labels and The Hazardous Chemical Inventory

The Hazard Communication Standard requires every workplace to use warning labels and maintain a Hazardous Chemical Inventory. This lesson identifies the information that these resources must contain and shows you how to use these documents to help protect yourself from chemical hazards.

Course Materials

Each lesson contains two types of resources: videotape and workbook. The videotape covers the lesson content. For each-lesson, this workbook contains the following

- ***LESSON INTRODUCTION*** — highlights what the lesson covers
- ***LEARNING OBJECTIVES*** — presents a checklist of statements describing what you should be able to do when you have completed the lesson
- ***LEARNING RESOURCES*** — identities the specific videotape viewing segments and workbook exercises available to help you achieve the stated learning objectives
- ***DIRECTIONS FOR PROCEEDING*** — *gives* step-by-step instructions for taking the lesson as a self-study
- ***VIDEOTAPE INTRODUCTIONS*** — highlight what to look for when watching each videotape viewing segment; provide space to take notes
- *APPLICATION EXERCISES* — provide the opportunity to apply your videotape learning and to discover additional information
- *LESSON SUMMARY* — summarizes information presented in the lesson and serves as a job aide for quick review of key points

The Appendices in this workbook contain examples of the three documents covered in Lessons 5, 6, and 7: MSDSS (Appendix A), Warning Labels (Appendix B), and the Hazardous Chemical Inventory (Appendix C). Application Exercises in these three lessons provide practice using these documents. In addition, Appendix D contains a glossary of key technical terms introduced throughout the course. Refer to this glossary whenever you need to check the definition of a technical term.

How to Take This Course

If you are taking this course with an instructor in a classroom environment, the instructor will tell you how to proceed and guide you through the course.

If you are taking this course as a self-study, complete the lessons in numerical order. Begin each lesson by reading the introduction, learning objectives, and list of learning resources for the lesson in this workbook. Then follow the "Directions for Proceeding," which tell you the order in which you should complete the learning resources. If you wish, you may check off each learning resource as you complete it.

When taking this course, remember that the workbook application exercises are *NOT* intended as tests, Instead, view them as resources to help you identify key information and learn how to put this information to work. Answer all the questions as best you can, and then follow the instructions given for checking your answers, Make sure to read the additional information given with the answers. This will help you get the most out of this course.

If you wish, you can go back and review any videotape segment before proceeding to the next learning resource. Do this when you feel that you missed some important information, or might understand it better if you saw it again. For example, you might want to review a videotape segment if you have difficulty completing an associated application exercise, or if you find that you answered a number of the questions incorrectly.

Before proceeding from one lesson to the next, go back and review the stated learning objectives. Check off those you think you can do. If some remain unchecked, review the appropriate learning resource(s), or ask your course administrator for assistance.

LESSON 1: THE FEDERAL HAZARD COMMUNICATION STANDARD

INTRODUCTION

You have a right to work in a safe and healthful environment that is free from recognized chemical hazards. In 1983, the Occupational Safety and Health Administration (OSHA) issued the Hazard Communication Standard for manufacturing operations to help protect this right for you, In 1987, OSHA revised this standard and expanded the scope of the standard to include *ALL* workplaces where personnel are occupationally exposed to hazardous chemicals. This first lesson teaches you about the goals of this Standard and the actions it requires, You'll see how the Standard helps make sure that everyone —

- understands the hazards of chemicals they work with; and
- learns how to minimize these hazards.

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following

Identify the agency responsible for the Hazard Communication Standard and describe that agency's general responsibilities.

List the goals of the Hazard Communication Standard.

List the actions that the Hazard Communication Standard requires of chemical manufacturers, importers, management and employers.

LEARNING RESOURCES

- Videotape Segment 1: The Federal Hazard Communication Training Program
- Workbook Application Exercise 1: Finding Out About Chemical Hazards
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

1) Read the workbook introduction to Videotape Segment 1.

2) Watch Videotape Segment 1.

3) Complete Application Exercise 1 in this Workbook.

4) Read the Lesson 1 Summary in this Workbook

INTRODUCTION TO VIDEOTAPE SEGMENT 1:
The Federal Hazard Communication Training Program

This videotape explains how the Occupational Safety and Health programs of the Federal government work in your behalf, The videotape helps you learn how the Hazard Communication Standard helps protect your right to work in a safe and healthful environment.

As you watch the tape, look for the goals of the Hazard Communication Standard, Also pay careful attention to the actions required of chemical manufacturers, importers, distributors, and employers, in your case, the Federal government.

If you wish, *you may* take notes on the following page as you watch. "

Now, watch Videotape Segment L

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SAMPLE APPLICATION EXERCISE

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question. Remember, some questions may have more than one answer.

Here is a sample question:

Which of the following documents are required by the Hazard Communication Standard?

A) Hazard Warning Labels

B) Material Safety Data Sheets

C) Hazardous Chemical Inventory

D) Chemical textbooks for training you

Fold the right side of the page over to check the answer. Then turn the page and begin Application Exercise 1.

SAMPLE APPLICATION EXERCISE

Answer	Additional Information
A B C	The Hazard Communication Standard requires three documents for your everyday use: Hazard Warning Labels, Material Safety Data Sheets, and the Hazardous Chemical Inventory. The Standard also requires each facility to develop a local written program about how it will implement Hazard Communication. While your training is required under the Standard, there is no requirement for the use of textbooks.

APPLICATION EXERCISE 1: Finding Out About Chemical Hazards

*Directions: Check or **circle** your answer(s) to each question, or write your answer in the **blank provided**. When you complete the exercise, **fold** over the right side of the page to check your answers. Then turn the page to get more information about each question. Remember, some questions may have more than one answer.*

1) Which documents must chemical manufacturers and importers obtain or prepare?

A) MSDS (Material Safety Data Sheet)

B) Label

C) Hazardous Chemical Inventory

2) Which action(s) does the Hazard Communication Standard require *EVERY* employer to take?

A) Prepare MSDSS

B) Make MSDSs available on every shift

C) Maintain an inventory of hazardous chemicals

D) Make sure that containers of hazardous chemicals are labeled

3) What must the written Hazard Communication Program contain?

A) Copies of all MSDSS

B) Copies of all warning labels

C) Complete Hazardous Chemical Inventory

D) Plans for informing and training employees

APPLICATION EXERCISE 1: Finding Out About Chemical Hazards

Answer	Additional Information
1) A B	Chemical manufacturers and importers must obtain or prepare an MSDS for every hazardous chemical material they sell. The MSDS identifies the hazards of the chemical and ways to control those hazards. This document must be provided to anyone who purchases the material. Employers must have an MSDS for every hazardous chemical they use. Manufacturers, importers, or distributors must ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged, or marked with the identity of the hazardous chemical they distribute. This label must identify the material, all appropriate hazard warnings, and the name and address of the responsible party. The Hazardous Chemical Inventory is the responsibility of the end user.
2) B C D	The Hazard Communication Standard requires every employer to: • Make MSDSS readily accessible to employees on all shifts • Maintain an up-to-date Hazardous Chemical Inventory • Make sure that containers of chemical hazards in the workplace are labeled • Inform and train employees • Write a Hazard Communication Program
3) C D	The local written hazard communication program must contain at least the following • Complete Hazardous Chemical Inventory • Plans for labeling and providing MSDSS (but not the actual labels or MSDSs) • Plans for informing and training employees

4) When must you be trained about chemical hazards in your workplace?

A) At the time of your first job assignment

B) Before a new hazard is introduced into your work area

c) When you change job assignments

5) What must your training on hazardous chemicals cover?

A) The Hazard Communication Standard itself

B) Methods used to detect the presence or release of a hazardous chemical in your workplace

C) How to obtain and use MSDSS

D) How to protect yourself from chemical hazards

Now go back to page 1-7, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. When you have finished, either review Videotape Segment 1 or proceed to the Lesson Summary.

Answer **Additional Information**

4) A B By law, you must be trained at the time of your first job assignment and whenever —

- a new hazard is introduced into your work area, or
- you are assigned to perform a non-routine task.

Simply being assigned to a new job does not require chemical hazard training. Additional training takes place only if you are being introduced to anew chemical hazard.

5) A B C D Your training on hazardous chemicals must cover the following

- The Hazard Communication Standard itself and your rights under this law.
- The labeling system being used at your facility.
- The location and use of MSDSS.
- How to obtain all required written information.
- Where hazards in your work area exist and what those specific hazards are.
- Safe work practices, precautions, and equipment required to protect you.
- Correct procedures for handling emergency situations.
- Methods used to detect the presence or release of a hazardous chemical in your workplace.

LESSON 1 SUMMARY

The Hazard Communication Standard was issued in 1983 and revised in 1987 by the Occupational Safety and Health Administration (OSHA). This Standard strives to achieve the following goals

1. Reduce the incidence of injury and illness caused by hazardous chemicals in the workplace.

2. Identify and evaluate chemical hazards.

3. Establish uniform requirements for communicating information about chemical hazards to both management and workers.

To achieve these goals, the Standard requires certain actions. First, chemical manufacturers and importers must:

1. Conduct hazard determinations to identify the hazards of, and appropriate control measures for the chemicals they produce or import.

2, Label all containers of hazardous chemicals leaving the workplace to communicate the identity of the material, all appropriate hazard warnings, and the name and address of the responsible party.

3. Obtain or prepare an accurate and up-to-date MSDS for each hazardous chemical material sold aud provide a copy to every employer that purchases the chemical.

4. Add new information to the MSDS on the hazards of a chemical, and/or appropriate control measures within three months after becoming aware of such information.

The Standard also requires employers to do the following

. Maintain an MSDS for every hazardous chemical used and make these MSDSS readily available to workers on every shift.

. Make sure that containers of hazardous chemicals are labeled, tagged, or otherwise marked to identify the chemical and warn workers of the hazards it presents.

. Maintain an up-to-date list of all hazardous chemical materials known to be present in the workplace and make this list readily available to workers at all times.

• Inform and train workers.

• Maintain a written local Hazard Communication Program that describes how the organization complies with the above actions and make this written program available to employees upon request.

LESSON 2: CHEMICAL FORMS AND EXPOSURE HAZARDS

INTRODUCTION

Many work processes require the use of hazardous chemicals. Having a safe and healthful work environment means that you must recognize potential chemical hazards and protect yourself from them. In this lesson you will see what forms chemicals take, and how chemicals can enter your body.

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following

Define physical hazards and health hazards.

Identify the forms that chemicals take.

Describe how liquids and solids become airborne.

Identify sources of mists, vapors, dusts, and fumes in the workplace,

List and describe the major routes of exposure for health hazards.

Identify factors that affect the degree of hazard associated with exposure to health hazards.

List the categories of chemicals not included in the Hazard Communication Standard.

LEARNING RESOURCES

- Videotape Segment 2A: Chemical Forms
- Workbook Application Exercise 2A-1: Recognizing Chemical Hazards
- Workbook Application Exercise 2A-2: Identifying Sources of Airborne Hazards
- Videotape Segment 2B: Exposure Routes and Degree of Hazard
- Workbook Application Exercise 2B: Routes of Exposure
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

___ 1) Read the workbook introduction to Videotape Segment 2A.

___ 2) Watch Videotape Segment 2A.

___ 3) Complete Application Exercise 2A-1 in this workbook.

___ 4) Complete Application Exercise 2A-2 in this workbook.

___ 5) Read the workbook introduction to Videotape Segment 2B.

___ 6) Watch Videotape Segment 2B.

___ 7) Complete Application Exercise 2B in this workbook.

___ 8) Read the lesson summary.

INTRODUCTION TO VIDEOTAPE SEGMENT 2A: Chemical Forms

In Lesson 1, you saw that the Hazard Communication Standard helps protect your right to work in a safe and healthful environment. The Standard does this by requiring actions that contribute to the recognition, evaluation, and control of chemical hazards in the workplace. The Standard includes most chemical hazards, but not all. For example, the following are not covered:

- Hazardous wastes regulated by the Environmental Protection Agency (EPA)

  Example: contaminated soils and waste solvents covered under EPA regulations

- Tobacco and tobacco products

  Example: cigarettes

- Wood and wood products

  Example; lumber, paper

- Manufactured articles with a specific shape or design, and an end-use function dependent on that shape or design — provided that such articles do not release or cause exposure to a chemical hazard under normal conditions of use.

  Example: chairs, phonograph records, styrofoam cups

- Food, drugs, and cosmetics intended for personal consumption by employees while in the workplace.

  Example: candy bars, aspirin, lipstick

As you watch this videotape segment, look for the many types of chemical hazards the Standard *DOES* cover.

Learn to distinguish between physical hazards and health hazards. Also notice the forms chemicaIs can take, and the ways that chemical hazards get into the air.

If you wish, you may take notes on the following pages as you watch the tape.

Now, watch Videotape Segment 2A,

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APPLICATION EXERCISE 2A-1: Recognizing Chemical Hazards

Directions: Check or ***circle*** *your answer(s) to each question, or write your answer in the blank provided. When you complete the* ***exercise,*** *fold over the right side of the page to check your answers. Then turn the page to get more* ***information*** *about each question.* ***Remember,*** *there maybe* ***more*** *than one answer.*

1) Which of the following terms identify a *HEALTH* hazard associated with exposure to hazardous chemical-s?

A) Explosives

B) Irritants

C) Flammable gases

D) Gasoline or asphyxiants

2) Which of the following terms describes **a** ***PHYSICAL*** hazard of a hazardous chemical?

A) Compressed gas

B) Water reactive

C) Spontaneously combustible

D) Corrosive

3) The caution label on a can of insect **killer** reads

DO NOT USE NEAR FIRE OR FLAME. HARMFULIF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN.

What type of hazard(s) does this **chemical** present?

A) **Health**

B) Physical

APPLICATION EXERCISE 2A-1: Recognizing Chemical Hazards

Answer	Additional Information
1) B D	*HEALTH HAZARDS can cause illness* or injury when you are exposed to hazardous chemicals by breathing, swallowing, skin contact, or eye contact. Irritants can cause injury to whatever part of your body they contact — e.g., skin, eyes, lungs. Repeated skin contact with igniting explosives or flammable liquids, such as gasoline, can cause skin irritation. Breathing the vapors slows down the central nervous system. Asphyxiants cause suffocation by displacing oxygen in the air.
2) A B C D	Chemicals that are PHYSICAL *HAZARDS can* cause explosions, fires, violent chemical reactions, or other hazardous situations, All compressed gases present a physical hazard because they contain stored energy which can turn the gas cylinder into a powerful rocket. Some substances are water-reactive and create a hazardous chemical reaction when mixed with water (water-reactive). Spontaneously combustible chemicals present a fire hazard. Corrosives can cause a dangerous situation by eating through metals and other materials. They also present a *HEALTH* hazard because they can eat away body tissues, causing burns.
3) A B	Many chemicals are both physical and health hazards. This label warns you of a physical hazard (flamiability) by telling you not to use the chemical near fire or flame, It warns you of a health hazard by telling you that the chemical is harmful when it enters your body — i.e., when swallowed, inhaled, or absorbed through the skin.

4) Classify each substance as either a SOLID (S), a LIQUID (L), or a GAS (G).

_____ Glue

_____ Solvent

_____ Water

_____ Air

_____ Scouring powder

_____ Plastic

5) Which state of chemical can become airborne and inhaled in the workplace?

A) Solid

B) Liquid

C) Gas

Now go back to page 2-5, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, continue to Application Exercise 2A-2, "Identifying Sources of Airborne Hazards." If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
4)	Chemical materials exist in one of three basic physical forms,
(L) Glue (L) Solvent (L) Water (G) Air (S) Scouring powder (S) Plastic	• *SOLIDS*, such as plastic, hold their shape. Each small granular particle of scouring powder also holds its shape. • *LIQUIDS* take the shape of their container. Glue, water, and solvents are liquids. • *GASES* have no definite shape. They can be compressed, and they expand to fill c-ontainers. Air is an example of a gas that is everywhere.
5) ABC	Chemicals in *ALL* physical forms can become airborne. ANY airborne chemical can be inhaled. • Solids become airborne as fumes or dusts. • Liquids become airborne as mists or vapors • Gases become airborne if not contained

APPLICATION EXERCISE 2A-2:
Identifying Sources of Airborne Hazards

*Directions: Check or **circle your** answer(s) to each question, or write your answer in the **blank provided.** When you complete **the exercise,** fold over the right side of thepage to check your answers. Then turn the page to get more information about each question.*

1) Which properties are common to all airborne hazards?

A) Spread out from the source

B) Settle quickly

C) Easily seen and smelled

D) Normally enter the body through breathing

2) What type of airborne hazard probably forms when a solvent such as gasoline is transferred from a drum to a can?

A) Dust B) Fume C) Vapor D) Mist E) Gas

3) What type of airborne hazard probably results from grinding clean, dry metal parts?

A) Dust B) Fume C) Vapor D) Mist E) Gas

APPLICATION EXERCISE 2A-2:
Identifying Sources of Airborne Hazards

Answer	Additional Information
1) A D	All airborne hazards — . spread out from their source; and . enter the body through breathing. Not all airborne hazards settle quickly. Larger mist droplets and solid particles tend to settle, whereas smaller, lighter ones often remain airborne. Most airborne hazards are NOT easily seen or smelled. Many are invisible and have no odor. The amount of airborne chemical that is hazardous to your health when inhaled maybe too small for you to see or smell.
2) C	Vapors form above any exposed liquid surface. When a container of liquid is opened or leaks, a vapor is formed. Most liquid transfer operations produce vapors.
3) A	Dust (tiny solid particles) becomes airborne during mechanical operations like grinding, crushing, pulverizing, and abrasive cleaning. Transfer of granular, fibrous, or powdered solids such as cement mix or asbestos, also produces dust. Solids become airborne as fumes as well, but mechanical operations don't produce fumes. Fumes form when solids are melted.

4) Which airborne hazard(s) is (are) present in smoke?

A) Dust B) Fume C) Vapor D) Mist E) Gas

_____

Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, proceed to the Lesson Summary when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
4) ABE	Smoke is a mixture of fire gases and tiny airborne dust or fume particles. The fire which produced the smoke can also produce vapors and mists, although these are not part of the smoke itself.

INTRODUCTION TO VIDEOTAPE SEGMENT 2B: Routes of Exposure

Exposure routes are ways that chemicals enter the body. This videotape segment describes four routes of exposure.

- Breathing/Inhalation
- Skin and eye contact
- Skin absorption
- Swallowing/Ingestion

Also look for the factors that affect degree of hazard when you are exposed by one of these routes.

If you wish, you may take notes on the following page as you watch the tape. Now, watch Videotape Segment 2B.

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APPLICATION EXERCISE 2B:
Understanding How Chemicals Enter Your Body

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

1) How can chemicals enter your bloodstream?

A) Ingestion
B) Inhalation
C) Skin absorption
D) Skin contact

2) Match the exposure route(s) to the effect most likely to appear immediately.

_____ Red, irritated skin	A) Inhalation
_____ Difficulty in breathing	B) Ingestion
_____ Burned esophagus	C) Skin absorption
_____ Headache, dizziness	D) Skin contact

APPLICATION EXERCISE 2B:
Understanding How Chemicals Enter Your Body

Answer	Additional Information
l) ABC (D)	Ingested chemicals can enter the bloodstream from the intestines. Many inhaled chemicals can pass from the lungs into the bloodstream. Some chemicals enter the bloodstream by being absorbed through skin. Skin absorption cannot occur without skin contact, but skin absorption does not always follow skin contact. Once in the bloodstream, chemicals can affect any part of your body.
2) D	*RED,IRRITATED* SKI... Skin contact hazards can cause anything from mild irritation and redness to severe burns.
A B C	*DIFFICULTY IN BREATHING.* Inhalation hazards can affect the respiratory system on contact, making it hard to breathe. Chemicals that enter the bloodstream through skin absorption or ingestion can also affect the respiratory system.
B	*BURNED ESOPHAGUS.* Chemicals that are ingested travel from the mouth, down the esophagus, and into the stomach. Damage can occur anywhere along this route.
A B C	*HEADACHE, DIZZINESS.* Headache and dizziness occur when some chemicals enter the bloodstream — whether by inhalation, ingestion, or skin absorption.

3) Joe welds occasionally as part of his job in a repair shop. Harry does the same kind of welding all day as part of his job. The degree of hazard is higher for

_____.

_____

Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. When you have finished, either review the tape or proceed to the Lesson Summary.

Answer	Additional Information
3) Harry	The degree of hazard greatly depends on dosage — • how *MUCH* you are exposed to each time; • how *LONG* each exposure lasts; and . how *OFTEN* you are exposed. Harry's dosage is higher because he is exposed eight hours a day, five days a week. Joe does not weld all day every workday.

LESSON 2 SUMMARY

The Hazard Communication Standard defines two main categories of chemical hazards:

- PHYSICAL HAZARDS are chemicals that cause explosion, fires, violent chemical reactions, or other hazardous situations.

- *HEALTH HAZARDS* are chemicals that can cause illness or injury when inhaled or swallowed, or through contact with the skin or eyes.

All chemicals exist in one of three basic forms:

- *SOLIDS* have a definite shape and can become airborne as dust or fume particles.

- *LIQUIDS* take the shape of their container and can become airborne as mists or vapors.

- GASES are easily compressed, expand to fill a container, and become airborne when not contained.

Both *DUSTS* and *FUMES* are made up of tiny solid particles. Mechanical operations like grinding and crushing produce dust, So does transfer of powdered or fibrous solids and abrasive cleaning. Fumes form by vapor condensation when solids are melted in operations like welding and metal casting.

VAPORS are formed above any exposed liquid surface. Heating a liquid makes it vaporize more quickly, *MIST is* made up of tiny droplets that become airborne when liquids are sprayed, agitated, or applied to a hot surface. Mists also form when hot vapors cool in air and condense.

Exposure routes are ways that chemicals enter your body, There are four main routes of exposure:

- *BREATHING/INHALATION* takes a chemical from your nose or mouth, down your windpipe, and into your lungs. Some chemicals get trapped in your lungs. Others leave when you breathe out. But many pass from your lungs into your bloodstream.

- *SKIN/EYE* CONTACT can cause anything from reddening or itching to severe rashes, burns, loss of eyesight or even death.

- *SKIN ABSORPTION* hazards pass through the skin on contact and enter the bloodstream. Once in your bloodstream, chemicals can spread throughout your body and cause injury or disease far away from the original site of contact. Chemicals can also be absorbed through the mucous membranes of the eye.

- *SWALLOWING/INGESTION* takes a chemical from your mouth, down your esophagus, and into your stomach. From your stomach, many chemicals enter the intestines, where they can be absorbed into the bloodstream and spread throughout your body, Damage can be done at any point along the way.

The *DEGREE OF HAZARD* associated with exposure to health hazards depends on the following,

. *TOXICITY* of the chemical

Toxicity	Effects of Exposure
Low	Minor symptoms that go away when exposure stops
Medium	Require medical attention, may be permanent
High	Can cause death or severely disabling conditions

• *EXPOSURE ROUTE*

Some chemicals are more toxic by one exposure route than by another. For example, onion juice vapor irritates the eyes, but skin contact with onion juice produces little or no effect.

. *DOSAGE,* which depends on —

- How *MUCH* you are exposed to each time;
- How *LONG* each exposure lasts; and
- How *OFTEN* you are exposed.

. *INDIVIDUAL DIFFERENCES,* such as the following:

- Work practices
- Age and size
- General physical and emotional health
- Allergies and sensitivities
- Level of exertion
- Combination of chemicals in the body, which depends on what medications you are taking and whether or not you smoke tobacco or drink alcoholic beverages.

LESSON 3: TYPES OF PHYSICAL AND HEALTH HAZARDS

INTRODUCTION

In the preceding lesson, you saw that The Hazard Communication Standard covers both physical hazards and health hazards. This lesson introduces you to the different types of hazards in each of these two categories. It helps you understand how each type of hazard can affect your health and safety.

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following

Identify the basic types of physical hazards.

List and define types of fire hazards,

List and define two types of unstable/reactive chemicals.

Identify eight basic types of health hazards.

LEARNING RESOURCES

- Videotape Segment 3A Types of Physical Hazards
- Workbook Application Exercise 3A-1: Defining Physical Hazards
- Workbook Application Exercise 3A-2: DOS and DON'TS
- Videotape Segment 3B: Types of Health Hazards
- Workbook Application Exercise 3B-1: Defining Health Hazards
- Workbook Application Exercise 3B-2: Recognizing Workplace Health Hazards
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

1) Read the workbook introduction to Videotape Segment 3A.

___ 2) Watch Videotape Segment 3A.

3) Complete Application Exercise 3A-1 in this workbook.

4) Complete Application Exercise 3A-2 in this workbook.

5) Read the workbook introduction to Videotape Segment 3B.

6) Watch Videotape Segment 3B.

7) Complete Application Exercise 3B-1 in this workbook.

8) Complete Application Exercise 3B-2 in this workbook.

9) Read the lesson summary.

INTRODUCTION TO VIDEOTAPE SEGMENT 3A: Types of Physical Hazards

Physical hazards are chemicals that can cause explosion, fires, violent chemical reactions, or other hazardous situations.

As you watch this videotape segment, learn to recognize the different types of physical hazards in the workplace. Notice how compressed gases, explosives, fire hazards, and unstable or reactive chemicals can affect your safety.

Now, watch Videotape Segment 3A.

NOTES

APPLICATION EXERCISE 3A-1: Defining Physical Hazards

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

1) What are the four basic types of *PHYSICAL* hazards?

_____ _____

_____ _____

2) Match the description with the type of physical hazard.

Contains a lot of stored energy	A) Fire hazard
Ignites and burns easily	B) Compressed gas
Causes a sudden release of pressure and heat.	C) Reactive chemical
Causes a dangerous situation when mixed with other chemicals	D) Explosive

3) Which type of physical hazard causes or supports fire in other materials?

A) Combustible liquid

B) Pyrophoric

C) Flammable liquid

D) Oxidizer

APPLICATION EXERCISE 3A-1: Defining Physical Hazards

Answer	Additional Information
1)	The four basic types of *PHYSICAL* hazards are —
	• compressed gases; • explosives; • fire hazards, including combustibles and • unstable or reactive chemicals.
2) B	Contains a lot of stored energy
A	Ignites and burns easily
D	Causes a sudden release of pressure and heat
C	Causes a dangerous situation when mixed with other chemicals
	Compressed gases contain a great deal of stored energy. They are physical hazards because the sudden release of this energy is dangerous. Explosives and reactive chemicals can cause a sudden release of energy.
	Chemicals that ignite and burn easily are fire hazards. So are chemicals that cause or support fire in other materials. Explosives are chemicals that can cause a sudden and violent release of pressure, gas, and heat.
	Reactive chemicals produce or release a hazard when allowed to contact certain other chemicals.
3) D	Oxidizers are fire hazards that supply the oxygen required to start or support a fire. Oxygen itself is an oxidizer. Many materials that contain oxygen, such as peroxides, are also oxidizers.

4) Match each liquid with the type of fire hazard it presents.

____ Turpentine ignites at 95°F.	A) Flammable liquid
____ Kerosene ignites at 1OO-165"F.	B) Combustible liquid
Auto lubricating oil ignites at 300-450°F.	C) Neither flammable nor combustible
Toluene ignites at 40°F.	
Methyl cellosolve ignites at 115°F.	
____ Ethylene glycol ignites at 232°F.	

5) A label on a can of drain opener reads:

> NEVER USE OR MIX WITH OTHER CHEMICALS. KEEP AWAY FROM ALUMINUM UTENSILS AND ALUMINUM-CONTAINING MATERIALS.

Which type(s) of physical hazard does this product present?

A) Flammable B) Oxidizer C) Pyrophoric D) Reactive

Now go back to page 3-5, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, continue to Application Exercise 3A-2, "DOS and DON'Ts" when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
4) A	The *FLASH POINT is* the temperature at which a liquid gives off enough vapor to burst into flame when exposed to an ignition source.
B	*FLAMMABLE LIQUIDS* have a flash point below 100°F. Turpentine and toluene are examples.
C	
A	*COMBUSTIBLE LIQUIDS* have a flash point of 100°F or greater, but below 200°F. Kerosene and methyl cellosolve are examples.
B	Liquids that don't ignite easily at temperatures below 200°F are neither flammable nor combustible. Auto lubricating oil and ethylene glycol are examples.
C	
5) D	Chemicals that must be kept away from other chemicals are reactive. The warning does not identify any specific type of fire hazard.

APPLICATION EXERCISE 3A-2: DOS and DON'Ts

Directions: Check or circle your answer(s) to each question; or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

Larry works in the painting/coating operation of a manufacturing facility. He does spray painting with a solvent-based paint.

1) What physical hazard is associated with Larry's job?

A) Compressed gas

B) Pyrophoric

C) Flammable liquid

D) Explosive

2) Circle all the DOS and DON'TS associated with the physical hazard in Larry's job.

A) DON'T throw paint-covered rags into open trash containers.

B) DO have a portable fire extinguisher available at all times.

C) DON'T use an electric heater in the work area,

D) DO provide ash trays in the work area.

APPLICATION EXERCISE 3A-2: DOS and DON'Ts

Answer	Additional Information
1) c	Like paints, many liquids used in solvent-based painting and coating operations are flammable. Ignition occurs easily at temperatures below 100"F.
2) ABC	Proper disposal of waste containing flammable liquids is essential. Covered waste containers should be used to reduce the danger of exposure to an ignition source that could start a fire. Failure to properly dispose of paint-covered rags could also present a spontaneous combustion hazard, Fire extinguishers should be provided whenever a fire hazard exists. Smoking and electric heaters are potential ignition sources and are not allowed in areas where flammable liquids are present. No ash trays should be provided in the area because no one should smoke in there. Ash trays should be provided in the outer area so that cigarettes may be disposed of properly before entering the area.

Marilyn works as a supervisor in a plant that uses ammonium nitrate to make gunpowder and blasting agents.

3) What physical hazard is associated with the ammonium nitrate in the plant where Marilyn works?

A) Flammable liquid

B) Explosive

C) Oxidizer

D) Water-reactive chemical

4) What DOS and DON'TS are associated with the physical hazard of ammonium nitrate in Marilyn's plant?

A) DON'T carry matches or lighters into the work area.

B) DON'T store ammonium nitrate in the same warehouse where flammable or combustible chemicals are stored.

C) DO stop any surface operations during thunderstorms.

D) DO keep warehouse aisles wide and clear at all times.

Now go back to page 3-9, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, proceed to Videotape Segment 3B when you have finished. Ifyou are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
3) B C	Ammonium nitrate is explosive and is an oxidizer. Heat or reaction with certain other chemicals (but not water) can cause an explosion.
4) A B C D	Special precautions and training are required to work safely with explosives. Extreme care must be taken to prevent contact with an ignition source. Handling explosives outdoors during a thunderstorm is hazardous because lightning could detonate the material. Special regulations also apply to warehousing explosive materials. Wide, clear aisles are required to make sure firefighting equipment can be brought in without delay. Explosives must be stored away from materials that ignite easily — a fire could detonate the explosive, and an explosion could ignite the fire hazard.

INTRODUCTION TO VIDEOTAPE SEGMENT 3B: Types of Health Hazards

Health hazards are chemicals that can cause injury or illness when you are exposed by skin or eye contact, skin absorption, inhalation, or ingestion. The type of injury or illness —

- ranges from short-term irritation to permanent damage or death; and
- depends on the type of health hazard.

As you watch this videotape segment, look for the different types of health hazards and the health effects each type can produce.

Now, watch Videotape Segment 3B.

NOTES

APPLICATION EXERCISE 3B-1: Defining Health Hazards

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

1) Match the description with the type of health hazard.

_ Burns skin on contact	A) Irritant
___ Causes cancer	B) Corrosive
___ Causes the skin to itch on contact	C) Target organ chemical
___ Darnages genes in sperm and egg cells	D) Sensitizer
_ Can cause an allergic-like response	E) Carcinogen
___ Causes liver damage	F) Teratogen
_ Damages the fetus during its development	G) Mutagen
_ Freezes the skin on contact	H) Cryogenic

APPLICATION EXERCISE 3B-I: Defining Health Hazards

Answer	Additional Information
1) B	Burns skin on contact
E	Causes cancer
A	Causes the skin to itch upon contact
G	Damages genes in sperm and egg cells
D	Can cause an allergic-like response
C	Causes liver damage
F	Damages the fetus during its development
H	Freezes the skin on contact

CORROSIVES burn on contact, causing visible damage or irreversible changes to body tissues.

CARCINOGENS are chemicals that can cause cancer.

IRRITANTS react with the body at the site of contact, causing the skin to redden or itch. Repeated contact can crack or break the skin, but the damage is reversible.

MUTAGENS cause genetic changes in sperm and egg cells. This can cause sterility, birth defects, and miscarriages.

SENSITIZERS cause an allergic-like response in many people who are repeatedly exposed to the chemical The response can happen on the second exposure, or any exposure thereafter.

TARGET ORGAN CHEMICALS damage a specific organ or body system, such as the liver.

TERATOGENS are reproductive hazards that darnage the fetus during its development.

CRYOGENICS are very cold materials that cause frostbite by freezing body tissues on contact.

2) Will you know if you have been sensitized to a chemical at the time of your first exposure?

A) Yes

B) No

3) Do corrosives damage only skin?

A) Yes

B) No

Now go ***back to*** *page* 3-15, *fold over the* ***right*** *side of the page, and check your answers. Look on the back of the question page for more information on each question.* ***If you*** *are taking this course as a* ***self-study,*** *continue to Application Exercise* ***3B-2,*** *"Recognizing* ***Workplace Health*** *Hazards, " when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.*

Answer	Additional Information
2) B	There is no way to tell who will become sensitized to a chemical nor how long it may take. The allergic-like response can appear on any exposure after your first exposure. Some workers become sensitized over time. Suddenly they develop symptoms that they never had before — usually itching, a skin rash, or difficulty breathing. Others who are repeatedly exposed to the same sensitizer never develop the allergic-like response.
3) B	Corrosives burn on contact. They can damage your skin, eyes, digestive tract, or respiratory system, The tissue damaged depends on the exposure route.

APPLICATION EXERCISE 3B-2: Recognizing Workplace Health Hazards

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

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1) Fran uses ammonia water to clean floors and tiled walls. One day, the air conditioning system stopped working in the room where Fran was cleaning. Her eyes got red and irritated, and her nose and throat hurt. What kind of health hazard is the ammonia cleaner?

   A) Corrosive

   B) Teratogen

   C) Cryogenic

   D) Irritant

2) Jack works in a metal cleaning operation. He was burned when the caustic cleaner splashed on his arm. What kind of health hazard is the cleaner?

   A) Corrosive

   B) Sensitizer

   C) Irritant

   D) Mutagen

Now fold over the right side of the page, and check your answers, Look on the back of the question page for more information on each question. When you have finished, either review Videotape Segment 3B or proceed to the Lesson Summary.

APPLICATION EXERCISE 3B-2: Recognizing Workplace Health Hazards

Answer	Additional Information
1) D	Like many maintenance cleaning products, dilute ammonia water is an irritant. The vapors cause reddening and irritation on contact. Proper ventilation is a must when working with irritants that become airborne easily. When the ventilation system is working properly, the vapors are diluted with fresh air. This lowers the exposure hazard by reducing Fran's dosage, and she experiences no irritating symptoms. Cryogenics are very cold chemicals that can freeze body tissue on contact, causing frostbite. Corrosives burn on contact. The damage is more severe than that produced by an irritant and maybe irreversible. Teratogens damage the fetus during its development.
2) A	Corrosives eat away or burn body tissue on contact. Caustic cleaners are corrosives, So are other strong acids and bases. Skin contact causes burns, like Jack's. Eye contact can permanently damage your eyesight. Breathing corrosive gases, vapors, or mists can severely damage the respiratory tract. When swallowed, corrosives burn the mouth and esophagus.

LESSON 3 SUMMARY

The Hazard Communication Standard helps protect you from both physical hazards and health hazards in the workplace.

PHYSICAL HAZARDS include:

- *COMPRESSED GASES* — contain a lot of stored energy, sudden release produces rocket effect.
- *EXPLOSIVES* — cause a sudden release of pressure and heat.
- *FIRE HAZARDS* — ignite and burn easily or cause/support fire in other materials.
- *UNSTABLE/REACTIVE CHEMICALS* — produce or release hazards under commonly occurring temperatures, pressures, or light conditions.

FIRE HAZARDS include:

- *PYROPHORICS* — ignite spontaneously in air below 130°F.
- *FLAMMABLE LIQUIDS* — ignite easily at temperatures below 100°F.
- *COMBUSTIBLE LIQUIDS* — ignite easily at or above 100°F, but below 200°F.
- *OXIDIZERS* — supply the oxygen required to start or support fire.

UNSTABLE/REACTIVE CHEMICALS include:

- *DECOMPOSITION HAZARDS* — easily break up into simpler substances.
- *POLYMERIZATION HAZARDS* — self-react to form long molecular chains, releasing heat and/or a hazardous chemical in the process.
- *WATER-REACTIVE CHEMICALS* — react violently with water resulting in physical and/or health hazards.

HEALTH ***HAZARDS*** include:

- ***IRRITANTS*** — cause reddening, itching, or other irritation on contact.
- CORROSIVES — burn or eat away body tissues on contact.
- *CRYOGENICS* — freeze body tissue on contact.
- Chemicals that damage a *SPECIFIC ORGAN OR SYSTEM.*
- *REPRODUCTIVE HAZARDS* — target the reproductive system, causing sterility, miscarriages, fetal injury, or birth defects.
- *SENSITIZERS* — cause an allergic-like response in many people who are repeatedly exposed.
- ***CARCINOGENS*** — cause cancer.

REPRODUCTIVE HAZARDS include:

- *MUTAGENS* — damage genes in egg or sperm cells.
- ***TERATOGENS*** — *damage the* fetus during its development.

LESSON 4: CONTROLLING CHEMICAL HAZARDS

INTRODUCTION

Everyone who works with chemical hazards needs to know how the hazards are controlled. This lesson introduces you to engineering controls, personal protective equipment, and administrative controls that may be required to protect you from chemical hazards in your workplace, Then it describes ways that you can detect uncontrolled hazards and help make your workplace safer for everyone.

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following

List and define three basic types of engineering controls.

Identify examples of substitution, isolation, and ventilation controls.

Distinguish between general and local exhaust ventilation.

Define personal protective equipment and identify limitations that apply to its use.

Match types of Personal Protective Equipment (PPE) with types of physical hazards or exposure hazards.

List and identify four basic types of administrative controls.

List and recognize four common ways that workers can identify uncontrolled chemical hazards,

LEARNING RESOURCES

- Videotape Segment 4A: Controlling Chemical Hazards: Engineering Controls, Personal Protective Equipment
- Workbook Application Exercise 4A: Working With Engineering Controls and PPE
- Videotape Segment 4B: Administrative Controls and Hazard Recognition
- Workbook Application Exercise 4B: Controlling Chemical Hazards: Administrative Controls
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

1) Read the workbook introduction to Videotape Segment 4A.
2) Watch Videotape Segment 4A.
3) Complete Application Exercise 4A in this workbook.
4) Read the workbook introduction to Videotape Segment 4B.
5) Watch Videotape Segment 4B.
6) Complete Application Exercise 4B in this workbook,
7) Read the lesson summary.

INTRODUCTION TO VIDEOTAPE SEGMENT 4A: Engineering Controls and Personai Protective Equipment

Controlling chemical hazards often requires a combination of control methods. In this videotape segment, you'll see how one facility decided to use a combination of engineering controls and personal protective equipment to protect workers from the hazards associated with use of a corrosive cleaner.

Notice the different types of engineering controls available to protect you from chemical hazards. Also watch for examples of how each type is used. Pay particular attention to the distinction between general and local exhaust ventilation, and learn to recognize appropriate applications for each, Then look for the types of personal protective equipment available to control both physical hazards and health hazards. Finally, learn why proper selection and use of PPE is essential to your safety and health,

Now, watch Videotape Segment 4A.

NOTES

APPLICATION EXERCISE 4A:
Working With Engineering Controls and PPE

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

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1) Match the application with the type of control method.

Using steam cleaning instead of solvent-based cleaning	A) Engineering
Wearing chemical splash goggles	B) Personal Protective Equipment (PPE)
Using a ventilation system to remove toxic dusts	
Complete enclosure of a sand blast operation	
Wearing a respirator to remove toxic vapors from your breathing air	

2) Most paints no longer contain lead-based pigments because lead paint is a health hazard. What type-of control is used when lead-based pigments are replaced by non-toxic pigments?

A) Isolation

B) Ventilation

C) Substitution

D) PPE

Now *fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, proceed to Videotape Segment* 4B *when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.*

APPLICATION EXERCISE 4A
Working With Engineering Controls and PPE

Answer	Additional Information
1) A	Using steam cleaning instead of solvent-based cleaning
B	Wearing chemical splash goggles
A	Using a ventilation system to remove toxic dusts
A	Complete enclosure of a sand blast operation
B	Wearing a respirator to remove toxic vapors from your breathing air

Engineering controls include:

- *SUBSTITUTION* — replacing a hazardous chemical, process, or piece of equipment with a less hazardous one
- *ISOLATION* — using' an enclosure, barrier, or distance to separate workers from hazards
- *VENTILATION* — mixing fresh air with contaminated air in a work area, or preventing release of airborne hazards by removing them at the source.

Personal protective equipment (PPE) includes eyewear, face masks, clothing, gloves, boots, and respirators — equipment that workers wear to prevent or reduce their exposure to hazardous chemicals.

2) c Substitution can be used to do any of the following

- Replace a hazardous *CHEMICAL*, such as lead-based pigment, with a less hazardous chemical, such as a non-toxic pigment.
- Replace a hazardous *PROCESS*, such as solvent-based cleaning, with a less hazardous process, such as steam cleaning.
- Replace a hazardous *PIECE OF EQUIPMENT*, such as a broom, which can create a dust hazard, with a more efficient piece of equipment, such as a wet vacuum cleaner.

INTRODUCTION TO VIDEOTAPE SEGMENT 4B: Administrative Controls

In addition to engineering controls and Personal Protective Equipment, controlling chemical hazards requires information and training, safe work practices, good housekeeping, good personal hygiene, and monitoring. As you watch this videotape, look for examples of each of these administrative controls.

Also pay close attention to ways that you can help to control chemical hazards. Notice how a simple change in work practices can reduce or eliminate an exposure. See why it's important to report any medical symptoms you may experience. And be alert for ways of using your senses to detect potential hazards.

Now, watch Videotape Segment 4B.

NOTES

APPLICATION EXERCISE 4B:
Administrative Controls and Hazard Recognition

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

1) Can a change in work practices help to control a chemical hazard?

A) Yes

B) No

2) How does good housekeeping help to control chemical hazards?

A) Capturing the hazard as it forms at the source

B) Mixing and diluting the hazard with air

C) Containing and removing the hazard

D) Putting a barrier between an individual worker and the hazard

3) Suppose you report exposure symptoms to your supervisor. What does this tell your supervisor?

A) You use sloppy work practices.

B) An exposure hazard may exist.

C) Routine medical monitoring is required.

D) You're on the alert for potential hazards.

Answer	Additional Information
1) A	A simple change in work practices and good personal hygiene can often help to control your exposure to a chemical hazard, For example: • Changing your position so you breathe less vapor • Washing your hands before eating or drinking • Handling volatile materials in a chemical laboratory hood • Covering or capping chemical containers when not in use
2) C	The goal of housekeeping is to contain and remove hazards, and requires the following • Proper storage and handling • Proper clean-up procedures • Prompt removal and correct disposal of chemical wastes Local ventilation captures chemical hazards at the source. General ventilation mixes and dilutes the hazard with air. PPE and isolation put barriers between people and hazards.
3) A B D	Reporting medical symptoms that may be caused by exposure to a health hazard in your work area tells your supervisor that — • an exposure hazard may exist; and . you are on the alert for potential hazards. Experiencing medical symptoms does NOT necessarily mean that the exposure is caused by your work practices, but it could be. Nor does it necessarily mean that medical monitoring is required. It DOES means that a hazard MAY exist, and that this potential hazard should be evaluated and, if necessary, controlled.

4) Label each statement either true or false,

I'll always be able to see, smell, or taste an exposure hazard.

___ Most airborne hazards can NOT be seen.

If's **smell** disappears, I am no longer breathing the chemical.

Monitoring may be required to detect hazardous exposures, even if the chemical has a strong odor.

Any chemical I can smell or taste is entering my body.

Answer	Additional Information
4) F	You cannot sense odorless, colorless, and sa tasteless gases like carbon monoxide. Although you can see bulk solids and liquids, airborne
T	forms are often invisible.
F	You can smell or taste some airborne hazards. But remember, anything you can smell or taste is also entering your body. Also
T	remember that your sense of smell is limited.
T	You may not be able to smell the very small amounts of an airborne hazard that can harm you. And some chemicals deaden your sense of smell — the smell disappears even though you're still breathing the hazard.

5) Which of the following clues alert you to a potential, uncontrolled health hazard?

Drop in noise level near a ventilation system

Abnormal reading on a gas gauge

Worker with a cold sneezing

Liquid being used up more quickly than usual

Sound of a near-by explosion

Maintenance worker vacuuming

Sudden build-up on exhaust vents

Unusual smell

Burning sensation

6) Regina routinely handles mercury, a liquid that can buildup in the body overtime and can cause irreversible brain damage. How could medical monitoring help protect Regina?

A) Detect uncontrolled exposure hazards

B) Prevent occurrence of immediate exposure symptoms

c) Prevent irreversible brain damage

D) None of the above

Now go back to page 4-9, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, proceed to the Lesson Summary when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
5) (Y)	Drop in noise level near a ventilation system
(Y)	Abnormal reading on a gas or vacuum gauge
(N)	Worker with a cold sneezing
(Y)	Liquid being used up more quickly than usual
(Y)	Sound of a near-by explosion
(N)	Maintenance worker vacuuming
(Y)	Sudden build-up on exhaust vents
(Y)	Unusual smell
(T)	Burning sensation

Anything unusual may alert you to a potential hazard —

- Drop in noise level
- Abnormal gauge or meter readings
- Using up a material more quickly or slowly than usual
- Sounds associated with accidents or emergency situations, such as explosion or fire
- Changes in the way equipment or materials look
- An odor you don't normally smell
- A sensation you don't normally feel

6) A C

Medical monitoring helps to detect uncontrolled and improperly controlled exposure hazards. When a medical exam or lab test indicates an exposure problem, a hazard exists. Identifying, evaluating, and controlling this hazard prevents repeated exposure. Sometimes, it can also prevent occurrence of more serious health effects that develop slowly over time.

Immediate health effects appear while you are being exposed, or shortly thereafter. Medical monitoring itself cannot prevent occurrence of immediate symptoms or subsequent long-term health effects.

LESSON 4 SUMMARY

There are three basic methods of controlling chemical hazards.

- Engineering controls
- Personal Protective Equipment (PPE)
- Administrative controls

ENGINEERING CONTROLS include the following

- *SUBSTITUTION* — replacing a chemical, process, or piece of equipment with a less hazardous or more efficient one.

  Example: steam instead of solvent cleaning

- *ISOLATION* — using an enclosure, barrier, or safe distance to separate workers from exposure hazards.

  Examples: machine enclosures, enclosed control rooms, splash guards

- *GENERAL VENTILATION* — mixing an airborne hazard with fresh air to reduce exposure levels; this is only suitable for hazards of low toxicity that mix readily with air.

  Examples: fans, make-up air vents

- *LOCAL EXHAUST VENTILATION* — capturing an airborne hazard as it is released and taking it out of the workplace to eliminate exposure.

  Examples: hoods, slots, and dust collectors

PERSONAL *PROTECTIVE EQUIPMENT* puts a barrier between the hazard and the individual who wears it. It can protect against both physical hazards and health hazards.

. *PROTECTIVE* ***GLOVES AND*** *CLOTHING*

Examples: hats, hoods, boots, impervious gloves, cloth gloves, rubber aprons, lab coats, impervious boots

• *EYE AND FACE PROTECTION*

Examples: safety glasses, splash goggles, face masks and shields

. ***AIR-PURIFYING RESPIRATORS***

Examples: Respirators with a cartridge or falter that removes contaminants from the air you breathe

. *AIR-SUPPLIED RESPIRATORS*

Examples: Self-contained units that supply air from a tank carried on the back; air-line units that provide air from a remote source

To protect you, PPE must be matched to the **specific** hazard. For example, cloth gloves are useless for protection against a corrosive liquid, PPE is also useless unless *you wear* **it.** Proper fit, correct *use,* and routine maintenance are also critical.

LESSON 4 SUMMARY

ADMINISTRATIVE CONTROLS include the following

- *DOCUMENTATION, INFORMATION, AND TRAINING*

  Examples: warning labels, MSDSS, Hazardous Chemical Inventory, written Hazard Communication Program

- *WORK PRACTICES*

  Examples: using all available controls correctly, reporting uncontrolled hazards promptly

- *HOUSEKEEPING* — containing and removing hazards

  Examples: vacuuming toxic dusts, proper storage and handling, correct disposal of chemical wastes

- *MONITORING* — checking the effectiveness of other controls

  Examples: Air and wipe samples for area monitoring, personal sampling for individual monitoring, medical exams and laboratory tests

Always be alert for uncontrolled chemical hazards in your workplace. You can see bulk liquids and solids, but most airborne hazards are invisible. You can smell or taste some airborne chemicals, but not others. Some chemicals deaden your sense of smell, and others cannot be detected by smell at the very low levels that can harm you.

Remember, anything you smell or taste is entering your body.

In addition to sensing the chemical itself, you can detect exposure hazards by doing the following

- Spotting equipment failures — a ventilation system that stops working, darnaged chemical containers, faulty PPE

- Spotting leaks, spills, frees, explosions, uncontrolled chemical reactions, or other emergency/accident situations

- Recognizing health effects produced by exposure, such as headache, dizziness, coughing, irritation, or nausea

- Watching for anything unusual or out of the ordinary.

LESSON 5: INTRODUCTION TO MSDSS AND MSDS PHYSICAL HAZARD INFORMATION

INTRODUCTION

Material Safety Data Sheets (MSDSs) contain a great deal of useful information about chemical hazards. You have a right to review a copy of the MSDS for any chemical material in your work area simply by asking, This lesson helps you understand how to read an MSDS. You will see what kinds of general information and physical data the MSDS contains, Then you will see how to use MSDSS to help protect yourself from physical hazards of the hazardous chemicals in your workplace.

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following

Identify general information that must be contained on an MSDS.

Use physical data on an MSDS to answer the following questions about a chemical material:

Is it a solid, a liquid, or a gas?

Can I see it?

Might I smell it?

How fast does it evaporate?

How much of it can evaporate?

How much force does its vapor exert inside a closed container?

Is it heavier than air or lighter than air?

Is it heavier than water or lighter than water?

Is it soluble in water?

Does it float on water or sink in water?

Use physical data on an MSDS to compare the vapor hazards of liquid chemicals.

Use MSDS physical hazard information to answer the following questions:

Can the chemical cause fires?

How do I put out a fire?

LEARNING OBJECTIVES Continued

Can the chemical explode?

[s the chemical unstable or reactive?

What conditions or materials must be avoided?

How do I clean up a spill or leak?

LEARNING RESOURCES

- Videotape Segment 5A: Physical Characteristics Information
- Workbook Application Exercise 5A-1: Understanding General Information and Physical Data on MSDSS
- Workbook Application Exercise 5A-2: Using General Information and Physical Data on MSDSS
- Videotape Segment 5B: Physical Hazard Information
- Workbook Application Exercise 5B-1: Understanding MSDS Physical Hazard Information
- Workbook Application Exercise 5B-2: Using MSDS Physical Hazard Information
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

1) Read the workbook introduction to Videotape Segment 5A.

2) Watch Videotape Segment 5A.

____ 3) Complete Application Exercise 5A-1 in this workbook.

____ 4) Complete Application Exercise 5A-2 in this workbook.

____ 5) Read the workbook introduction to Videotape Segment 5B.

____ 6) Watch Videotape Segment 5B.

____ 7) Complete Application Exercise 5B-1 in this workbook.

____ 8) Complete Application Exercise 5B-2 in this workbook.

____ 9) Read the Lesson Summary.

INTRODUCTION TO VIDEOTAPE SEGMENT 5A
Physical Characteristic Information

Every MSDS must contain certain kinds of information about the organization that prepared the document, the identity of the chemical material, and the material's physical properties.

As you watch this videotape segment, look for the kinds of general information that the MSDS must contain. Pay particular attention to the information included in the Physical Data Section. Notice how this data can help you recognize chemical materials, vapor hazards, and special fire hazards.

Now, watch Videotape Segment 5A.

NOTES

APPLICATION EXERCISE 5A-1 :
Understanding General Information and Physical Data on MSDSS

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

1) What information must the MSDS contain about the party who prepared the document?

   A) Name

   B) Address

   C) Phone number

2) Can an MSDS include more than one name for a chemical material?

   A) Yes

   B) No

3) If the chemical material is a mixture, what must the MSDS identify?

   A) Paints or coatings that are safe to use with it

   B) Name of each hazardous ingredient

   C) Other similar mixtures of liquids, solids, or gases

APPLICATION EXERCISE 5A-1 :
Understanding General Information and Physical Data on MSDSS

Answer	Additional Information
1) ABC	Every MSDS must contain the name, address, and telephone number of the party responsible for preparing the document. OSHA requires this information so that you can easily contact the responsible party.
2) A	One name on the MSDS must be the same as the name used on the label and the Hazardous Chemical Inventory in your workplace. But many chemical materials have more than one name. So, you may also see synonyms or trade names. The MSDS may also tell you that the material belongs to a chemical family or has a particular chemical structure. Section (g)(2) of the Hazard Communication Standard (29CFR 1910.1200) contains very specific requirements for identifying chemicals on the MSDS.
3) B	Mixtures contain more than one ingredient. If the material is a mixture, the MSDS must identify all the hazardous ingredients. Paints, preservatives, solvents, alloys, and metallic coatings are common mixtures, but any solid, liquid, or gas can be a mixture.

4) Which chemical gets into the air faster?

A) Evaporation Rate 0.35 (Water = 1)

B) Evaporation Rate 3.5 (Water = 1)

5) What does vapor pressure tell you?

A) How fast a chemical gets into the air.

B) How much of the chemical can evaporate.

C) Whether the vapor is lighter or heavier than air.

D) How much force the vapor exerts inside a closed container.

Answer **Additional Information**

4) B Evaporation rates are reported as comparisons. The evaporation rate tells you HOW FAST a liquid evaporates compared to water, in this case, the standard, which has an evaporation rate of one. That is, it tells you how quickly vapors get into the air from an exposed liquid surface.

Evaporation Rate (Water = 1)	**Meaning**
Less than 1(< 1)	Vaporizes *SLOWER* than water
1	*SAME* rate as water
More than 1(> 1)	Vaporizes *FASTER* than water

5) A, B, D Vapor forms above the liquid surface inside a closed container. This vapor exerts a force on the walls of the container. The force is the vapor pressure of the liquid.

Like air pressure, vapor pressure is measured in millimeters of mercury (mm Hg), Vapor pressure increases as the temperature of a liquid rises.

Liquids with high vapor pressures at room temperature (greater than about 100 mm Hg) present a special hazard. The pressure inside a sealed container can make the container swell or burst open. This releases a hazard and is most likely to happen if a sealed container is exposed to heat.

Given a closed room, vapor pressure can tell you how much liquid will evaporate.

High vapor pressure will tell you how fast it gets into the air, as well.

6) Which vapor tends to sink in still air?

A) Vapor Density 0.80
(Air = 1)

B) Vapor Density 1.52
(Air = 1)

7) Which liquid is lighter than water?

A) Specific Gravity 0.60
(Water = 1)

B) Specific Gravity 1.80
(Water = 1)

Now go back to page 5-5, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, proceed to Application Exercise 5A-2, "Using General Information and Physical Data on MSDSS," when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer **Additional Information**

6) B Vapor density tells you whether **a** vapor is lighter than air or heavier then air, which has a density of 1.

Vapor Density (Air = 1)	**Meaning**
Less than 1 **(c** 1)	*LIGHTER* than air. Tends to *RISE*, and get out of your breathing zone.
Greater than 1(> 1)	***HEAVIER*** than air. Tends to *SINK*, *stay in your* breathing zone, and accumulate in low spots.

Note: *If the air around the vapor is turbulent* ***(breezy),*** *the vapor may mix with air and become close to 1.*

7) A Specific gravity tells you whether a liquid is lighter than water or heavier than water, which has a specific gravity of 1.

Specific Gravity (Water = 1)	**Meaning**
Less than 1(< 1)	*LIGHTER* than water. *FLOATS* if not soluble in water.
Greater than 1(> 1)	*HEAVIER* than water. *SINKS if not* soluble in water.

APPLICATION EXERCISE 5A-2:
Using General Information and Physical Data on MSDSs

*Directions: Check or **circle** your answer(s) to **each** question, or write your answer in the blank provided. **Remember,** there maybe more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about **each** question.*

Locate the MSDS for Automatic Transmission Fluid in Appendix A and use it to answer the following questions.

---

1) What should you do if you need more information about Automatic Transmission Fluid in an emergency situation?

   A) Call 318-555-5214

   B) Call a doctor

   C) Write PO Box 3758, Anytown, OK 74000

   D) Write OSHA

2) Is this transmission fluid a mixture?

   A) Yes

   B) No

APPLICATION EXERCISE 5A-2:
Using General Information and Physical Data on MSDSS

Answer	Additional Information
	The MSDS for Automatic Transmission Fluid is located on pages A-4 to A-5 in Appendix A.
1) A	Section 1 of the MSDS gives you an emergency telephone number to call for assistance. Calling this number is usually the fastest way to get the answers you need in an emergency situation. This puts you in immediate contact with the manufacturer or party responsible for preparing the MSDS. Writing for answers only works when you can afford to wait for the information. Most physicians know little or nothing about transmission fluid. With hundreds of thousands of chemical materials in use, you cannot expect OSHA to have specific information about any one product.
2) A	Look at Section 2 of the MSDS. It lists three ingredients: refined oils, anti-oxidant, and dye. Any material that contains two or more different ingredients is a mixture.

3) What is the material's physical form?

A) Solid

B) Liquid

g) Gas

4) How might you sense release of this transmission fluid in your workplace?

A) See it

B) Smell it

C) Can't sense it — chemical is invisible and odorless

Now go back to page 5-11, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, read the introduction to Videotape Segment 5B when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
3) B	Look at the APPEARANCE& ODOR information in the Physical and Chemical Characteristics Section, Section 3. It tells you that the material is a red, oily liquid.
4) A B	Again, look at the APPEARANCE& ODOR information in Section 3. It tells you that the material is a red, oily liquid. You can see the liquid, but you probably cannot see the vapor or mist that can be formed from the liquid. The MSDS also tells you that this transmission fluid has a slightly oily odor. This means you can smell it, but the odor is faint. So you may not notice the smell — especially if the air you are breathing contains only small amounts of vapor.

INTRODUCTION TO VIDEOTAPE SEGMENT 5B:
Physical Hazard Information

You have seen that physical hazards include explosion hazards, fire hazards, and unstable or reactive chemicals. The MSDS identifies these types of hazards and provides information to help you control them.

As you watch this videotape, look for the kinds of information contained in the Fire and Explosion Hazard Data Section of the MSDS, and learn how to identify these hazards. Learn to use the Reactivity Data Section to identify unstable or reactive chemicals, and watch for ways of preventing hazardous reactions in the workplace. Finally, notice how the Precautions for Safe Handling and Use Section helps you clean up chemical spills or leaks correctly and dispose of the chemical waste properly.

Now, watch Videotape Segment 5B.

NOTES

APPLICATION EXERCISE 5B-I :
Understanding MSDS Physical Hazard Information

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

---

1) Which chemical material is flammable?

( ) Flash Point 70°F

B) Flash Point 150°F

2) For which materials must the MSDS list *CONDITIONS* to avoid?

A) Unstable chemicals

B) Reactive chemicals

C) Polymerization hazards

3) If the MSDS lists *MATERIALS* to avoid, what kind of hazard is the chemical?

A) Unstable

B) Flammable

C) Reactive

D) Combustible

Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, continue to Application Exercise 5B-2, "Using MSDS Physical Hazard Information," when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
1) A	The flash point is the lowest temperature at which a liquid gives off enough vapor to ignite in the presence of an ignition source, such as a match, spark, or cigarette. *FLAMMABLE* liquids have flash points below 100”F. *COMBUSTIBLE* liquids have flash points at or above 100”F.
2) ABC	The Reactivity Data Section of the MSDS lists conditions to avoid for unstable chemicals and polymerization hazards and incompatible reactions or materials. The conditions to avoid are those that might cause the chemical to decompose (break down into simpler molecules), or to polymerize (self-react to form large molecules).
3) c	Reactive chemicals become hazardous when in contact with certain other chemical materials. Contact may cause a fire, explosion, or other violent chemical reaction. It may also produce or release a hazardous chemical. For this reason, the Reactivity Data Section lists materials to avoid for reactive chemicals.

APPLICATION EXERCISE 5B-2: Using Physical Data on MSDSs

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

Locate the MSDS for Crystal Clear in Appendix A and use it to answer the following questions.

---

1) What type(s) of physical hazards does Crystal Clear present?

A) Fire

B) Explosion

C) Unstable

D) Reactive

E) Polymerization

2) Crystal Clear produces a hazardous situation when it comes in contact with:

A) Corrosives

B) Certain metals

C) Water

D) Air

3) Does Crystal Clear produce any hazards when it burns or breaks down into simpler chemicals?

A) Yes

B) No

Now fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. If you are taking this course as a self-study, either review Videotape Segment 5B or proceed to the Lesson Summary when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer.

APPLICATION EXERCISE 5B-2: Using Physical Data on MSDSS

Answer	Additional Information
	The MSDS for Crystal Clear is located on pages A-2 and A-3 of Appendix A.
1) A B D	Look at the Fire and Explosion Hazard Data given in Section 4 of the MSDS. Crystal Clear is a fire hazard because it contains a flammable gas. It's an explosion hazard because explosive limits (LEL and UEL) are given. The Reactivity Data in Section 5 of the MSDS tells you that Crystal Clear is stable, and that it does not undergo hazardous polymerization. It also tells you two kinds of materials to avoid — corrosives and active metals. Whenever the MSDS lists materials to avoid, the chemical is reactive.
2) A B	Look at the MATERIALS TO AVOID listed in the Reactivity Data Section. It tells you to keep Crystal Clear away from corrosives and active metals, such as aluminum and magnesium. Whenever the MSDS lists Materials to Avoid, it means that contact with these materials can produce or release a hazard.
3) A	Look at the HAZARDOUS DECOMPOSITION PRODUCTS listed in the Reactivity Data Section. All four chemicals listed are toxic gases formed when Crystal Clear burns or decomposes. Carbon monoxide, phosgene and hydrogen chloride are deadly.

LESSON 5 SUMMARY

Every MSDS must contain the following general information,

- Name, address, and telephone number of the party responsible for preparing or distributing the MSDS, who can provide additional information on the hazardous chemical and appropriate emergency procedures.
- Name of the chemical material as it appears on the warning label and Hazardous Chemical Inventory in your workplace.
- Health hazards of the chemical, including signs and symptoms of exposure,
- Precautions for safe handling and use.
- Any applicable control measures.

Many chemical materials are mixtures. Mixtures contain more than one ingredient. The MSDS must identify *ALL* hazardous ingredients in a mixture.

The following table summarizes the information you will find in the **Physical Data Section** of the MSDS.

Physical Data	**Question Answered**	**Explanation**
APPEARANCE AND ODOR	Solid, liquid, or gas? What does it look like? Can I see/smell it?	MSDS describes physical form/appearance, color, and odor (if any).
BOILING POINT	Is it a gas?	YES if boiling point is BELOW room temperature
EVAPORATION RATE (STANDARD = 1)	How FAST does it evaporate?	FASTER than standard if rate GREATER than 1. SLOWER than standard if rate LESS than 1.
VAPOR PRESSURE (mm Hg)	How much FORCE does the vapor exert inside a closed container?	Higher is more hazardous. Over 100 mm Hg may cause container to burst open upon exposure to heat.
VAPOR DENSITY (Air = 1)	Is it heavier than air or lighter than air?	HEAVIER if GREATER than 1. LIGHTER if LESS than 1.
SPECIFIC GRAVITY (Water = 1)	Is it heavier than water or lighter than water?	HEAVIER if GREATER than 1. LIGHTER if LESS than 1.
VOLUBILITY IN WATER	Is it soluble in water?	NO if volubility none or a number near zero.

Liquids that are not soluble in water either float (specific gravity less than 1) or sink (specific gravity greater than 1). Liquids that float on water present a special fire hazard. Water does not stop such liquids from burning. Instead, water spreads the fire.

Physical hazard information appears in the following sections of the MSDS.

- Fire and Explosion Hazard Data Section
- Reactivity Data Section
- Precautions for Safe Handling and Use Section

The following table summarizes the information you will find in the **Fire and Explosion Hazard Data Section of** the MSDS.

Data	Question Answered	Explanation
FLASH POINT	Is it a fire hazard? Is it flammable? Is it combustible?	YES if below 200°F. YES if below 100°F. YES if 100-200°F. Lower is more hazardous.
LEL and UEL	Can it explode in air?	YES if limits given. Low LEL or wide explosive range most hazardous.
EXTINGUISHING MEDIA	What material should be used to put out a fire?	Use protective equipment and special procedures given.
SPECIAL FIRE FIGHTING PROCEDURES	How should firefighters put out afire?	Use protective equipment and special procedures given.
UNUSUAL FIRE AND EXPLOSION HAZARDS	Is it a fire hazard? Can it explode?	YES if any information is given in either category.

Do *NOT* attempt to put out a chemical fire unless you have been specially trained to do so. Instead, sound the alarm and leave the area.

The following table summarizes the information you will find in the **Reactivity Data Section** of the MSDS.

Data	Question Answered	Explanation
STABILITY	Is it unstable? What conditions should be avoided?	YES if "Unstable" checked. Conditions to avoid are listed.
INCOMPATIBILITY	Is it reactive? What materials should be avoided?	YES if information given. Materials to avoid are listed.
HAZARDOUS DECOMPOSITION PRODUCTS	Does it produce or release a hazard when it decomposes?	YES if any products are listed.
Hazardous POLYMERIZATION	Can it occur? What conditions should be avoided?	YES if "May Occur" checked. Conditions to avoid are listed.

The following table summarizes the information you will find in the **Precautions for Safe Handling and Use Section** of the MSDS.

Data	Question Answered	Explanation
STEPS TO BE TAKEN IF MATERIAL IS SPILLED OR RELEASED	How do I clean up a spill or leak?	Follow specific steps and procedures given.
WASTE DISPOSAL METHOD	What is the proper waste disposal method?	Follow specific methods given and refer to any government regulations.

LESSON 6: MSDS HEALTH HAZARD INFORMATION

INTRODUCTION

In addition to physical hazard information, Material Safety Data Sheets contain a great deal of information about health hazards. In this lesson, you'll see how you can use the MSDS to identify the following

- Health hazards
- Exposure routes
- Health effects
- First-aid procedures
- Required protective equipment
- Special handling and storage precautions

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following

Describe different types of exposure limits.

Use health hazard data on an MSDS to answer the following questions about a chemical material:

Is it a health hazard?

What is the exposure limit?

How can I be exposed?

What can it do to me?

What first-aid procedures should I use?

What protective equipment is required?

What special precautions should I take?

LEARNING RESOURCES

- Videotape Segment 6: Health Hazard Information
- Workbook Application Exercise 6-1 Understanding MSDS Health Hazard Information
- Workbook Application Exercise 6-2: Using MSDS Health Hazard Information
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

1) Read the workbook introduction to Videotape Segment 6.

2) Watch Videotape Segment 6.

3) Complete Application Exercise 6-1 in this workbook,

4) Complete Application Exercise 6-2 in this workbook.

5) Read the lesson summary.

INTRODUCTION TO VIDEOTAPE SEGMENT 6:
MSDS Health Hazard Information

As you watch this videotape segment, first watch for the description of exposure limits. Then notice how you can use the MSDS to recognize carcinogens, exposure routes, and medical symptoms. Also pay close attention to the importance of knowing and using the correct frost-aid procedures in a medical emergency. Finally, learn how the MSDS helps protect you from health hazards by specifying particular types of protective equipment required and special handling and storage precautions.

Now, watch Videotape Segment 6.

NOTES

APPLICATION EXERCISE 6-1:
Understanding MSDS Health Hazard Information

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there maybe more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

1) Which question(s) can be answered by looking at exposure limits on an MSDS?

A) Is the material a health hazard?

B) Is breathing the material hazardous?

C) Is the material a carcinogen?

D) How much can be airborne?

E) Can I see or smell it?

2) Which type of exposure limits are set by OSHA?

A) TLVs

B) RELs

C) PELs

D) ANSI limits

APPLICATION EXERCISE 6-1:
Understanding MSDS Health Hazard Information

Answer	Additional Information
1) A B D	Exposure limits define the amount of chemical allowed in a given volume of air. Limits are set to define airborne levels that produce no ill health effects in most people, even if they are exposed every day for their entire working lives. If an exposure limit has been set, it means that the chemical is a health hazard. It also means that the chemical can become airborne, and that breathing too much of it can injure you or make you sick. Many chemicals — not just carcinogens — have exposure limits. Often, you cannot see or smell an airborne hazard even when it is present above its exposure limit.
2) C	*OSHA* sets *Permissible Exposure Limits,* or PELs. Compliance with PELs is mandatory, Compliance with other exposure limits is voluntary. • ACGIH (American Conference of Governmental Industrial Hygienists) recommends *Threshold Limit Values,* or TLVs. • NIOSH (National Institute of Occupational Safety and Health) proposes *Recommended Exposure Limits,* or RELs. • ANSI (American National Standards Institute) recommends limits set by a consensus of experts. • Chemical manufacturers may recommend their own exposure limits.

3) What must the MSDS tell you for EACH exposure route?

A) Exposure limits

B) Immediate health effects

C) Delayed health effects

D) First-aid procedures

4) If required, does the MSDS have to tell you the specific type of protective gloves and eyewear that you need?

A) Yes

B) No

Answer	Additional Information
3) A B C D	Health effects and first-aid procedures vary with the exposure route. Thus, MSDSs must identify known health effects and recommended first-aid procedures for each exposure route that may be hazardous. MSDSs must identify both immediate and delayed health effects. Immediate health effects appear right away, whereas delayed effects develop slowly over time, Exposure limits are set for airborne hazards, not for specific exposure routes.
4) A	MSDSs must specify the specific type of gloves or protective eyewear required. For example, impervious gloves and full-face protection are required for working safely with strong acids. The MSDS cannot simply say that gloves and eye protection are required.

APPLICATION EXERCISE 6-2:
Using Health Hazard Data on MSDSs

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

Locate the MSDS for Caustic Soda Beads in Appendix A and use this MSDS to answer the following questions.

---

1) *What* type of health hazard(s) does this material present?

A) Irritant

B) Corrosive

c) Target organ chemical

D) Reproductive hazard

E) Sensitizer

F) Carcinogen

2) What should you do if a co-worker accidentally swallows some of this chemical?

A) Try to make the person throw up

B) Get the victim to fresh air

C) Make the person drink a lot of water

D) Begin artificial respiration

Answer	Additional Information
	The MSDS for Caustic Soda Beads is located on pages A-6 to A-7 of Appendix A.
1) B	The Health Hazard Data Section, Section VI clearly identifies this material as a corrosive. It destroys body tissues upon contact, and it can cause serious burns, permanent blindness, or death upon ingestion. Although the effect of exposure can be only mild irritation, this material is not classified as an irritant. Irritants are capable of causing only minor health effects, not life-threatening or disabling burns. Section VI also tells you that neither the NTP, IARC, nor OSHA considers this material either a carcinogen or potential carcinogen. The MSDS does not identify any effects associated with entry into the bloodstream. This corrosive is a contact hazard, not a target *organ* chemical, reproductive hazard, or sensitizer.
2) c	The FIRST-AID PROCEDURES given in the Health Hazard Data Section give specific instructions for each exposure route. For ingestion, the MSDS recommends giving large amounts of water — provided that the victim is conscious. This is the correct procedure for ingestion of most corrosives. You should *NOT* try to make the victim throw up because the corrosive would burn as it came back up. For inhalation, the correct procedure is either to get the victim to fresh air (breathing) or to give artificial respiration (not breathing). Skin or eye contact calls for "flushing" the exposed area with water, which means running water over it for at least 15 minutes.

3) What type(s) of special protection tight be required to work safely with solutions of this material?

A) Air-supplied respirator

B) **Air-purifying** respirator

c) Chemical splash-proof goggles

D) Rubber gloves

E) Full-body protective clothing

Now go *back to page* 6-9, ***fold*** *over the right side of the page, and check your answers. Look on the back of the question page for* ***more*** *information on each question. If you are taking this course as a* ***self-study,*** *proceed to the Lesson* ***Summary*** *when you have finished.* ***If you are*** *taking this course in a classroom situation, wait for further instructions* ***from*** *your trainer when finished.*

Answer	Additional Information
3) B C D	Generally required protective equipment is identified in the Control Measures Section. This includes a respirator with a high efficiency filter to remove any corrosive mists or vapors. Rubber gloves, apron and chemical splash-proof goggles are also recommended.

LESSON 6 SUMMARY

Three sections of the MSDS contain specific information about health hazards.

- Hazardous Ingredients Section
- Health Hazard Data Section
- Control Measures Section

The following tablesurnmarizes the information you will find in the **Hazardous Ingredient Section.**

Data	Question Answered	Explanation
EXPOSURE LIMITS	Is it a health hazard? Is breathing it harmful? How much can be in the air, without causing adverse health effects in exposed individuals?	YES ifa limit is given. YES ifa limit is given. Limit gives parts of contaminant per million parts of contaminated air (ppm) or milligrams (mg) per cubic meter; PELs (Permissible Exposure Limits) are mandatory.

The following table summarizes the information you will find in the **Health Hazard Data Section,**

Data	Question Answered	Explanation
EXPOSURE HAZARDS	How can I be exposed? What can it do to me?	If any are known, MSDS must give both immediate and delayed health effects for each exposure route.
FIRST-AID PROCEDURES	What first-aid procedure should I use?	Follow the recommended procedure given for the person's exposure route and current condition.

The following table summarizes the information you will find in the **Control Measures Section.**

Data	Question Answered	Explanation
RESPIRATORY PROTECTION	Do I need respiratory PPE? What type do I need?	YES if any type listed. Air-supplied or specific type of air-purifying should be given.
VENTILATION	Is ventilation required? Is local exhaust needed? Is general needed? Isa special type needed?	YES if any identified. YES if section identifies. YES if section identifies. YES if section identifies.
PROTECTIVE GLOVES	Do I need gloves? What type do I need?	YES if any identified. MSDS must state type.
EYE PROTECTION	What type of eye protection do I need?	MSDS must state specific type needed.
OTHER PROTECTIVE EQUIPMENT	What other protective equipment is required?	Any lieted.

LESSON 7: USING LABELS AND THE HAZARDOUS CHEMICAL INVENTORY

INTRODUCTION

The Hazard Communication Standard requires the use of warning labels. It also requires a Hazardous Chemical Inventory that names all hazardous chemical materials in your workplace. In this lesson, you will see —

- what information these documents contain; and
- how to use the labels and Inventories available in your workplace.

LEARNING OBJECTIVES

When you have completed this lesson, you should be able to do the following:

Identify information that must be included on all warning labels.

Identify containers that do and do not require warning labels.

Use warning labels to identify information about chemical hazards and to locate MSDSs.

Describe the Hazardous Chemical Inventory and its uses.

List four types of chemicals excluded from OSHA'S labeling requirement.

LEARNING RESOURCES

- Videotape Segment 7: Labels and The Hazardous Chemical Inventory
- Workbook Application Exercise 7-1: Knowing About Labels and The Hazardous Chemical Inventory
- Workbook Application Exercise 7-2: Using Labels and The Hazardous Chemical Inventory
- Lesson Summary

DIRECTIONS FOR PROCEEDING

Complete the following steps in order. You might want to check off each step as you complete it.

____ 1) Read the workbook introduction to Videotape Segment 7.

2) Watch Videotape Segment 7.

3) Complete Application Exercise 7-1 in this workbook.

4) Complete Application Exercise 7-2 in this workbook.

____ 5) Read the Lesson Summary.

INTRODUCTION TO VIDEOTAPE SEGMENT 7:
Labels and The Hazardous Chemical Inventory

OSHA requires four written documents to help protect you from chemical hazards in the workplace.

- Warning labels
- Hazardous Chemical Inventory
- MSDSS
- Local Written Hazard Communication Program

As you watch this videotape segment, notice how these documents work together. Pay close attention to the information labels contain, and how you can use labels to help protect yourself from chemical hazards. Also watch for ways you can use the Hazardous Chemical Inventory in your workplace.

Now, watch Videotape Segment 7.

NOTES

APPLICATION EXERCISE 7-1:
Knowing About Labels and The Hazardous Chemical Inventory

Directions: Check or circle your answer(s) to each question, or write your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get more information about each question.

1) What information *MUST* be included on *EVERY warning* label?

A) **Name** of the chemical material

B) Chemical formula

C) Name and address of supplier or manufacturer

D) All appropriate hazard warnings

2) How can you find out about the hazards of chemicals traveling through your work area inside pipes?

A) Read the warning label — all pipes carrying chemicals must be labeled.

B) I must be informed by my employer — the OSHA Standard requires this.

C) Find out the name of the chemical and lookup its hazards on the Hazardous Chemical Inventory.

D) I have no right to know about the hazards of chemicals inside pipes because pipes are not considered containers.

Answer	Additional Information
1) A D	The Hazard Communication Standard says that every warning label MUST include: • **Name** of the chemical material . All appropriate hazard warnings Other information, such as a manufacturer's, importer's or other responsible party's name or address, may also be included, and usually is. But this information does not have to be on the label unless the container leaves the workplace.
2) B	The Hazard Communication Standard requires every employer to inform employees about the hazards of any chemicals contained in unlabeled pipes in their work area. The method used to do this must be described in the written Hazard Communication Program. Pipes do not have to be labeled because the Standard does not consider pipes to be containers. Containers that do require labels include bags, barrels, bottles, boxes, cans, cylinders, drums, reaction vessels, and storage tanks, or the like, that contain hazardous chemicals. The Hazardous Chemical Inventory is just that — an inventory or list of hazardous chemicals known to be present in the workplace. It does not contain specific hazard information.

3) Scott fills a one-gallon safety can with solvent. A few minutes later, Ellen picks up the same safety can and empties it into a parts washer. Does this safety can require a label?

A) Yes

B) No

4) Can the name used on a label differ from the name used on the Hazardous Chemical Inventory?

A) Yes

B) No

5) Suppose paint thinner IS on the Hazardous Chemical Inventory for your workplace. Which of the following is/are true?

A) Paint thinner is a chemical hazard.

B) Containers of paint thinner must be labeled.

C) An MSDS for paint thinner must be available.

Now go *back to page* **7-5,** *fold over the right side of the page, and check your answers, Look on the back of the question page for more information on each question. If you are taking this course as a self-study, continue to the Application Exercise 7-2, "Using Labels and The Hazardous Chemical Inventory, " when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.*

Answer	Additional Information
3) A	This safety can must be labeled because more than one worker uses it. Only transfer containers that meet *BOTH* of the following requirements are exempt from the labeling requirement. • Container used by only *ONE* worker; AND • Container filled AND emptied during the same shift.
4) B	The *SAME* name must be used on the label, the Hazardous Chemical Inventory, and the MSDS. OSHA requires use of the same name to make it easier to use the label or Inventory to find the right MSDS.
5) ABC	When a chemical *IS* included on the Hazardous Chemical Inventory, all of the following are true. . The chemical is found in your workplace. • The chemical is hazardous. . Containers of the chemical must be labeled. . An MSDS for the chemical must be readily accessible to you during your workshift, when you are in your work area.

APPLICATION EXERCISE 7-2:
Using Labels and The Hazardous Chemical inventory

*Directions: Check or **circle** your answer(s) to each question, or **write** your answer in the blank provided. Remember, there may be more than one correct choice for a question. When you complete the exercise, fold over the right side of the page to check your answers. Then turn the page to get **more** information about each question.*

---

*Appendix **C** contains a sample Hazardous Chemical **Inventory.** Use it to answer the following questions.*

---

1) Which of the following chemical hazards are used in the workplace to which this Hazardous Chemical Inventory applies?

A) Epoxy Paint - Blue Prime 107

B) Stop-Rust, Black

C) AC Dark Blue Gloss

D) Tight Seal

E) Clear Spray

2) Which brand of Anti-Freeze is **used in the** 239th Street Maintenance Shop?

A) Pioneer Oil

B) Texas Oil Co.

C) Titan Research

3) Is Blue Spray Paint used in the Pitkin Shop?

A) Yes

B) No

APPLICATION EXERCISE 7-2:
Using Labels and The Hazardous Chemical Inventory

Answer	Additional Information
1) B D E	Stop-Rust, Black; Tight Seal, and Clear Spray are included in the sample Hazardous Chemical Inventory in Appendix C. Make sure the name you are looking for matches the name on the Inventory exactly. Epoxy Paint - Blue 207 is on this Inventory, but Epoxy Paint Blue - *Prime 107* is not. Similarly, AC Dark Blue and AC *Light* Blue Gloss are on the Inventory, but AC *Dark* Blue Gloss is not.
2) B	Only Texas Oil Co. Anti-Freeze is listed for the 239th Street Maintenance Shop. When the Hazardous Chemical Inventory covers several different facilities, individual inventories maybe available for each facility. Similarly, specific Inventories may be put together for individual work areas.
3) B	Blue spray paint is used in five of the facilities covered by this Hazardous Chemical Inventory, but the Pitkin Shop is not listed as a "USE POINT,"

Locate the Hazard Warning Label for 1,1,1, -tricholoethane in Appendix B and use it to answer the following question.

_____

4) Can 1,1,1 trichloroethane cause a **fire?**

A) Yes

B) No

_____

Locate the DoD Hazard Warning Label for methanol in Appendix B and use it to answer the following question.

_____

5) What kind(s) of protection do you need when working with methanol?

A) Eyewear

B) Gloves

C) Respirator or ventilation system

_____

Now go back to page 7-9, fold over the right side of the page, and check your answers. Look on the back of the question page for more information on each question. Ifyou are taking this course as a self-study, proceed to the Lesson Summary when you have finished. If you are taking this course in a classroom situation, wait for further instructions from your trainer when finished.

Answer	Additional Information
	The warning label for 1,1,1 trichloroethane is located on page B-3 of Appendix B.
4) B	The label tells you that 1,1,1 trichloroethane *IS NOT* a fire hazard.
	The warning label for methanol is located on page B-2 of Appendix B.
5) ABC	The label for methanol warns you to protect your eyes, skin, and respiratory tract. You need to protect yourself against eye contact by wearing eye protection. The proper gloves can protect against skin contact, and a respirator or ventilation system protects against breathing hazardous airborne forms of the chemical

LESSON 7 SUMMARY

The Hazard Communication Standard requires the use of hazard warning labels that include —

- The name and identity of the chemical that matches the name and identity on the MSDS and Hazardous Chemical Inventory; *AND*
- *ALL* appropriate hazard warnings,

Labels on containers that leave the workplace must also contain the name and address of the responsible party. The warning label is often your first source of information about chemical hazards, The name and identity on the label can be used to find the right MSDS, where you will find additional information.

Warning labels must be affixed to bags, barrels, bottles, boxes, cans, cylinders, drums, reaction vessels, storage tanks, and other chemical containers. Placards or bin labels can be used for stationary containers as long as the placard clearly identifies the containers to which it applies, and provides the same information required for any other type of hazard warning label.

Pipes carrying chemicals do not have to be labeled, but you must be informed about the hazards of any chemicals carried through your work area in unlabeled pipes. A transfer container does not have to be labeled provided that only one person handles the container and the container is filled and emptied in the same shift.

The following types of chemicals are exempt from the OSHA labeling requirement because labelling is required by other federal laws.

- Pesticides covered by the Federal Insecticide, Fungicide, and Rodenticide Act (MSDSs must be available for pesticides).

- Food, food additives, color additives, drugs, cosmetics, and ingredients in these products covered by the Federal Food, Drug, and Cosmetic Act.

- Distilled spirits, wine, or malt beverages not intended for industrial use covered by the Federal Alcohol Administration Act. MSDSS must be available if the use of these products results in worker exposures significantly greater than those of consumers.

- Consumer products and hazardous substances covered by the Consumer Product Safety and Federal Hazardous Substances Acts. MSDSS must be available, if the use of these products results in worker exposures significantly greater than those of consumers.

The Hazardous Chemical Inventory must name all hazardous chemical materials currently found in your workplace. Containers of materials on the Hazardous Chemical Inventory must be labeled, tagged, or placarded and MSDSs must be available for every material on the Inventory. You can use the Inventory to find out whether a hazardous chemical material is used in your workplace. You can also use the Inventory to see if a material you work with is considered hazardous. If it is hazardous, it must be on the Hazardous Chemical Inventory.

Congratulations! You have now completed this course. It's time to put what you've learned to work. But remember to keep this workbook handy — it's your personal reference on working safely with chemical materials.

If you desire further information about the Hazard Communication Standard or about the information you've been studying in this course, contact:

_____

Name

_____

Title

at

_____

Telephone

APPENDIX A
MATERIAL SAFETY DATA SHEETS (MSDSs)

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatorv Form)
"Form Approved
OMB No. 1218-0072

IDENTITY (As used on Label and List)
Crystal Clear

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name AAA Chemicals	Emergency Telephone Number 215-555-2456
Address (Number, Street, City, State, and ZIP Coda) 100 A Street	Telephone Number for Information 215-555-2400
Anytown, NJ 99999	Oare Preperad 6/12/85
	Signature of Preparer (optional)

Section II - Hazardous Ingredients/Identity Information

Hazardous components (Specific Chemical Identity; common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (opponal)
Toluene	200 ppm	100 ppm		30
Methylene Chloride	500 ppm	100 ppm		25
Hexane	500 ppm	50 ppm		19
Propane	1000 ppm	N/A		10
Aromatic Naphtha (Stoddard Solvent)	500 ppm	100 ppm		2.0

Note: Propane functions as an aerosol propellant

section III — Physical/Chemical Characteristics

Boiling POmt	120°F	Specific Gravity (H_2O - 1)	0.96
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR - 1)	> 1	Evaporation Rate (Butyl Acetate = 1)	> 1

Solubility in Water
Insoluble

Appearance and Odor
Clear liquid with sweer, aromatic odor.

Section Iv — Fire and Explosion Hazard Data

Flash Point (Method Wad)	Flammable Limits	LEL	UEL
<20°F (For propellant)	N/A		

Extinguishing Media
Carbon Dioxide, Foam, Dry chemical

Special Fire Fighting Procedures
The contents are under pressure, when exposed to high temperature they will explode.

In case of fire, keep exposed containers cool.

Unusual Fire and Explosion Hazards
Contents are classified as "Extremelyflammable". They can be ignited readily.

NOTE : Fire Data is given for Propane, the most fire hazardous ingredient.

section V - Reactivity Data

Stability	Unstable		Conditions to Avoid Elevated (120° F) Temperature
	Stable	X	

Incompatibility (Materials to Avoid) Keep away from all corrosives and active metal (Aluminum, Magnesium, Strong Oxidizers.

Hazardous Decomposition or Byproducts Combustion Products: Carbon Monoxide; Carbon Dioxide, Phosgene; Hydrogen Chlori de.

Hazardous Polymerization	May Occur		Conditions to Avoid N/A
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry:	Inhalation? YES	Skin? YES	Ingestion? NO

Health Hazards (Acute and Chronic)
Central Nervous System Depressant - Symptons include: dizziness, disorientation, confusion. H ON iver & idney damage will result from long te rm over-exposure. Symptons of this:ef ect wil not be seen until years of exposure have existed.

Carcinogenicity:	NTP? YES	IARC Monographs? NO	OSHA Regulated? NO

Sgnsand Symptorna of Exposure
Worker may appear drunk or confused: headache: nausea: skin-dry and irritated.

Eyes - burning and irritation.

Medical Conditions Generally Aggravated by Exposure Liver, kidney, conditions and ethanol dependency, respiratory tract conditions.

Emergency and First Aid Procedures
Remove the victim to fresh air if vou can without harm to yourself. Begin CPR if breathing has stopped. For skin contact, 'ash with warm water. 'or 'ye contact' "ush with water for at least 15 minutes.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled
Remove source of ignition. Soak up with absorbent material, and placein closed container r. Ventilate area and place in closed container.

Waste Disposal Method
Dispose of as hazardous wastes in 'accordance with state and federal regulations.

Precautions to Be Taken in Handling and Storing
Do not store above 120" F. Excessive heat will cause containers to burst suddenly and violently. Combustion products are highly toxic.

Other Precautions
Vapors tend to collect in low areas.

Section VIII — Control Measures

Respiratory Protection (Specify Type)
Use self-contained breathing apparatus if vapor cone. above TLVS .

Ventilation	Local Exhaust Not normally required when vapors cone. less than TLVs.	Special N/A
	Mechanical (General) Will often be adeouate	Other N/A

Protective Gloves	Eye Protection
Neoprene or butyl rubber	goggl es

Other Protective Clothing or Equipment
Not normallyrequired for aerosol usage.

Work/Hygienic Practices
N/A

☆U.S. Government Printing Office: 1 987—181-804/64362

Material Safety Data Sheet

May be usad to comply with OSHA's Hazard Communication Standard, 29 CFR 191 O,12QO. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label end List)
Automatic Transmission Fluid

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section 1

Manufacturer's Name Some Chemical Company	Emergency Telephone Number 318-555-5214
Address (Number, Street, City, State, and ZIP Code) P.O.Box 3758	Telephone Number for Information 318-555-5000
Anytown, OK 74000	Date Prepared 2/26/86
	Signature of Preparer (optional)

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Refined Oils (Oil mist)	5mg/m3	5mg/m3	10 mg/m3 (STEL)	87-95 %
Anti - Oxidant				3-12 %
Dye and Additives				<1.0 %

Section III - Physical/Chemical Characteristics

Boiling Point (327°C)	620°F	Specific Gravity (H_2O - 1)	0.87
Vapor Pressure (mm Hg.)	2.7	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate - 1)	N/A

Solubility in Water
Negligible

Appearance and Odor
Red oily liquid, slight oily odor

section Iv — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
202°C (395°F) (Cot)		N/A	N/A

Extinguishing Media Carbon Dioxide, dry chemical, foam or water fog. Do not use direct stream of water - product will float and can be reignited on surface of water.

Special Fim Fighting Procedures Do not enter confined fire space without full Bunker gear, including a positive pressure NIOSH - approved self-contained breathing apparatus.

Unusual Fire and Explosion Hazards
Water used to extinguish may cause frothing.

Burning liquid will float on water.

Section V – Reactivity Data

Stability			Conditions to Avoid
	unstable		None
	Stable	X	Heat, open flames, oxidizing materials

Incompatibility (Materials to Avoid)
Strong oxidizer

Hazardous Decomposition or Byproducts Combustion may result in a complex mixture of air borne solids, liquids and gases. Carbon monoxide and other unidentified organic compounds.

Hazardous Polymerization			Conditions to Avoid
	May Occur		None
	Will Not Occur	x	

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	YES	NO	YES

Health Hazards (Acute and Chronic) Vapors and mists may cause drowsiness, dizziness, headache, nausea, and respiratory tract irritation. Mist in massive exposure may cause pneumonitis. Ingestionn may cause stomach irritation and iarrhea. CHRONIC: Repeated contact with skin may cause drying, cracking, and dermatitis.

Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
	NO	NO	NO

Signs and Symptoms of Exposure
Drowiness, headache, nausea, respiratory tract irritation. skin irritation.

Medical Conditions Generally Aggravated by Exposure personnel with pre-existing skin or respiratory disorders should . avoid contact with this product.

Emergency and First Aid Procedures Remove overcome victim to fresh air and provide oxygen if breathing is difficult. Begin artifical respiration if not breathing. Flush eves and skin with water for 15 minutes or more. Do not induce vomiting. Get medical attention.

section VII - Precautions for Sofa Handling ● nd Use

Steps to Be Taken in Case Material Is Released or Spilled
Dike spill, soak up on absorbent material and dispose of properly. Flush area with water to remove trace residues. Remove large spill with vacuum trucks or pump to storage

Waste Disposal Method
Dispose of in accordance with EPA and state and local rules.

Precautions to Be Taken in Handling and Storing
Keep away from extreme heat and open flame.

Other Precautions
May"burn although not readily ignitable.

Section VIII - Control Measures

Respiratory Protection (Specify Type)
Not normally needed.

Ventilation		
	Local Exhaust: Not normally needed.	Special: N/A
	Mechanical (General)	Other

Protective Gloves Chemical resistant gloves to minimize skin contact. Oil proof for prolonged use, NITRILE.

Eye Protection Safety goggles.

Other Protective Clothing or Equipment Protective clothing as required to minimize skin contact. Shc misting be anticipated, use MIST respirator or organic vapor.

Work/Hygienic Practices Minimize skin contact. Wash hands with plenty of soap and water after use. Remove oil-soaked clothing and launder before re-use. Properly dispose of contaminate leather articles, including shoes, that cannot be decontaminated.

☆U.S. Government Printing Office: 1987—181-804/64362

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard *must be* consulted for specific requirements.

U.S. Department of Labor

Occupational safety and Health Administration
(Non-Mandatorv Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)*
CAUSTIC SODA BEADS

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name Some Importer Inc.	Emergency Telephone Number 304-555-1515
Address (Number, Street, City, stem. end ZIP Code) 12 Edgar Street	Telephone Number for Information 304-555-1500
Somerville, New Jersey 17272	Date Prepared 2/12/84
	Signature of Preparer *(optional)*

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(a))	OSHA PEL	ACGIH nv	Other Limits Recommended	% *(optional)*
Sodium Hydroxide (caustic soda; soda lyr; lyr)	2mg/m3	2 mg/m3 - ceiling		100Z

Section III - Physical/Chemical Characteristics

Mung Point	1390°C	Specific Gravity (H_2O = 1)	2.13
vapor Pressure (mm Hg.)	0	Melting Point	318°C
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate -1)	1

Solubility in Water
50g/100g

Appearance and Odor
White powder, no odor

Section IV — Fire and Explosion Hazard Data

Flesh Point (Method Used) None - non combustible	Flammable Limits N/A	LEL N/A	UEL N/A

Extinguishing Media
Flood with water using care not to splatter or splash.

Special Fire Fighting Procedures
Wear full protective clothing and self-contained breathing apparatus when fighting fires involving this material.

Unusual Fire and Explosion Hazards
Not combustible but solid form in cotact with moisture or water may generate sufficient heat to ignite combustible material.

Section V - Reactivity Date

Stability	Unstable		Conditions to Avoid
	stable	x	None

Incompatibility (Materials to Avoid) Water, acids, flammable materials, chlorinated hydrocarbon, aluminum, tin, zinc, nitro compounds.

Hazardous Decomposition or Byproducts
None

Hazardous Polymerization	May Occur		Conditions to Avoid
			None
	Will Not Occur	X	

Section VI — Health Hazard Date

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	YES	YES	YES

Health Hazards (Acute and Chronic) ACUTE : Mild irritation to major destructive burns. Destructive to all urman tissue contacts. ve contact can cause blindness. Ingestion can burn mouth, throat, and stomach and may be fatal. Inhalation of mist may be corrosive to upper respiratory tract.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	NO	NO	NO

Signs and symptoms of Exposure
Burning: Inhalationof dust or mi st vary from minor irritation to severe burning of upper respiratory tract.

Medical Conditions
Generally Aggravated by Exposure Impaired pulmonary function or other respiratory tract disorder. Chronic skin or eye disorders.

Emergency and First Aid Procedures Wash immediately with water. For inhalation, get to fresh air. For ingestion, give large amounts of water. Do not induce vomiting.

Section VII — Precautions for Safe Handling and Uee

Steps to Be Taken in Case Material Is Released or Spilled
Wear protective equipment to prevent skin and eye contact. Promptly shovel into suitable container. Avoid dust generation.

Waste Disposal Method
Follow local, state and federal regulations. Dilute well with water and carefully neutralize with acid.

Precautions to Be Taken in Handling and Storing Store away from incompatible materials noted above. Store in well-sealed containers In a dry location, avoid dust Generation. Sodium hydroxide will attack some forms of plastics, rubber and coatings.

Other Precautions
When working with solutions, full body protection may be required.

Section VIII - control Measures

Respiratory Protection (Specify Type)
Air purifying with High Efficiency Filter.

Ventilation	Local Exhaust	Special
	N/A	N/A
	Mechanical (General)	Other
	N/A	N/A

Protective Gloves	Eye Protection
Rubber *(See precautions section)	Dust and chemical splash-proof safety gog s

Other Protective Clothing or Equipment
Rubber *apron, rubber *boots (see precautions section)

Work/Hygienic Practices Eye wash and safety showers must be immediately available. Eating and smoking should not be permiited in areas where sodium hydroxide is stored.

*U.S. Government Printing Office:1987—181-604/64362

*See "Guide for the Selection of Chemical Protective Clothing", 3rd Edition, Vol. II
A. D. Little (for EPA and U. S. Coast Guard)

MATERIAL SAFETY DATA SHEET

IDENTITY
Methanol/Wood Alcohol

SECTION I

Manufacturer's Name A Chemical Company	Emergency Telephone Number 215-555-6500
Address 1500 Beacon Street	Telephone Number for Information 215-555-1207
Some City, NJ 99999	Date Prepared 11/09/85

SECTION 11 - Hazardous Ingredients /Identity Information

Methanol (Wood alcohol; wood naphtha)	200 ppm	200 ppm	100%

SECTION III - Physical/Chemical Characteristics

Boiling Point:	64.51°C	Specific Gravity (H20 = 1)	0.7924
Vapor Pressure: @ 20°C	97.30	Melting Point	-97.8°C
Vapor Density:	1.1	*Evaporation Rate*	5.9

Volubility in Water: Complete

Appearance and Odor: Clear, colorless, liquid with an alcohol odor.

SECTION IV - Fire and Explosion Hazard Data:

Flash Point (Method Used)	Flammable Limits	LEL	UEL
11°C (52°F) (Closed cup)		6.0%	36%

Extinguishing Media:
Dry chemical, foam, carbon dioxide, water fog.

Special Fire Fighting Procedures:
Use water spray tokeep exposed containers. cool. Water spray may be used to disperse liquid and dilute to nonflammable mixture. Do not enter confined fire space without full Bunker gear, including a positive pressure NIOSH-approved self-contained breathing apparatus.

Unusual Fire and Explosion Hazards:
Fire exposed containers will explode. Vapors are heavier than air and may travel a considerable distance to an ignition source and flashback.

SECTION V - Reactivity Data:

Stability Unstable Conditions to Avoid: Heat, sparks, open flame, contact with strong oxidizers.
Stable x

Incompatibility (Materials to Avoid):
Oxidizers, active metals such as Aluminum and Zinc.

Hazardous Decomposition or Byproducts: (Combustion) Carbon Dioxide, Carbon Monoxide, Aldehydes and unidentified organic compounds.

Conditions to Avoid: N/A

Will Not Occur: X

SECTION VI - Health Hazard Data:

Routes of Entry:	Inhalation?	Skin?	Ingestion?
	YES	YES	YES

Health Hazards (Acute and Chronic):
ACUTE : Drowiness, drunkenness, headache, eye irritation and visual disturbances leading to blindness, coughing, shortness of breath and respiratory tract irritation. In extreme cases can result in collapse and death. Eye irritation may occur.
CHRONIC : Prolonged and repeated skin contact can result in dermatitis. Will be absorbed through the intact skin. Prolonged or repeated over-exposure by all routes can result in damage to the central nervous system, liver, kidneys and eyes, blindness and death.

Carcinogenicity:	NTP	ARC Monographs?	OSHA Regulated?
	NO	NO	NO

A 1985 publication reported teratogenicity in rats inhaling 20,000 ppm 7 hours/day during gestation with little maternal toxicity (Fund. Appl. Tox. 5:727 1985).

Signs and Symptoms of Exposure:
Irritation to nose, throat, respiratory tract and eyes. Headache, dizziness, nausea; changes in urinary output; edema; loss of appetite; jaundice; fatigue.

Medical Conditions: Impaired liver and kidney functions; eye disease; skin and respiratory disorders.

Emergency and First Aid Procedures: Ingestion: Induce vomiting; Inhalation: If overcome by exposure, move the victim immediately to fresh air and provide oxygen if breathing difficult. Keep warm and quiet administer artifical respiration if not breathing. Get medical attention. For eye and skin contact, flush with water for 15 minutes.

SECTION VII - Precautions for Safe Handling and Use:

Steps to be taken in Case Material is Released or Spilled: Dike the spill, eliminate sources of ignition. For large spills, evacuate hazard area. Soak up spill with absorbent material and place in non-leaking containers. Do not flush into drains. Use only grounded equipment to prevent sparking. Wear appropriate protective clothing and equipment. Suppress vapor cloud with water fog.

Waste Disposal Method: May be incinerated or disposed of as a hazardous waste in an approved land fill. Refer to latest EPA or state regulations regarding proper disposal.

Precautions to Be Taken in Handling and Storing:
Store in tightly closed vented containers away from heat, flame, sparks and oxidizing agents. Ground & Bond when dispensing. Use non-sparking tools. Extinguish pilot lights and other sources of ignition until all vapors are gone.

Other Precautions:
Do not reuse contaminated clothing or shoes until cleaned.

SECTION VIII - Control Measures:

Respiratory Protection (Specify Type)
Air-supplied only.

Ventilation: Local Exhaust: Explosion-proof ventilation should be used to control vapor accumulation.

Mechanical (General):
Explosion-proof

Special:
Explosion-proof ventilation.

Other:
N/A

Protective Gloves:
Impervious, chemical resistant

Eye Protection: Splash proof safety glasses or goggles as appropriate.

Other Protective Clothing or Equipment:
Chemical protective aprons, boots, and face shield as necessary when splashing may occur.

Work/Hygienic Practices:
Avoid prolonged or repeated contact with skin.
DO NOT USE AIR PURIFYING RESPIRATOR: METHANOL HAS POOR WARNING PROPERTIES AND CARTRIDGES HAVE VERY SHORT BREAK-THROUGH TIMES.

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Labs/SW List)
732 Selant

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name 12 Smith Company	Emergency Telephone Number I 517-555-3905
Address (Number, Street, City, State, and ZIP Code) 12 Smith Street	Telephone Number for Information I 517-555-3900
Whalen, DE 99999	Date Prepared 2/2/85
	Signature of Preparer (optional)

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Ace t oxysilane	10 ppm*	10 ppm*		5

*Based on TLV for Acetic Acid which is liberated in curing .

Section III — Physical/Chemical Characteristics

Boiling Point	300°F	Specific Gravity (H_2O = 1)	1.05
Vapor Pressure (mm Hg.)	5	Mailing Point	N/A
Vapor Density (AIR . 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	1

Solubility m Water
0.1g/100g

Appearance and Odor
Vinegar odor, colored paste

section Iv — Fire and Explosion Hazard Data

Flash Point (Method used)	Flammable Limits	La	UEL
250°F (open cup)		UNK	UNK

Extinguishing Media
Class B

Special Fire Fighting Procedures
Use self contained breathing apparatus to protect against evolved acetic acid.

Unusual Fire and Explosion Hazards
None

Section V - Reactivity Date

Stability	Unstable		Conditions to Avoid Air and moisture causes the material to polymerize.
	Stable	x	Liberating acetic acid.

Incompatibility [Materials to Avoid]
Strong oxidizers can cause the material react, liberating acetic acid.

Hazardous Decomposition or Byproducts
Combustion: Carbon Monoxide 50 ppm; Carbon Dioxide 5000 ppm.

Hazardous Polymerization	May Occur		Conditions to Avoid N/A
	Will Not Occur	x	

Section VI - Health Hazard Date

Route(s) of Entry:	Inhalation? YES	Skin? YES	Ingestion? NO

Health Hazards (Acute and Chronic)
ACUTE : Will irritate the eye and skin, causing reddening and burning due to acetic acid action. Irritation of the upper respiratory system (nose, throat) may occur if the product is applied over a large area. CHRONIC: None.

Carcinogenicity:	NTP? NO	IARC Monographs? NO	OSHA Regulated? NO

Signs and Symptoms of Exposure
Skin irritation, burning, eye irritation.

Medical Conditions Generally Aggravated by Exposure Bronchitis

Emergency and First Aid Procedures Promptly flush eyes with water for at least 15 minutes. Wash with water. Respiratory irritation is transient (short lived). Remove from exposure if irritation occurs.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled
Soak up on absorbent material.

Waste Disposal Method
Dispose of as normal waste in accordance with state and federal relations.

Precautions to Be Taken in Handling and Storing
Store below 90°F. Exceesive heat could cause premature reaction (curing) and liberation of acetic acid.

Other Precautions
N/A

Section VIII - control Measures

Respiratory Protection (Specify Type)
Organic Vapor.

Ventilation	Local Exhaust Not normally required	Special N/A
	Mechanical (General) Usually adequat e	N / A

Protective Gloves	Eye Protection
Rubber or plastic recommended	Goggles

Other Protective Clothing or Equipment
N/A

Work/Hygienic Practices
N/A

● U.S. Government Printing Office: 1987—181-504/64262

Material Safety Data Sheet

May be used to comply with OSHA's Harard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)
Gasoline

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name Some Oil Company	Emergency Telephone Number 914-555-3400 X214
Address (Number, Street, City, State, and ZIP Code) 100 Industrial Drive	Telephone Number for Information 914-555-3400 X570
Some City, TX 99999	Data Prepared November 20, 1987
	Signature of Preparer (optional)

section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH nv	Other Recommended	% (optional)
Blend of Carbon 6 - Carbon 10		900 mg/m3		
Alipatic/parafinic hydrocarbons				
BENZENE	1 ppm	10 ppm	0.8-2.0	
Organic Lead Compounds			varies	
Toluene	200 ppm	100 ppm		
Xylene	100 ppm	100 ppm		
Unleaded premium gasoline		300 ppm/500 ppm	short term exposure limit	

Section III - Physical/Chemical Characteristics

Boiling Point	90-410"F	Specific Gravity (H_2O = 1)	0.72-0.76
Vapor Pressure (mm Hg.)	400	m -	N/A
vapor Density (AIR - 1)	3-4	Evaporation Rate (Butyl Acetate = 1)	1

Solubility in Water
Insoluble

Appearance and Odor
Pink liquid, aromatic odor

Section Iv — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	La	UEL
40"F (tag closed)		1.4	7.6

Extinguishing Media Dry chemical, Carbon Dioxide, Foam, water fog (product will float and can be reignited on surface of water).

Special Fire Fighting Procedures Cool storage drums with water mist. Evacuate area. Prevent run-off from entering water supply. Do not enter confined space without appropriate Protective equipment.

Unusual Fire and Explosion Hazards Water may be ineffective on gasoline fires. Extremely flammable. Vapor accumulation could flash and/or explode.

Gasoline

Section V — Reactivity Data

stability	Unstable		Conditions to Avoid Prevent vapor accumulation.
	Stable	X	Heat, open flame, sparks and strong oxidizing agents.

Incompatibility (Materials to Avoid)
Oxidizers, acids, bases

Hazardous Decomposition or Byproducts
Carbon Dioxide, Carbon Monoxide and other unidentified organic compounds.

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section Vi — Health Hazard Data

Route(s) of Entry	Inhalation?	Skin?	Ingestion?
	YES	YES	YES

Health Hazards (Acute and Chronic) ACUTE : Irritation of eyes, nose and throat. May cause "drunkeness" if exposure is massive. Harmful or fatal, if swallowed.

CHRONIC: Vomiting, diarrhea, insomnia, headache, dizziness, anemia, muscle and nerve damage." Aplastic anemia and leukemia may be caused by Benzene content. Gasoline containing more than 0.1% Benzene must be labeled warning of the Benzene toxicity. Prolonged or repeated skin contact causes dermatitis.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	YES (Benzene 0.1%)	YES (Benzene 0.1%)	YES (Benzene 0.1%)

Signs and Symptoms of Exposure
Irritation of eyes, nose, throat, nausea, vomiting, diarrhea, insomnia, headache, giddiness, dizziness.

Medical Conditions Generally Aggravated by Exposure Nerve disease; eye, skin and respiratory disorders; impaired liver or kidney function.

Emergency and First Aid Procedures Remove overcome victim from the exposure. Begin artificial respiration, get medical attention. If skin and eyes are involved, flush with water immediately and for at least 15 minutes. Ingestion - do not induce vomiting.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled Dike spill, soak up small spills with absorbent material. Eliminate all ignition sources. Remove leaking containers to detached area. Runoff may create fire or explosion hazard in sewer system. For major spills, get upwind and notify local emergency personnel.

Waste Disposal Method
May be incinerated. Product recovery or recycling recommended. Absorbent should be disposed of and as an ignitable hazardous waste.

Precautions to Be Taken in Handling and Storing Store away from heat sparks and open flames. Keep away from oxidizers, acids, bases. Drums may be grounded' and bonded and equipped with self closing valves.

Other Precautions Gasoline may contain organic lead compounds. These will significantly increase the toxicity of gasoline. Lead poisoning has been the cause of death when gasoline was ingested. Do not siphon by mouth.

Section VIII - Control Measures

Respiratory Protection (Specify Type)
Organic vapor.

Ventilation	Local Exhaust General ventilation. Use explosion proof ventilation to prevent vapor accumulation.	Special N/A
	Mechanical (General) YES, explosion-proof.	Other N/A

Protective Gloves Impervious	Eye Protection Splash proof chemical safety goggles.

Other Protective Clothing or Equipment Use in well ventilated area away from ignition sources. Wash with soap and water after handling.

Work/Hygienic Practices

U.S. Government Printing Office: 1987—181-506/64362

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
{Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)*
Stainless Steel Cleaner

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, me space must be marked to indicate that.

section I

Manufacturer's Name The Phone Corporation	Emergency Telephone Number 602-253-8805
Address *(Number, Street, City, State, and ZIP Cola)* 111 West Main Street	Telephone Number *for* Information 602-991-6000
Phoenix, AZ 85111	Date Prepared 5/26187
	Signature of Preparer *(optional)*

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH nv	Other Limits Recommended	% *(optional)*
Stainless Steel Cleaner	N/A	N/A		100
Sodium Linear Dodecylbenzene Sulfonate	N/A	N/A		
Sodium Silica Fluoride	2.5 mg/m3 (as fluoride dust)	2.5 mg/m3		
Sulfamic Acid	N/A	N/A		
Silica Flour	N/A	0.1 ❑e/m3 (resp . dust)		
Diatomaceous Earth	80 mg/m3 (7. SiO2)	1.5 mg/m3 (resp. dust)		
Starch		5 mg/m3 (resp. dust)		

Section m — Physical/Chemical Characteristics

Boiling Pans	N/A	Specific Gravity (H_2O = 1)	1.1
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
Moderate

Appearance and Odor
Off-white abrasive powder with pleasant odor

Section Iv — Fire and Explosion Hazard Data

Flash Pores (Method Used)	Flammable Limits	LEL	UEL
Nonflammable		N/A	N/A

Extinguishing Media
Water or other media suitable for surrounding fire.

Special Fire Fighting Procedures Cool fire-exposed containers with water. Under extreme heat, use self-contained breathing apparatus. Wear Protective clothing.

Unusual Fire and Explosion Hazards Dry powdered material builds static charge when subject *to* friction. Use with care around flammable liquids.

(Reproduce locally)

OSHA 174, Sept. 1985

Section V - Reactivity Data

Stability			Conditions to Avoid
	Unstable		Extreme heat
	Stable	x	

Incompatibility (*Materials to Avoid*) Ammonia, chlorine-, nitric acid, hydrochloric acid, strong alka powerful oxidizers

Hazardous Decomposition or Byproducts
Sulfur Oxides, Toxic Fluorine Compounds, Carbon Monoxide, Ammonium bisulfate

Hazardous Polymerization			Conditions to Avoid
	May Occur		
	Will Na Occur	x	

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	YES	YES	YES

Health Hazards (*Acute and Chronic*)

Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
	No	No	No

Signs and Symptoms of Exposure
Irritation of the upper respiratory tract and eyes. Symptoms include coughing, dypsnea, sneezing, throat irritation. Skin cotact may produce irritation and drying.

Medical Conditions Generally *Aggravated* by Exposure Impaired respiratory f unct ion.

Emergency and First Aid Procedures Flush eyes and skin for at least15 minutes. Inhalation - remove to fresh air. continuted irritation or difficulty in breathing, get medical attention.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled
Sweep up and containerize. Vacuuming or wet sweeping may be used to avoid dust dispersed.

Waste Disposal Method
Dispose in accordance with federal and state regulations.

Precautions to Be Taken in Handling and Storing
Store in cool dry ventilated area Protect against physical damage wash thoroughly after handling.

Other Precautions
Prevent dust suspension.

Section VIII -control Measures

Respiratory Protection (*Specify Type*)
NIOSH-approved Dust Respirator

Ventilation	Local Exhaust	Special
	Preferred, if silica dust exposure high	N/A
	Mechanical (*General*)	Other
	See above	N/A

Protective Gloves	Eye Protection
General purpose	Safety goggles

Other Protective Clothing or Equipment
Lab coats, uniforms or overalls

Work/Hygienic Practices
Launder soiled clothing.

★U.S. Government Printing Office: 1987—181-864/64363

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)*
STEEL ALLOYS

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name A *Steel* Company	Emergency Telephone Number 213-555-1111
Address *(Number, Street, City, State, and ZIP code)* 189 Eighth *Street*	Telephone Number for Information 213-555-5307
Sometown, MI 99999	Date Prepared 12/12/85
	Signature of Preparer *(optional)*

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% *(optional)*
Iron	10 mg/m3	5 mg/m3	(As Iron Oxide)	90-100
Carbon	3.5 mg/m3			.01-1.5
Chromium	0.5 mg/m3	(sol. salts) 0.5 mg/m3		.01-12
Manganese	5 mg/m3 (ceiling)	5 mg/m3	(as dust celing)	.05-2.0
Nickel	1 mg/m3 (ceiling)	1 mg/m3		01-10
Lead	0.05 mg/m3	0.15 mg/m3	(dust & fume	.15- .35
Tungsten	--	--		0-18

section III — Physical/Chemical Characteristics

Boiling Pours	5000°F	Specific Gravity (H_2O = 1)	7.8-8.2
Vapor Pressure (mm Hg.)	N/A	Melting Point	Approx. 2500°F
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water
Insoluble

Appearance and Odor
Gray - Black metal, odorless

Section Iv — Fire and Explosion Hazard Data

Flash Point (Method Used) N/A - 'not combustible	Flammable Limits	LEL N/A	UEL N/A

Extinguishing Media
N/A

Special Fire Fighting Procedures
N/A

unusual Fire and Explosion Hazards

(Reproduce locally)

OSHA 174, Sept. 1985

Section V – Reactivity Date

Stability	Unstable		Conditions to Avoid
	Stable	X	None

Incompatibility (*Materials to Avoid*)
ReaCts with strong acides to liberate explosive hydrogen gas

Hazardous Decomposition or Byproducts
Metallic oxides

Hazardous Polymerization	May Occur		Conditions to Avoid N/A
	Will Not Occur	x	

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	YES	NO	YES

Health Hazards (Acute end *Chronic*) ACUTE: Inhalation of fumes may result in chill and fever for 12 to 48 hours. Metal fume fever - metallic taste, throat irritation and flu-like symptoms.
CHRONIC: ". Chromium manganese and nickel fumes may cause lung disease, lead fumes can carnage kidneys and affect muscle strength.

Carcinogenicity:	NTP?	IARC Monographs?	Regulated?
	YES - nickel & chromium	YES - nickel & chromium	- NO

Signs and Symptoms of Exposure
Dust, welding fumes: Metallic taste: nausea; tightness of chest, fever, irritation of eyes, nose, throat and skin.

Medical Conditions Generally Aggravated by Exposure Chronic lung disease; allergic conditions.

Emergency and First Aid Procedures
Dust, welding fumes: Remove to fresh air. Eye/skin *contact:* Flush with water.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled
Chips and dust should be swept up and placed in suitable container.

Waste Disposal Method
Dispose of as hazardous waste: follow applicable regulations.

Precautions to Be Taken in Handling and Storing
Use good housekeeping tominimize particle accumulation.

Other Precautions
Ventilate welding, brazing, burning and grinding operations.

Section VIII — Control Measures

Respiratory Protection (*Specify Type*)
Dust/fume respirator.

Ventilation	Local Exhaust	Special
	Required for welding, grinding operations.	N/A
	Mechanical (*General*) N/A	Other N/A

Protective Gloves	Eye Protection
As needed based on operation	As needed

Other Protective Clothing or Equipment
Maybe needed for grinding, welding, etc.

Work/Hygienic Practices
N/A

● U cows,.mmt Printing Office 1987—181-505/64362

APPENDIX B
HAZARD WARNING LABELS

Chemical/Common Name: Methanol, Wood Alcohol

NSN/LSN: 5910-01-018-3021 Part Number: 5160-081

tern Name:

HAZARD CODE

HAZARDS

	ACUTE (IMMEDIATE) NONE	SLIGHT	MODERATE	SEVERE	CHRONIC (DELAYED)
HEALTH				X	X
CONTACT		•1			
FIRE			n	u	m
REACTIVITY		X	•1		•1

SPECIFIC HAZARDS and PRECAUTIONS (INCLUDING TARGET ORGAN EFFECTS)

DANGER! Flammable Liquid

Acute: Overexposure to vapors may cause drowsiness, headache, nausea, visual disturbances, blindness. May irritate lungs and cause coughing, shortness of breath, collapse and death. Liquid is absorbed through intact skin. Causes skin and eye irritation.

Chronic: May damage the central nervous system; may cause liver enlargement; may cause blindness.

Flammable! Avoid oxidizers, active metals, e.g. aluminum, zinc.

PROTECT: EYE ☐ SKIN ☐ RESPIRATORY ☐

Name ABC Chemical Company

Address 2345 Flower Street, Any City, NW 00078

Emergency Telephone (978) 555-0987

See MSDS for Further Information

Chemical/Common Name: 1,1,1-Trichloroethane, Methyl Chloroform

NSN/LSN: 6810-00-292-9625 Part Number: O-T-620

Item Name: 1,1, 1-Trichloroethane, Technical

HAZARD CODE

HAZARDS

	ACUTE (IMMEDIATE) NONE	SLIGHT	MODERATE	SEVERE	CHRONIC (DELAYED)
HEALTH	☐	•1	•1	X	X
CONTACT	☐	•1	☐	☐	
FIRE	☐	X	•1	•1	
REACTIVITY	X	•1	c1	•1	

SPECIFIC HAZARDS and PRECAUTIONS (INCLUDING TARGET ORGAN EFFECTS)

DANGER :

Acute: Overexposure to vapors may cause headache, dizziness, unconsciousness, irregular heart beat and death. Prolonged or repeated skin contact may cause skin irritation.

Chronic: High concentration may cause reproductive abnormalities. Avoid open flames and high temperatures; in fire, highly toxic fumes emmited.

PROTECT: EYE ☐ SKIN ☐ RESPIRATORY ☐

Name ABC Chemical Company

Address 2345 Spring Street, Anytown, TA 00234

Emergency Telephone (987) 555-0987

See MSDS for Further Informallon

CHEMICAL NAME

HAZARD:
Irritant, Moderate Eye

CAUTION!

MAY CAUSE EYE IRRITATION
Avoid contact with eyes.
Wash thoroughly after handling
FIRST AID: In case of contact immediately flush eyes with plenty of water.
Call a physician if irritation persists.

For additional information, see Matenat Safety Oats Sheet (MSDS) for this chemical

ABC CHEMICAL COMPANY

One Industrial Drive
Anytown, NJOSO1O

CHEMICAL NAME

HAZARDS.
Irritant. Severe Respiratory
Toxic by Absorbtion
Liquid

WARNING!

CAUSES RESPIRATORY TRACT IRRITATION
HARMFUL IF ABSORBED THROUGH SKIN

Avoid breathing vapor or mist
Avoid contact with eyes, skin, ● nd clothing.
Keep container closed.
use with adequate ventilation.
Waeh thoroughly after handling.

FIRST AID: If inhaled, remove to fresh air. If not breathing, give artificial respiration. if breathing is difficult. give oxygen. Cail a physician.

in case of contact immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

For additional information, see Material Safety Data Sheet (MSDS) for this chemical

ABC CHEMICAL COMPANY
One Industrial Drive
Anytown, NJ 06010

CHEMICAL NAME

HAZARDS OF MIXTURE.
Irritant. Severs Skin. Moderate Eye
Kidney Damage (Delayed) Baaed on Animal Data
Nervous System Damage (Delayed) Based on Animal Data
Components A and B Contribute Substantially to the Hazards

WARNING!

CAUSES SKIN ANO MAY CAUSE EYE IRRITATION

CONTAINS "A" WHICH MAY CAUSE KIDNEY DAMAGE AND NERVOUS SYSTEM EFFECTS BASED ON ANIMAL DATA

Risk of damage and effects depends upon duration and level of exposure

Avoid contact with eyes, skin end clothing.
Wash thoroughly after handing.
FIRST AID: In case of contact, immediately flush eyes and skin with plenty of water. Caft a physician. Wash clothing before reuse.
Contains 8.

For additional information, see Material Safety Data Sheet (MSDS) for this material.

ABC CHEMICAL COMPANY
One Industrial Drive
Anytown, NJ 08010

CHEMICAL NAME

HAZARDS OF MIXTURE.
strong Sensitizer. Lungs
Irritant. Severe Eya
Reproductive System Effects Based on Animal Data

DANGER!

MAY CAUSE SEVERE ALLERGIC RESPIRATORY REACTION
CAUSES EYE IRRITATION

CONTAINS MATERIAL WHICH MAY CAUSE REPRODUCTIVE SYSTEM EFFECTS BASED ON ANIMAL DATA

Do not breath dust or vapor.
Avoid contact with eyes.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handing.

FIRST AID: If inhaled, remove to trash air. li not breathing, give artificial respiration. it breathing is difficult, give oxygen. in case of contact, immediately flush eyes with plenty of water for at least 15 minutes Get medical ● ttentron immediately. Remove material irom skin and clothing.

Before using, read Material Safety Data Sheet (MSDS) for this material.

ABC CHEMICAL COMPANY
One Industrial Drive
Anytown, NJ 0S010

APPENDIX C
HAZARDOUS CHEMICAL INVENTORY

Product Name	Manufacturer	Use Point
Acetone	Best Chemical Corp	Pitkin Shop
AC Dark Blue Lacquer	American Paint Co.	Base Shop East Base Shop East Depot Yukon Depot
AC Lt. Blue Lacquer	American Paint Co.	Base Shop East Base Shop East Depot Walnut Depot Yukon Depot
Air Lube	Panfax oil Corp.	Base Shop East Base Shop
All-Purpose Cutting Fluid	Jones Industrial Corp.	Maintenance Shop
Ammonia	Weston Chemical	Plant Service Jamaica Shop
Anti-Freeze	Texas Oil Co.	East Depot 239th Street Maintenance Shop
Blue Spray Paint	Presto Paints	East Shop East Depot Paint Shop Walnut Depot Yukon Depot
Clear Spray	Chemco	Power Test Station
Contact Adhesive D-220	Jones Industrial Corp.	Pitkin Shops
Epoxy Paint - Beige 201	Federated Paints	Paint Shop
Epoxy Paint - Blue 207	Federated Paints	Paint Shop
Freon 22	Applied Gases	Maintenance Shop Pelham Shop Pitkin Shop
Grease Lube, Dimethyl Polysiloxane	Freehold Products	East Base Shop Maintenance Shop
Light Hydraulic Oil	Texas Oil Co.	Plant Maintenance

Product Name	Manufacturer	use Point
Linseed Oil	Smith Brothers	Power Test Station Truck Storage Yard
Methanol/Wood Alcohol	Chemco	East Depot
Mercury	Best Chemical Corp.	Pitkin Shop
No, 901 Cleaner	Jones Industrial Corp.	Maintenance Shop
Parts Cleaning Fluid	Grover Parks	Maintenance Shop
Potassium Silver Cyanide	Best Chemical Corp.	Pitkin Shop
Refrigeration Oil	Sunco	East Depot Jerome Shop
Sodium Hydroxide	ZZ Chemicals	Pitkin Shop
Soluble Cutting Oil	Panfax oil Corp.	Maintenance Shop Machine Shop
Stop-Rust, Black	National Paint Co.	East Depot Signal Shop
Sulfuric Acid	Best Chemical Corp.	Signal Shop
Tight-Bond Cement	Jones Industrial Corp.	Car Repair Shop
Tight-Seal	Jones Industrial Corp.	East Base Shop Walnut Depot
Trisodium Phosphate	H.B.II. Corporation	Pitkin Shop
Urethahold	Jones Coatings	East Base Shop Jerome Shop
ZZ-Off	ZZ Chemicals	Signal Shop
1,1,1-Trichloroethane	Best Chemical Corp.	Base Shop Signal Shop

APPENDIX D
GLOSSARY

Administrative Controls
Use of information, training, shift schedules, work practices, housekeeping, and monitoring to reduce or eliminate exposures.

Airborne
Word used to describe something that is in the air.

Air-Purifying Respirator
Type of personal protective equipment that uses a special inter or chemical cartridge to remove specific airborne hazards from contaminated air before the wearer inhales it.

Air-Supplied Respirator
Type of personal protective equipment that supplies the air that the wearer breathes; includes self-contained breathing apparatus and hose-type supplied-air units.

Barrier Cream
Protective cream applied to the skin to protect against skin contact/absorption hazards; often used in addition to gloves.

Boiling Point
Temperature at which a liquid changes into a gas.

Carcinogen
Health hazard that causes cancer in the exposed individual.

Chemical Container
Bags, barrels, bottles, boxes, cans, cylinders, drums, reaction vessels, storage tanks, and other vessels used to hold chemicals.

Chemical Formula
Way of identifying chemical materials by showing the number of each type of atom contained in one molecule of the chemical.

Chemical Hazard
Any chemical material that can cause health problems, fire, explosion, or other dangerous situations.

Combustible Liquid
Liquid having a flash point at or above 100°F, but below 200°F.

Combustion
The process of burning.

Compressed Gas
Gas stored inside a container at a pressure much higher than normal air pressure; contains a lot of stored energy; a physical hazard due to the potential for sudden release of the stored energy when the gas expands.

Condensation
Process by which an airborne vapor becomes a mist or free.

Corrosive
Health hazard that burns on contact, causing visible damage and/or irreversible changes to body tissues; also a physical hazard that can burn through inert materials.

Cryogenic
Health hazard that freezes body tissues on contact.

Cubic Meter
A cube measuring 1 meter on each side.

Decomposition Product
Chemical that forms when a material breaks down into simpler molecules; maybe hazardous even if the parent material is not.

Degree of Hazard
Measure of how serious an exposure is based on what can happen as a result; takes into account the chemical, exposure route, dosage, number and length of exposures, and individual differences.

Delayed Effect
Health effect that appears slowly over time, rather than right away; can be associated with either single or repeated exposures.

Dermatitis
Cracked, broken, dry skin caused by exposure to health hazards that remove fat from the skin; inflammation of the skin caused by direct contact or systemic exposure to hazardous chemicals.

Dosage
Amount of chemical that enters the body over a specified period of time.

Dust
Airborne particles formed from solids.

Engineering Controls
Use of substitution, isolation, or ventilation to reduce exposure to chemical hazards and the injury or illness caused by such exposure.

Environmental Monitoring
Type of administrative control that involves collecting, measuring, and analyzing air or wipe samples of chemical substances to determine whether a hazard exists, or whether a known hazard is being effectively controlled.

Esophagus
Tube that leads from the throat to the stomach.

Evaporate
Process by which liquids change into the vapor form.

Evaporation Rate
Physical data on the MSDS that describes how fast a liquid evaporates in comparison to a standard having a rate of 1.

Explosive "
Chemical material that can undergo a sudden and violent release of pressure and heat.

Explosive Limits
Data on the MSDS that define the ranges of air-chemical mixtures that can explode when exposed to an ignition source; see Upper and Lower Explosive Limits.

Exposure Limit
The maximum amount of chemical in a given volume of air to which workers maybe exposed, as averaged over a specified period of time. Most people can be exposed to this airborne limit for an entire working lifetime without developing health effects.

Exposure Symptom
Health effect produced by exposure to a chemical material, such as headache or skin irritation.

Extinguishing Medium
Chemical used to put out a fire.

Eye Contact Hazard
Chemical material that damages or irritates the eye on contact or is systemically absorbed (with either with the bulk chemical or its airborne forms), or that can be absorbed through the eyes; an exposure route.

Chemical Family
Name given to a group of chemicals having related structures or properties (e.g., aliphatic hydrocarbons).

Fire Hazard
Chemical material that ignites and bums easily, or that cause or supports fire in other materials; includes pyrophorics, flammables, combustibles, and oxidizers.

Flammable Liquid
Liquid having a flash point below 100”F.

Flash Point
Lowest temperature at which a liquid gives off enough vapor to ignite in the presence of an ignition source.

Fume
Tiny airborne particles that can form when a solid is melted.

Gas
Physical form of a chemical that is easily compressed and expands to fill its container; has a boiling point below room temperature.

General Ventilation
Type of ventilation system that is used to mix an airborne a hazard with fresh air to dilute it and reduce its concentration to safe levels.

Hazard Communication program
Written document that describes how an employer or facility complies with all requirements of the Federal Hazard Communication Standard (29 CFR 1910.1200).

Hazard Communication Standard
Federal law developed by OSHA to reduce illness and injury caused by chemical hazards in the workplace; requires evaluation of chemical hazards and communication of hazard information to both employers and employees.

Hazard Determination (or Evaluation)
Process of finding out whether a chemical material is hazardous and what the hazards are.

Hazardous **Chemical Inventory**
List of all hazardous chemicals known to be present in a given workplace; identity/name of chemicals used on this list must match the identity/name used on the warning labels and MSDSs.

Hazardous Ingredient
Chemical in a mixture that presents either a physical hazard or a health hazard.

Health Hazard
Any chemical material that can cause illness or injury when a person is exposed by ingestion, skin or eye contact, skin absorption, or inhalation.

High Toxicity
Description applying to chemicals that can produce either life-threatening or seriously disabling health effects.

Housekeeping
An administrative control that involves containing and removing chemical hazards — e.g., vacuuming, proper storage and handling, prompt removal and correct disposal of chemical wastes.

IARC
International Agency for Research on Cancer.

Immediate Effect
Health effect that appears right away — either during the exposure or shortly afterwards.

Industrial Hygienist
Expert in the recognition, evaluation, and control of safety and health hazards.

Ingestion
The way that a chemical enters the body ifyou swallow it; an exposure route.

Ingredient
See Hazardous Ingredient.

Inhalation
The way that a chemical enters the body when you breathe it through your nose or mouth; an exposure route.

International Agency for Research on Cancer (IARC)
Agency that evaluates the research data on substances tested for their carcinogenic potential. IARC publishes information on carcinogens and potential carcinogens. The IARC listing is one of the references that must be used to identify cancer-causing chemicals on MSDSs.

Irritant
Health hazard that reacts with body tissues at the point of contact causing reddening, itching, tearing, irritation, and/or minor inflammation.

Isolation
Engineering control that involves using an enclosure, barrier, or safe distance to separate workers from exposure hazards.

LEL
See Lower Explosive Limit.

Liquid
Physical form of a chemical that has no definite shape, but takes the shape of its container; has a boiling point above room temperature.

Local Exhaust Ventilation
Type of ventilation system that captures an airborne hazard as it is released at the source and takes it out of the workplace.

Low Toxicity
Description applying to chemicals that produce only minor health effects — effects that usually go away with or without medical attention when exposure stops.

Lower Explosive Limit (LEL)
Data on the MSDS that defines the minimum amount of airborne chemical that must be present in an air-chemical mixture to make it explosive.

Material Safety Data Sheet (MSDS)
Written document that identifies a chemical material; gives its physical propertied describes known physical hazards, health hazards, and required controls; and identifies correct procedures for putting out fire, cleaning up a spill or leak, disposing of waste, and handling/storing the material safely.

Medical Monitoring
Type of administrative control that involves physical examinations and/or lab tests to establish an individual's baseline health status and check the effectiveness of other controls used to protect an individual from health hazards.

mg/m^3
See Milligrams Per Cubic Meter.

Milligrams Per Cubic Meter (mg/m^3)
Unit used to express exposure limits; defines the mass of chemical contaminantt (in milligrams) allowed in each cubic meter volume of air.

Mist
Airborne form of a liquid chemical; consists of tiny droplets.

Mixture
Material that contains more than one chemical.

Moderate Toxicity
Description applying to chemicals that produce health effects requiring medical attention, damage may be permanent but is neither life-threatening nor seriously disabling.

Monitoring
An administrative control that checks the effectiveness of other controls by analyzing air samples, wipe samples, and personal exposure levels; may involve medical monitoring.

MSDS
See Material Ssfety Data Sheet.

Mutagen
Reproductive hazard that causes genetic changes in sperm or egg cells.

National Toxicology Program (NTP)
Organization that funds and conducts research on chemical substances. NTP publishes lists of carcinogens and potential carcinogen this list is one of the reference sources that must be used to identify cancer-causing chemicals on MSDSS.

NTP
See National Toxicology Program.

Occupational Safety and Health Administration (OSHA)
Federal agency within the Department of Labor that develops and enforces standards for workplace safety and health.

OSHA
See Occupational Safety and Health Administration.

Oxidizer
Chemical material that supplies the oxygen required to start or support fire. Common oxidizers include chlorine gas, oxygen and peroxides.

Parts Per Million (ppm)
Unit used to express exposure limits; defines parts of the chemical allowed in each one million (1,000,000) parts of the air-chemical mixture.

PEL
See Permissible Exposure Limit.

Permissible Exposure Limit (PEL)
Exposure limit set and enforced by OSHA. (See Exposure Limit).

Personal Monitoring
Type of administrative control that involves the worker's wearing a badge or other sampling device to measure exposure to a chemical hazard in the workplace.

Personal Protective Equipment (PPE)
Equipment that protects the individual who wears it by placing a barrier between that individual and a hazard; includes protective eyewear, face shields and masks, gloves, boots, hats, clothing, and respirators.

Physical/Chemical Characteristics
Information on the MSDS that describes the appearance, odor, boiling point, vapor pressure, vapor density, evaporation rate, specific gravity, and water volubility of a chemical material.

Physical Hazard
Any chemical material that can cause fire, explosion, violent chemical reactions, or other similarly hazardous situations.

Polymerization Hazard
Unstable chemical that undergoes a violent reaction and release of energy that produces or releases a hazard when two or more small molecules combine (self-react) to form large molecules called polymers.

PPE
See Personal Protective Equipment.

PPM
See Parts Per Million.

Pyrophoric
Chemical material that spontaneously bursts into flame when exposed to air at temperatures below 130°F; no ignition source is needed.

Reactive Chemical
Material that reacts violently on contact with certain other chemical materials to produce or release a hazard.

Recommended Exposure Limit (REL)
Exposure limit recommended by the National Institute for Occupational Safety and Health (NIOSH).

REL
See Recommended Exposure Limit.

Reproductive Hazard
Health hazard that targets the human reproductive system; category that includes teratogens and mutagens.

Sensitizer
Health hazard that produces an allergic-like reaction in some people after repeated exposure.

Skin Absorption
Way that some chemicals pass through the skin on contact and enter the bloodstream; an exposure route.

Skin Contact Hazard
Chemical material that damages or irritates the skin on contact; an exposure route.

Smoke
An airborne mixture of fire gases, dust, and fumes.

Solid
Physical form of a chemical that has a definite shape.

Volubility in Water
Physical data element on the MSDS that describes whether or not a material dissolves in water.

Specific Gravity
Physical data on the MSDS that describes whether a liquid is lighter or heavier than water.

Substitution
Engineering control that involves replacing a chemical, process, or piece of equipment with a less hazardous one.

Target Organ Chemical
Health hazard that enters the bloodstream and damages specific internal organs or body systems; effects can be delayed.

Teratogen
Reproductive hazard that damages the fetus during its development.

Threshold Limit Value (TLV)
Exposure limit recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). (See Exposure Limit).

TLV
See Threshold Limit Value.

Toxicity
Description of the degree of health hazard associated with exposure to a chemical; see Low, Moderate, and High Toxicity.

Transfer Container
Chemical container that does not require labels because only one person handles the container, and it is filled and emptied during the same shift.

UEL
See Upper Explosive Limit.

Unstable Chemical
Material that violently self-reacts under commonly occurring conditions; a type of physical hazard.

Upper Explosive Limit (UEL)
The maximum amount of airborne chemical that can he present in an air-chemical mixture and still have it be explosive.

Vapor
One airborne form of a liquid chemical.

Vapor Density
Physical data that describes whether the vapor formed by a material is lighter or heavier than air.

Vapor Pressure
Force exerted on the walls of a closed container of liquid by vapor formed above the liquid surface.

Vaporization
Process by which liquids become airborne.

Ventilation
Engineering control that reduces airborne exposure levels either by mixing the hazard with fresh air, or by removing it as it is released at the source.

Warning Label
Document affixed to chemical containers (or posted by stationary containers) that identifies the chemical material and all appropriate hazard warnings.

Water-Reactive
Chemical material that reacts with water or moist air to produce or release a hazard.

Work Practices
Procedures normally used to do the job.