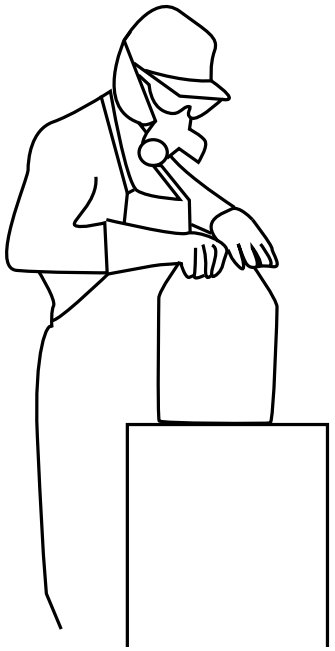
Working Safely Around Hazardous Substances

For the Fruit and Vegetable Preserving and Specialty Manufacturing Industry



K-STATE Research and Extension
Kansas State University

"Knowledge for Life"

Working Safely Around Hazardous Substances

Contents

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What's Inside?

This manual provides important guidelines for working safely around hazardous substances, including chemicals, hot liquids and steam.

Safety tips, along with real accident reports, have been combined to give you a better understanding of the risks of working around hazardous substances and what you can do to avoid accidents. Use this manual along with hands-on safety training, Material Safety Data Sheets (MSDSs), labels and the equipment operator's manual.

Lesson 1

Objectives

1. Identify the causes of serious injury and illness from hazardous substances.

2. Recall frequently used terms found on labels and in Material Safety Data Sheets (MSDSs).

Take Control of Your Own Safety

What are Hazardous Substances?

Hazardous substances are chemicals and other substances that can affect your health — causing injury, illness or death. They may be cleaning supplies, paints, adhesives, hot liquids, steam or any other substance that may harm your health. These substances can be liquid, solid, vapors, gases or dust. The most common causes of serious injury or illness from hazardous substances are:

1. Skin and Eye Contact

Accident Report
Employee's Eyes Burned with Sodium Hydroxide

Summary of OSHA Accident Investigation 120178488
A group of employees was moving a tank that had contained sodium hydroxide. Several unlabeled pipes were attached to the tanks. One of the pipes broke and sprayed sodium hydroxide on an employee, burning his eyes. His eyes were flushed at an eye wash station, but needed treatment by a specialist. None of the employees were wearing eye protection.

Follow lockout/tagout procedures. Make a plan with your supervisor to protect yourself and others before servicing pipes or equipment that contain hazardous substances.

2. Breathing Gases and Vapors

Accident Report
Employee Inhales Chlorine Gas, Taken to Hospital

Summary of OSHA Accident Investigation 301213013
An employee was unclogging a sink. The sink contained bleach and other products. The employee poured in drain cleaner containing sulfuric acid. The acid reacted with the bleach and released chlorine gas. He was overcome by the gas and hospitalized for one week.

Never mix chemicals without reading labels and understanding their chemical reactions.

3. Swallowing Hazardous Substances

Accident Report
Employee Burned after Drinking Disinfectant

Summary of OSHA Accident Investigation 120259288
An employee placed her drinking cup down in the breakroom as she left to use the restroom. When she returned, she picked up a cup and began drinking. It was not the same cup she had put down. The liquid in the cup burned her mouth and throat because it contained disinfectant. She was immediately taken to the emergency room and treated for chemical burns to the mouth and throat.

Never store chemicals in unlabeled containers. Never handle or store chemicals near food or drink.

4. Fires and Explosions

Accident Report
Employee Dies from Explosion

Summary of NIOSH FACE Program Report Number 00MA04201
An employee was using a torch to cut the lid off an empty chemical drum. He had been told not to do this because the drum contained chemical vapors. The drum exploded, killing him.

Know your company procedures when working with flammables.

Help Yourself

Safe work habits are important. Take the following actions to be safe on the job.

1. Plan Ahead

Before you begin, learn all you can about the hazardous substances you use.

2. Reduce Exposure

Keep hazardous substances from contacting your skin and eyes. Use protective equipment. Provide ventilation to prevent breathing in hazardous substances.

3. Be Prepared for Accidents

Always assume that any mixture will be more hazardous than the substances alone. Treat all unknown substances as hazardous. Know what to do in an emergency.

LABELING

If you transfer a substance from its orginal container into an unlabeled portable container, label the portable container with the following information:

- *name of the hazardous substance*
- *warning information*

Report any unlabeled substance to your supervisor immediately.

Warning From the Label of a Lubricant

DANGER:

CONTENTS ARE FLAMMABLE:
Keep spray away from heat, sparks, pilot lights, open flames, etc. Unplug electrical tools, motors and appliances before spraying or bringing the can near any source of electricity.

ELECTRICITY MAY BURN HOLE IN CAN AND CAUSE CONTENTS TO BURST INTO FLAMES:
To avoid serious burn injury, do not let the can touch battery terminals, electrical connections on motors or appliances, or any other source of electricity.

BREATHING HAZARD:
Use only in well ventilated areas. Do not breathe vapor or spray mist. DELIBERATE OR DIRECT INHALATION OF VAPOR OR SPRAY MIST MAY BE HARMFUL OR FATAL.

CONTENTS UNDER PRESSURE:
Do not store above 120 degrees F. Do not place can on hot surfaces or in direct sunlight: Heat may cause can to burst violently. Do not puncture, crush or incinerate (burn) can, even when empty.

FIRST AID: **Ingestion:** CONTAINS PETROLEUM DISTILLATES. Harmful or fatal if swallowed. If swallowed, do not induce vomiting. Call physician immediately. **Eye Contact:** Immediately flush eyes with large amounts of water for 15 minutes. **Skin Contact:** Wash with soap and water. **Inhalation (breathing):** Remove to fresh air. Give artifical respiration or oxygen, if necessary.

Know the Risks

Check the labels and Material Safety Data Sheets (MSDSs).

Labels on containers give the following information:

- name of the hazardous substance
- warning
- name and address of manufacturer

MSDSs give more details on how to use, handle and store chemicals safely. MSDSs may look different but all will contain the following basic information:

- product name
- chemical name
- routes of entry
- health hazards
- chemical and physical characteristics
- protective measures
- personal protective equipment (PPE)
- safe handling
- emergency and first-aid
- use and storage

If there is no label or MSDS, you should report it to your supervisor immediately.

MSDS Example

Material Safety Data Sheet

Occupational Safety and Health Adminstration

1. Product Identification

Manufacturer's Name:	Emergency Telephone No:
Address:	
Chemical Name:	Trade Name:
Chemical Family:	Formula:

2. Ingredient Information

3. Hazard Identification

Boiling Point	Specific Gravity
Vapor Pressure	Percent Volatile by Volume
Vapor Density	Evaporation Rate
Solubility in Water	
Appearance & Odor	

4. First Aid

Flash Point:	Flammable Limits:
Extinguishing Media:	
Special Fire Fighting Procedures:	
Unusual Fire and Explosion Hazards:	

5. Fire Fighting Measures

Stability	Unstable		Conditions to Avoid
	Stable		
Incompatability (*Materials to Avoid*)			
Hazardous Decomposition			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

6. Accidental Release

Route(s) of Entry	Inhalation	Skin	Ingestion
Health Hazards			
Carcinogenicity	NTP	IARC Monographs	OSHA Regulated
Signs and Symptoms of Exposure			
Medical Conditions Generally Agravated by Exposure			
Emergency and First Aid Procedures			

7. Handling and Storage

Steps to Be Taken in Case Material Is Released or Spilled
Waste Disposal Method
Precautions to Be Taken in Handling and Storing
Other Precautions

8. Personal Protection

Respiratory Precautions *(Specify Type)*		
Ventilation	Local Exhaust	Special
	Mechanical *(General)*	Other
Protective Gloves		Eye Protection
Other Protective Clothing or Equipment		
Work Hygiene Practices		

Basic Terms Found on Labels and MSDSs

Acute Effects – can occur after one-time exposure.

Chronic Effects – Generally occur as a result of repeated exposure.

Corrosives – such as acids and bases, can burn the skin and eyes. Acidity and alkalinity are measured on a pH scale. The scale is from 0-14, with 7 being neutral. Measurements of less than 7 are acidic and greater than 7 are alkalinic. The closer the substance measures to the ends of the scale (0 or 14) the more corrosive.

Explosives – may explode when they are exposed to heat or flame.

Flammables – can catch fire easily, burn rapidly, spread quickly and give off intense heat.

Irritants – are not corrosive, but cause irritation at the site of contact.

Reactive – substances may be unstable and should be used with extreme caution. They may burn, explode or undergo other dangerous chemical reactions.

Route of Entry – is how a substance enters the body, such as through inhalation (breathing), skin absorption or ingestion (swallowing).

Sensitizers – can cause allergic reactions.

Toxicity – is how poisonous a substance is. If allowed to enter the body through the skin, eyes, mouth or nose, in certain doses, it can make you sick.

Quiz Yourself

Answers can be found on page 41.

Use the list of words to fill in the blanks:

label
reactive
eyes
store

1. Hazardous substances may enter the body through contact with the nose, mouth or skin and _____.

2. If there is no _____ or MSDS you should report it to your supervisor immediately.

3. A _____ substance is unstable and should be used with extreme caution.

4. The MSDS gives more detailed information on how to handle, use and _____ chemicals safely.

Avoid Skin and Eye Contact with Hazardous Substances

Some chemicals, such as acids and bases can burn your skin. Other chemicals such as oil-based solvents can pass through your skin and enter your blood stream making you sick. Still other chemicals can cause rashes and skin reactions. When your skin is extremely dry and chapped or has been damaged from cuts, abrasions, rashes or exposure to hot water and detergent, it is easier for chemicals to pass through the skin and cause illness.

Chemical exposure to any part of the eye can cause slight irritation to total blindess. The seriousness depends on the substance and how long it had contact with the eye.

Accident Report
Employee Burned by Boiling Water and Caustic Soda

Summary of OSHA Accident Investigation 111878476
An employee was cleaning the inside of a pressure cooker. He turned on the water and steam to fill the cooker. Then he added caustic soda as a cleaning agent. The caustic soda reacted violently with the hot water and steam causing the mixture to spew out on the employee, burning him severely.

Make a plan with your supervisor to protect yourself before attempting a new task.

Work Safely

- Read the label and MSDS.
- Follow directions and wear the necessary personal protective equipment (PPE).
- Open containers carefully to prevent spills and splashes.
- Use a funnel to prevent spills while pouring.
- Pour slowly and carefully to prevent splashes.
- Clean up spills and splashes immediately.
- Close the container tightly when finished.
- Keep surfaces free of chemicals.
- Wash your hands if chemicals contact your skin.
- Remove clothing immediately if it contacts a hazardous substance.
- Wash hands after you remove personal protective equipment.
- Wash your hands with soap and water at every break.
- Do not eat or store food or drink in areas where hazardous substances are used or stored.
- If in doubt, stop and immediately ask your supervisor.

Lesson 2

Objectives

1. Identify safe work practices that can prevent skin and eye contact with hazardous substances.
2. Identify protective eyewear.
3. Recall basic first aid for treating minor burns and contact with hazardous substances.

Prevent Contact

Pour slowly and carefully, don't splash or spill. Never wear open-toed or canvas shoes when working around chemicals. Keep your feet covered and protected.

Always wear gloves, proper eye protection and all necessary personal protective equipment when handling hazardous substances.

You must wash your hands and face BEFORE you:

- Put in or remove contact lenses
- Use the restroom
- Put on makeup
- Eat
- Drink
- Chew gum
- Smoke or chew tobacco
- Take medication

Personal Protective Equipment

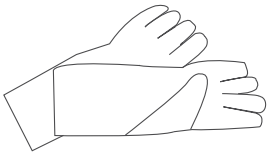
Accident Report
Employee Hospitalized from Caustic Soda Splash to Face

Summary of OSHA Accident Investigation 127364776

An employee was loosening a drain trap to repair it. When it came loose, caustic soda splashed his nose, mouth and eyes. He was hospitalized for burns. Before he began this task his supervisor had told him there might be caustic soda in the drain.

Make a plan with your supervisor to protect yourself and others before opening pipes or equipment that may contain hazardous substances.

Protect Your Hands



- Wear gloves whenever you may come in contact with hazardous or unknown substances.
- Make sure the gloves are compatible with the chemical you are handling.
- Inspect gloves before you wear them and throw them away if there is a leak or if they become tacky, discolored or hardened.
- Don't touch your face, hair or clothing with contaminated gloves.
- Don't spread chemicals by touching clean surfaces with contaminated gloves.

NO GLOVE IS COMPATIBLE WITH EVERY CHEMICAL.
For more information on glove materials and their protection:
http://www.hazmat.msu.edu:591/glove_guide/

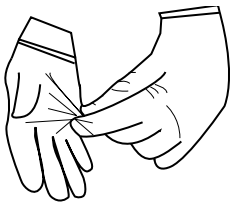
Chemical Resistant Gloves

Below are some pros and cons of glove materials you may use at your job. Contact your supervisor or glove manufacturer when selecting gloves.

Glove Material	Pros	Cons	Protects Against
Natural rubber (latex)	*Low cost, good physical properties, and easy to wear while working*	*Poor vs. oils and greases*	*Bases, alcohols, water-based solutions*
Neoprene	*Medium cost, medium chemical resistance, medium physical properties*	*Poor vs chlorinated hydrocarbons.*	*Acids, phenol, and glycol ethers*
Nitrile	*Low cost, excellent physical properties, and easy to wear while working*	*Poor vs. benzene, methylene chloride, chlorinated substances, and many ketones*	*Oils, greases*

How to Remove Disposable Gloves

1.



- Pinch one glove without touching the skin.
- Peel away the glove from your hand, turning it inside-out.
- Hold the remove gloved in the gloved hand.

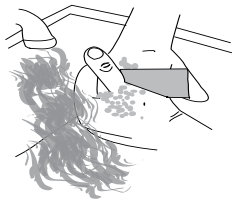
2.

- Carefully, slide ungloved finger under wrist of the gloved hand.
- Peel off from inside, so that both gloves are "bagged".

3.

- Dispose of "bagged" gloves.

4.



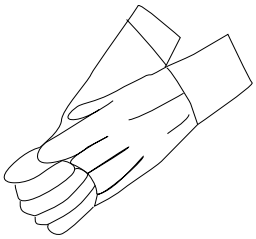
- Always wash hands with soap and water after glove removal.

Work Safely

- ☐ Read Lables
  Are there hazardous contents?
- ☐ Follow Required Precautions
  Are you wearing the necessary PPE?
- ☐ Handle Safely
  How can you prevent a splash or spill?
- ☐ Select Properly
  Is the chemical appropriate for the task?
- ☐ Mix Properly
  Are you mixing chemicals that can react?
- ☐ Store Properly
  Did you close the container tightly?

How to Remove Reusable Gloves

1.

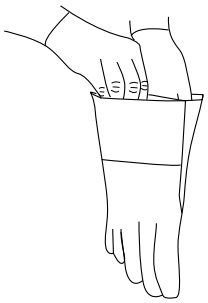


- Slowly begin removing one glove with the other gloved hand.

2.

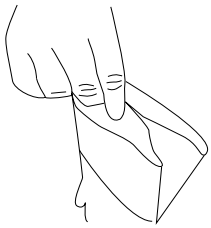
- Alternate with the other gloved hand, slowly and carefully working each glove off. Don't touch the gloved hand to the skin.

3.



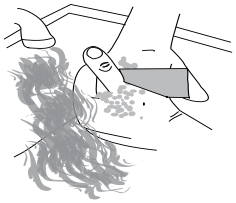
- when one hand is free, use it to grab both gloves from the inside, uncontaminated portion.

4.



- Pinch and hold gloves on the inside, uncontaminated portion.

5.



- Always wash hands with soap and water after glove removal.

Protect Your Feet

- Keep your feet covered and protected. Never wear open-toed shoes or canvas shoes when working around hazardous substances.

Protect Your Body

- Keep your body covered to minimize skin contact with hazardous substances.
- Wear an apron for extra protection.

Protect Your Face

- A face shield protects your skin, not eyes. If you wear a face shield you must wear approved eye protection.

Accident Report
Employee Seriously Burned by Chemical Mixture

Summary of OSHA Accident Investigation 125670042

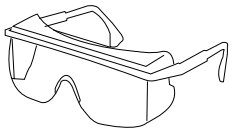
An employee was cleaning a tank in a food processing plant. This process required him to: 1) fill the tank with cold water 2) add caustic solution 3) heat the water. He ran out of caustic solution and went to look for more. Before he left, he decided to begin heating the water. He couldn't find the usual caustic solution so he added a different material to the already hot water. The tank erupted immediately. He was hospitalized for four days with second degree burns.

Do not take risky shortcuts; always follow instructions. Wear personal protective equipment when working with hazardous substances.

Protect Your Eyes

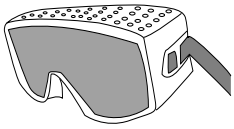
- Wear eye protection whenever a substance might contact the eye.
- Your eye protection must bear the Z87 label.
- Make sure your eye protection is comfortable, fits properly over any prescription glasses and is appropriate for the task.

Understanding Eye and Face Protection



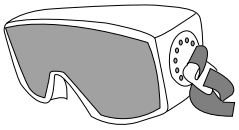
Only protects you from impact such as flying particles.

Safety Glasses



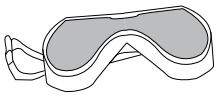
Only protects you from impact such as flying particles.

Safety Goggles
Direct vent



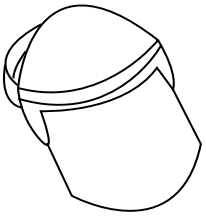
Protects you from impact and splashing liquids.

Safety Goggles
Indirect vent



Protects you from impact, splash and vapors.

Safety Goggles
No vent



Only protects your skin, not your eyes. Use only with approved eye protection.

Face Shield

Where You Can Find Skin/Eye Information on the MSDS

The following is an example of some of the information you might find on an MSDS for caustic soda solution (Sodium Hydroxide).

2. INGREDIENT INFORMATION
90% SODIUM HYDROXIDE
10% INERT

3. HAZARD IDENTIFICATION
EMERGENCY OVERVIEW
Causes severe eye burns. Causes severe skin burns.POTENTIAL HEALTH EFFECTS
EYE: May cause serious irritation and can lead to vision impairment and blindess.
SKIN: Short single exposure may cause corrosive skin burns.

4. FIRST AID:
EYE: Immediately wash eyes with water. Seek medical attention immediately. Hold eyelids open and continuously flush eyes with water until help arrives. Do not use soap.
SKIN: Remove clothing and immediately shower with large amounts of water. Seek medical attention immediately. Do not apply lotion.

8. PERSONAL PROTECTION
EYE/FACE PROTECTION: Wear chemical goggles. When there is a chance of spashing, wear a face-shield.
SKIN PROTECTION: Wear clothing that is chemically resistant to sodium hydroxide, including, but not limited to, a face-shield, boots, apron, gloves or full-body suit. Remove clothing immediately after use, wash skin with soap and water, launder clothing or dispose of properly.
CLOTHING: Wear proper protective clothing to prevent skin exposure.

Material Safety Data Sheet

Occupational Safety and Health Adminstration

1. Product Identification

Manufacturer's Name:	Emergency Telephone No:
Address:	
Chemical Name:	Trade Name:
Chemical Family:	Formula:

2. Ingredient Information

3. Hazard Identification

Boiling Point	Specific Gravity
Vapor Pressure	Percent Volatile by Volume
Vapor Density	Evaporation Rate
Solubility in Water	
Appearance & Odor	

4. First Aid

Flash Point:	Flammable Limits:
Extinguishing Media:	
Special Fire Fighting Procedures:	
Unusual Fire and Explosion Hazards:	

5. Fire Fighting Measures

Stability	Unstable		Conditions to Avoid
	Stable		
Incompatability (*Materials to Avoid*)			
Hazardous Decomposition			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

6. Accidental Release

Route(s) of Entry	Inhalation	Skin	Ingestion
Health Hazards			
Carcinogenicity	NTP	IARC Monographs	OSHA Regulated
Signs and Symptoms of Exposure			
Medical Conditions Generally Agravated by Exposure			
Emergency and First Aid Procedures			

7. Handling and Storage

Steps to Be Taken in Case Material Is Released or Spilled
Waste Disposal Method
Precautions to Be Taken in Handling and Storing
Other Precautions

8. Personal Protection

Respiratory Precautions *(Specify Type)*		
Ventilation	Local Exhaust	Special
	Mechanical *(General)*	Other
Protective Gloves		Eye Protection
Other Protective Clothing or Equipment		
Work Hygiene Practices		

First Aid for Minor Injury to Skin and Eyes

If a chemical contacts your skin:

- Carefully remove any contaminated clothing.
- Wash the affected area thoroughly.
- Seek medical attention as needed.

Accident Report
Employee Scalded When Sprayed with Hot Tomato Juice

Summary of OSHA Accident Investigation 119793255
Two employees were repairing a tank where a pipe was secured in place by a bracket. The bracket broke and caused the pipe to break loose from the tank, spraying hot tomato juice on one employee. The employee was hospitalized for burns. At the time of the accident, he was not doing work he was assigned to.

Make a plan with your supervisor before servicing equipment or pipes containing hazardous substances. Use lockout/tagout procedures.

Treating Burns from Hot Liquids and Steam

- Cool the burn by placing it under cool running water or in a container of cool water for at least 15 minutes. If the skin is broken, do not place under water. Instead, seek medical attention immediately.
- Cover the area with gauze or a clean cloth.
- Allow the burn to heal and keep dirt from creating infection by changing the gauze frequently.
- If blisters occur, do not break them.
- Get medical help if the burn is serious or if burns cover large areas of the body, or occur on the face or genitals.

Treating Chemicals in the Eyes

- Gently flush with water for at least 15 minutes.
- Seek medical attention as needed.

Quiz Yourself

Answers can be found on page 41.

Use the list of words to fill in the blanks:

15
eye protection
after
Z87
funnel

1. Wash your hands with soap and water immediately _____ removing gloves.

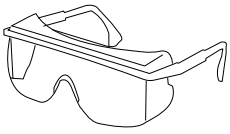
2. If you wear a face shield, you must also wear _____.

3. When treating a burn from a hot liquid, place the affected area under cool running water or in a container of cool water for at least _____ minutes.

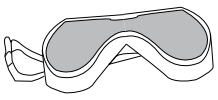
4. Your eye protection must bear a _____ label.

5. Use a _____ to prevent spills when pouring.

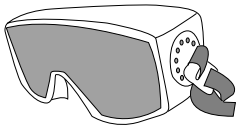
Match the eye protection below with the group of hazards it protect you from.



Protects you from impact and splashing liquids, but not vapors.



Protects your from impact, splash and vapors.



Protects you from impact such as flying particles, but not splashing liquids or vapors.

Avoid Breathing Hazardous Substances

When you breathe in a hazardous substance it can damage your airways and lungs. It can enter your bloodstream and make you sick.

Accident Report
Thirteen Employees Hospitalized After Ammonia Leak

Summary of OSHA Accident Investigation 123379927
While an employee was removing out-of-service lines in an old engine room, he accidentally cut into a live ammonia line causing an uncontrolled release of ammonia through the facility. Thirteen employees were hospitalized for ammonia inhalation.

Follow lockout/tagout procedures and make a plan with your supervisor to protect yourself and others before servicing pipes and equipment that contain hazardous substances.

Work Safely

- Read the label and MSDS to better understand possible chemical reactions when using hazardous substances.
- Minimize exposure. If the work is going to create a hazard, keep coworkers away.
- Ventilate the area.
- Exhaust hoods provide the best protection. Always keep the work close to the hood.
- General ventilation(heating/air conditioning system) is only acceptable for non-hazardous work.
- Wear the necessary personal protective equipment and follow label directions.
- If in doubt, stop and immediately ask your supervisor.

Personal Protective Equipment

Respirators

In order to wear a respirator, you must participate in your employer's respiratory protection program. As part of this program your employer will provide you with a medical evaluation and an annual respirator fit test. Your employer will also provide you with more training beyond the scope of this manual.

You must receive respiratory protection training that is beyond the scope of this manual before using a respirator.

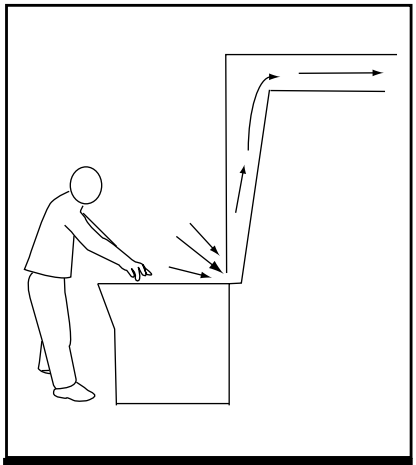
Lesson 3

Objectives

1. Recognize how hazardous substances can be harmful when breathed in.

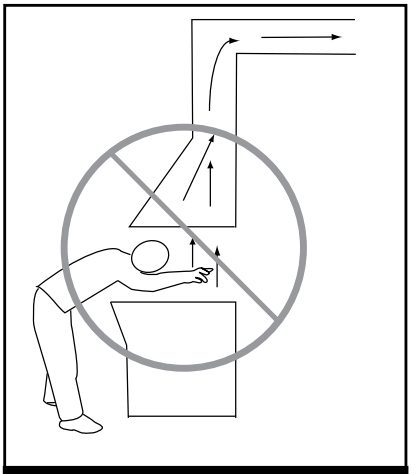
2. Identify safe work practices that can prevent you from breathing in hazardous substances.

Working Safely With a Hood

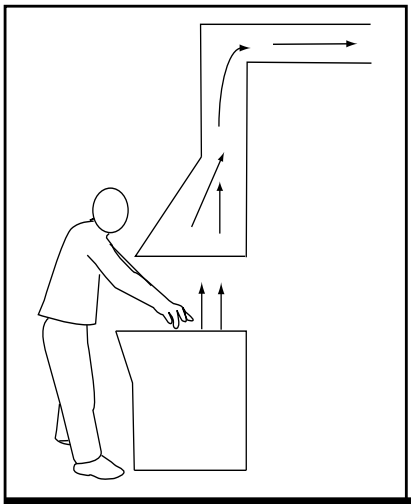


YES
Position yourself so the hood draws vapors away from your head.

- Keep the work as close to the hood as possible.
- Do not place your head between the work and hood.
- Keep movements in front of the hood to a minimum to avoid backdrafting.



NO
Never place your head between the work and the hood.



YES
Keep your head away from the hazardous vapors.

Choose safety

Where You Can Find Inhalation Information on the MSDS

The following is an example of some of the information you might find on an MSDS for a product containing Benzene.

Material Safety Data Sheet

Occupational Safety and Health Adminstration

1. Product Identification

Manufacturer's Name: Emergency Telephone No:

Address:

Chemical Name: Trade Name:

Chemical Family: Formula:

2. Ingredient Information

3. Hazard Identification

Boiling Point Specific Gravity

Vapor Pressure Percent Volatile by Volume

Vapor Density Evaporation Rate

Solubility in Water

Appearance & Odor

4. First Aid

Flash Point: Flammable Limits:

Extinquishing Media:

Special Fire Fighting Procedures:

Unusual Fire and Explosion Hazards:

5. Fire Fighting Measures

Stability	Unstable		Conditions to Avoid
	Stable		

Incompatability (*Materials to Avoid*)

Hazardous Decomposition

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

6. Accidental Release

Route(s) of Entry Inhalation Skin Ingestion

Health Hazards

Carcinogenicity NTP IARC Monographs OSHA Regulated

Signs and Symptoms of Exposure

Medical Conditions Generally Agravated by Exposure

Emergency and First Aid Procedures

7. Handling and Storage

Steps to Be Taken in Case Material Is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing

Other Precautions

8. Personal Protection

Respiratory Precautions *(Specify Type)*

Ventilation	Local Exhaust	Special
	Mechanical *(General)*	Other
Protective Gloves		Eye Protection

Other Protective Clothing or Equipment

Work Hygiene Practices

2. INGREDIENT INFORMATION
99% BENZENE
1% INERT

3. HAZARD IDENTIFICATION
EMERGENCY OVERVIEW
Danger! Harmful if inhaled.
POTENTIAL HEALTH EFFECTS
INHALATION: May cause serious irritation to the mucuos membranes and upper respiratory tract.

4. FIRST AID:
INHALATION: Get to fresh air immediately. Seek medical attention immediately. If breathing is difficult give oxygen.

7. HANDLIING AND STORAGE
DO NOT BREATHE VAPOR. KEEP TIGHTLY CLOSED. VENTILATION: USE ONLY IN A CHEMICAL FUME HOOD.

8. PERSONAL PROTECTION
RESPIRATORS: Follow OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH approved respirator.

DO – exercise your “right to know” and ask to see all MSDSs for the hazardous substances in your workplace.

DO – take all training offered that will help you when working with hazardous substances.

DO – use all protective eqiupment provided by your employer.

REMEMBER: Read the MSDSs. Talk to your supervisor about using and handling hazardous substances. Make the job safe.

First Aid for Breathing In Hazardous Substances

If you breathe in a hazardous substance, get to fresh air and call for help. Seek medical attention as needed.

If you find someone who has inhaled a hazardous substance:

- Do not endanger yourself: size up the situation before entering an area where hazardous substances may still be in the air.
- Follow your company’s emergency action plan.
- If a hazardous substance is in the air, specially trained rescuers will be needed to get the victim to fresh air.
- Call 911.
- If the victim is not breathing, give rescue breathing.

Accident Report
Nine Employees Hospitalized from Ammonia Inhalation

Summary of OSHA Accident Investigation 107427544
Nine employees were sorting onions on a conveyer line when they smelled ammonia. Nearby a worker was draining a refrigerant line. The ammonia from the draining refrigerant line began affecting the workers. Their employer directed all nine employees be taken to the hospital for observation. The employees had been given ammonia training two hours before the incident.

Always report unusual gases and vapors to your supervisor immediately.

Quiz Yourself

Answers can be found on page 42.

Circle the correct answer.

1. What important things should you remember if you have to rescue someone who has breathed in a hazardous substance?
   a. Do not endanger yourself.
   b. If the area is safe to enter, bring the person to fresh air.
   c. Call for help immediately.
   d. All of the above are important.

2. In order to wear a respirator, you must _____ _____.
   a. have a medical evaluation.
   b. be in your employer's respiratory protection program.
   c. have a respirator fit test.
   d. All of the above.

3. Which type of ventilation is more effective when working with hazardous substances.
   a. exhaust
   b. general

4. When working with a hazardous substance, always keep the work _____ the exhaust hood.
   a. away from
   b. close to
   c. None of the above, it doesn't matter.

Lesson 4

Objectives

1. Identify ways to avoid swallowing chemicals.

2. Recognize treatment and first aid for swallowing chemicals.

Avoid Swallowing Hazardous Substances

When swallowed, a hazardous substance can damage your digestive tract and be absorbed into your bloodstream. Chemicals are often transferred from the hands to the mouth by poor hygiene. Chemicals can also enter the mouth through unsafe work practices, such as preparing or storing food with chemicals.

Accident Report: **Employee Hospitalized After Swallowing Methyl Ethyl Ketone**

Summary of OSHA Accident Investigation 0950623
While in the breakroom, an employee opened the door of the refrigerator and grabbed an unlabeled jug of what he thought was drinking water. The employee drank some of the liquid which was actuallly Methyl Ethyl Ketone(MEK) peroxide. He received serious burns to his mouth, throat, esophagus and stomach and was hospitalized for 6 days.

Always label chemicals properly and do not store chemicals with food and beverage.

Work Safely

- Read the label and MSDS.
- Do not store food or drink in chemical containers.
- Do not eat, store food or drink in areas where hazardous substances are used or stored.
- Keep chemicals in designated chemical storage areas.
- Make sure chemicals are properly labeled.
- Wash your hands with soap and water at every break.
- Wash hands after you remove personal protective equipment.
- Keep all working surfaces free of chemicals.
- Open containers carefully to prevent spills and splashes.
- Use a funnel to prevent spills while pouring.
- Pour slowly and carefully to prevent splashes.
- Clean up spills and splashes immediately.
- Close the container tightly when finished.
- Wear the necessary personal protective equipment.
- If in doubt, stop and immediately ask your supervisor.

You must wash your hands and face BEFORE you:

- Eat
- Drink
- Chew gum
- Smoke or chew tobacco
- Take medication
- Put on makeup

If you don't wash your hands at these times, you may wipe hazardous substances from your hands into your mouth and swallow.

Personal Protective Equipment

Wearing appropriate personal protective equipment will minimize your exposure to hazardous substances and reduce the risk of them entering your body. A face shield may keep the chemicals from splashing onto your mouth. If you are in your employer's respiratory protection program a respirator may also keep chemicals from entering your mouth and being swallowed.

Where You Can Find Swallowing (Ingestion) Information on the MSDS

The following is an example of some of the information you might find on an MSDS for Sulfuric Acid found in many common cleaning solutions.

2. INGREDIENT INFORMATION
95% SULFURIC ACID
5% INERT

3. HAZARD IDENTIFICATION
INGESTION: Will burn the mouth, throat and stomach. HARMFUL OR FATAL if swallowed.

4. FIRST AID:
INGESTION: Do NOT induce vomiting. If victim is alert give 2-4 cups of milk or water. Never give anything by mouth to an unconsious person. Seek medical attention immediately.

7. HANDLING AND STORAGE:
Hygene Practices. Wash hands before eating or using the restroom. Smoke only in smoking areas.

Material Safety Data Sheet

Occupational Safety and Health Adminstration

1. Product Identification

Manufacturer's Name:	Emergency Telephone No:
Address:	
Chemical Name:	Trade Name:
Chemical Family:	Formula:

2. Ingredient Information

3. Hazard Identification

Boiling Point	Specific Gravity
Vapor Pressure	Percent Volatile by Volume
Vapor Density	Evaporation Rate
Solubility in Water	
Appearance & Odor	

4. First Aid

Flash Point:	Flammable Limits:
Extinquishing Media:	
Special Fire Fighting Procedures:	
Unusual Fire and Explosion Hazards:	

5. Fire Fighting Measures

Stability	Unstable		Conditions to Avoid
	Stable		
Incompatability (*Materials to Avoid*)			
Hazardous Decomposition			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

6. Accidental Release

Route(s) of Entry	Inhalation	Skin	Ingestion
Health Hazards			
Carcinogenicity	NTP	IARC Monographs	OSHA Regulated
Signs and Symptoms of Exposure			
Medical Conditions Generally Agravated by Exposure			
Emergency and First Aid Procedures			

7. Handling and Storage

Steps to Be Taken in Case Material Is Released or Spilled	
Waste Disposal Method	
Precautions to Be Taken in Handling and Storing	
Other Precautions	

8. Personal Protection

Respiratory Precautions *(Specify Type)*		
Ventilation	Local Exhaust	Special
	Mechanical *(General)*	Other
Protective Gloves		Eye Protection
Other Protective Clothing or Equipment		
Work Hygiene Practices		

First Aid for Ingesting Hazardous Substances

Get medical attention right away.

- Call 911 immediately. Be prepared to provide information from the label or MSDS.
- If no telephone is available follow label or MSDS instructions.
- Do not induce vomiting unless instructed by emergency response personnel, MSDS or label.

Quiz Yourself

Answers can be found on page 42.

Use the list of words to fill in the blanks:

MSDS
eat
mouth
free

1. Do not induce vomiting unless instructed by emergency response personnel, the _____ or label.

2. Chemicals are often transferred from the hands to the _____ by poor hygiene.

3. Keep surfaces clean and _____ of chemicals.

4. Wash your hands before you _____.

Avoid Fires and Explosions

Accident Report
Employee Killed When Cigarette Ignites Gasoline

Summary of OSHA Accident Investigation 200210128
An employee was fueling his vehicle. When he removed the hose from the tank, he accidently splashed gasoline on his clothing. He then got in the vehicle and lit a cigarette, igniting his clothing and the inside of the cab. He suffered severe burns and died.

Immediately remove clothing with gas stains. Never smoke near flammables such as gasoline.

Work Safely Around Flammables

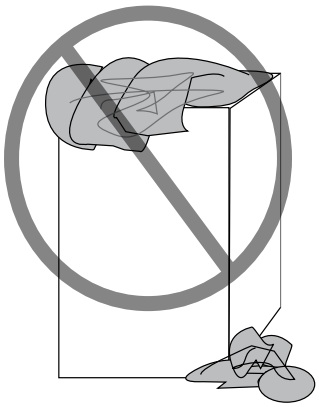
- Read the container label and product MSDS for directions on handling.
- If in doubt, stop and immediately ask your supervisor.
- Before using flammables make sure the area is properly ventilated.
- Keep flammable liquids and their vapors away from pilot lights and other sources of ignition.
- Do not smoke near flammables.
- Don't clean your hands with gasoline; use a nonflammable solvent instead.
- Never clean with flammable liquids.
- Keep lids tight on containers holding flammables. Storing flammables in open containers can cause the liquid to vaporize. The vapors can ignite and start a fire.
- Drums of flammable liquids should have self-closing faucets.
- When possible use self-closing safety cans as portable containers.
- Store solvent soaked-rags in steel oily waste cans with self-closing lids. These cans keep oxygen away from the rags and reduce the chance of fire.

Lesson 5

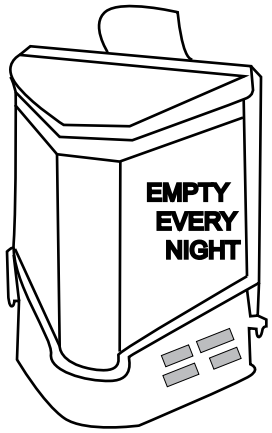
Objectives

1. Describe how to work safely around flammables.
2. Recognize flash point.
3. Describe how to ground and bond containers to prevent fires and explosions.

Prevent Fires and Explosions



NO
Never store solvent-soaked rags in an unapproved container.



YES
Store solvent-soaked rags in steel oily waste cans with self-closing lids.

Accident Report
Employee Killed in Explosion

Summary of OSHA Accident Investigation 201260023
An employee was using gasoline to clean glue from the floor. The vapors from the gasoline ignited causing an explosion. The employee suffered third-degree burns over his entire body and was killed.

Never use gasoline or flammable liquids as cleaning agents.

Avoid Static Electricity

- Use non-sparking tools, with non-metal parts, to avoid igniting flammables.
- Limit splashing when pouring flammable liquids. Splashing liquids can create static charge. To prevent splashing, use a funnel with a long spout that will reach the bottom of the container.
- If in doubt, stop and immediately ask your supervisor.

Ground and Bond Flammable Liquid Containers

What is Grounding?

Grounding creates a low resistance electrical path from the container to the ground. Grounding safely discharges static electricity.
How to ground a bulk container:

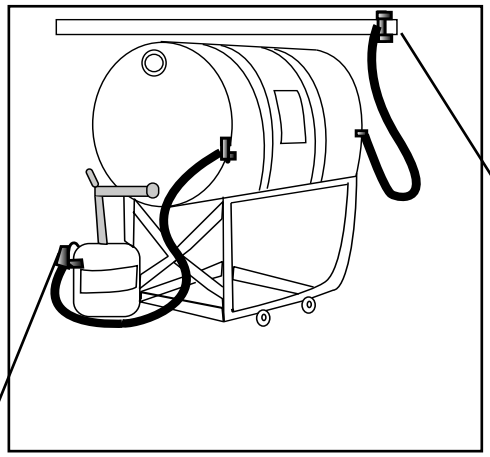
- Attach a ground wire from the bulk container to a grounded water pipe, construction steel or other effective ground.

What is Bonding?

Bonding equalizes the static charge between the bulk container and the container that is being filled. Bond all containers when transferring flammable liquids.

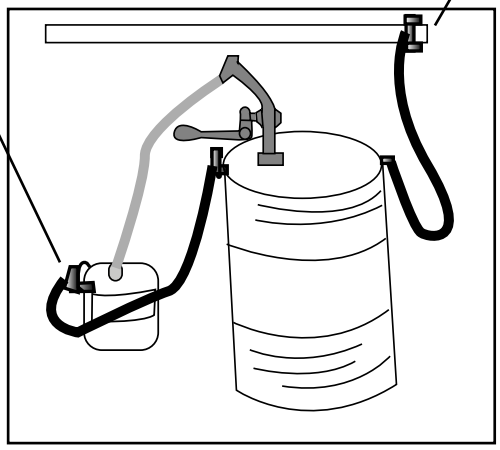
- Connect a bonding wire between the bulk container and the container you are filling.

Examples of Grounding and Bonding Flammable Liquid Containers



Ground the drum to construction steel, water pipe or other low-resistance ground.

Bond the portable container to the drum.



UNDERSTANDING FLASH POINT

If you know the flash point, you know a lot about the fire hazard. The flash point is the lowest temperature at which a liquid gives off enough vapor in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. The lower the flash point, the greater the fire hazard. Any time a liquid is at or above its flash point it is flammable.

Flammable liquids have flash points below 100°F. The lower the flash and boiling points, the more hazardous the liquid. For example, the flash point of gasoline is -49° F, so it can easily cause a fire at room temperature if there is a hot surface, spark or flame nearby. Work safely when handling and storing flammable liquids.

To find out the flash and boiling points of liquids you will be handling and storing, check the MSDSs.

For exact definition of flash point see OSHA standard 1910.106 at: *http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9752*

Know the Risks

- Combustible and flammable materials may ignite if exposed to high temperatures.
- Compressed gases can ignite or explode. Compressed gas containers may rupture and cause injury if exposed to rough handling or high temperature.
- Explosive materials may explode if subjected to sudden shock, pressure, or high temperature.

Classes of Flammable Liquids

	Flash Point	Boiling Point	Example
Class 1A	below 73˚F	below 100˚F	Diethyl Ether
Class 1B	below 73˚F	at or above 100˚F	Gasoline
Class 1C	at or above 73˚F but less than 100˚F		Turpentine

Classes of Combustible Liquids

	Flash Point	Example
Class II	greater than 100˚F but less than 140˚ F	Fuel Oil
Class III-A	greater than or equal to 140˚F but less than 200˚F	Hydraulic Fluid
Class III-B	greater than or equal to 200˚F with no upper limit	Peanut Oil

Safe Fueling Procedures

Portable Equipment

Gasoline and other fuels are flammable. Follow safe fueling procedures to help reduce the risk of fuel ignition.

- Always shut off the engine and wait at least 5 minutes for the engine to cool before refueling.
- Use only approved fuel containers and store in a well ventilated area, away from direct sunlight.
- Never smoke or have an open flame near fuel.
- Touch the fuel nozzle to the machine before removing the fuel cap to prevent a static spark from igniting the fuel.
- Use a funnel or non-spill nozzle when fueling to reduce spillage and static electricity.
- Keep the nozzle or funnel in contact with the fuel tank while filling to reduce the risk of static sparks.
- Wipe up all spills immediately, before starting the engine.

Motor Vehicles

Always follow safe shutdown procedures before refueling a motor vehicle. Refueling areas should be well ventilated, and away from any sources of sparks or open flames. Consult the operators manual for precautions specific to your vehicle.

General guidelines are:

- Touch the fuel nozzle to the metal of the vehicle before opening the fuel cap to reduce the chance that a static spark will ignite the fuel. Keep the nozzle in contact with the filler neck while fueling, and replace the cap as soon as you are finished fueling.
- Don't get in and out of the vehicle while fueling; doing so can create static charge.

To Properly Fill Fuel Containers:

1. Set the container on the ground.
2. Touch the nozzle to the container before removing the container lid to discharge any static sparks.
3. Keep the nozzle in contact with the container while filling to avoid static sparks.
4. Don't fill to the brim. Leave room for expansion. Portable containers and gas tanks should be filled 3/4 full.
5. To reduce the chance of static sparks, do not fill containers in the bed of a pickup or in a car.
6. Use only approved fuel containers and store in a well ventilated area, away from direct sunlight.

Where You Can Find Fire and Explosion Information on the MSDS

The following is an example of some of the information you might find on an MSDS for methyl ethyl ketone(MEK).

2. INGREDIENT INFORMATION
99% METHYL ETHYL KETONE
1% INERT

3. HAZARD IDENTIFICATION
EMERGENCY OVERVIEW
Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Flash Point: 20 °F

5. FIRE FIGHTING MEASURES
Extremely flammable vapor and liquid. Vapors may cause flash fire. Vapors may spread along the ground or collect in low or confined spaces.

7. HANDLING AND STORAGE
When transferring flammable substances, ground and bond containers. Use spark-proof tools. Keep away from flames, sparks and sources of heat. Do not cut, grind or weld or expose containers to flames, sparks or sources of heat. Use only with proper ventilation.

Material Safety Data Sheet

Occupational Safety and Health Adminstration

1. Product Identification

Manufacturer's Name:	Emergency Telephone No:
Address:	
Chemical Name:	Trade Name:
Chemical Family:	Formula:

2. Ingredient Information

3. Hazard Identification

Boiling Point	Specific Gravity
Vapor Pressure	Percent Volatile by Volume
Vapor Density	Evaporation Rate
Solubility in Water	
Appearance & Odor	

4. First Aid

Flash Point:	Flammable Limits:
Extinguishing Media:	
Special Fire Fighting Procedures:	
Unusual Fire and Explosion Hazards:	

5. Fire Fighting Measures

Stability	Unstable		Conditions to Avoid
	Stable		
Incompatability (*Materials to Avoid*)			
Hazardous Decomposition			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur		

6. Accidental Release

Route(s) of Entry	Inhalation	Skin	Ingestion
Health Hazards			
Carcinogenicity	NTP	IARC Monographs	OSHA Regulated
Signs and Symptoms of Exposure			
Medical Conditions Generally Agravated by Exposure			
Emergency and First Aid Procedures			

7. Handling and Storage

Steps to Be Taken in Case Material Is Released or Spilled	
Waste Disposal Method	
Precautions to Be Taken in Handling and Storing	
Other Precautions	

8. Personal Protection

Respiratory Precautions *(Specify Type)*		
Ventilation	Local Exhaust	Special
	Mechanical *(General)*	Other
Protective Gloves		Eye Protection
Other Protective Clothing or Equipment		
Work Hygiene Practices		

First Aid for Burns

- If the burn is minor and the skin is unbroken, immediately run cool water over the burn or cover it with a cool, wet dressing.
- If the skin is broken or if the burn is serious, cover it with a clean, dry dressing and seek medical attention right away.
- Always consult a physician for burns on the hands, feet, face, genitals and for burns that cover a large area of the body.

Quiz Yourself

Answers can be found on page 43.

Use the list of words to fill in the blanks:

burns
flash point
steel
splashing
starting

1. The _____ is the lowest temperature at which a liquid gives off enough vapor to become flammable.

2. Wipe up all fuel spills before _____ the engine.

3. Always consult a physician for _____ that cover a large area of the body.

4. _____ liquids can create static charge.

5. Store solvent-soaked rags in _____ oily waste cans with self-closing lids.

Working Safely with Hazardous Substances

Accident Report
Employee Severely Burned in Chemical Reaction

Summary of OSHA Accident Investigation 300020658
An employee was cleaning with hydroflouric acid. His bucket of acid was running low. He found a drum labeled “acid”. The drum actually contained acetic acid which is incompatible with hydroflouric acid. When he poured the acid into his bucket, the chemicals reacted burning him severely. He was hospitalized.

Never mix chemicals without knowing their reactions.

Labeling

Make Sure Chemicals Are Properly Labeled.

- Never remove the label from a chemical container.
- If you pour a chemical into a different container mark the new container with the contents and appropriate hazard warnings.
- Never put chemicals in food or drink containers.

Mixing

- Do not mix different chemicals unless you know the outcome.
- Check the MSDS for chemical incompatabilities.

Storage

Store Chemicals Properly

- Store chemicals in ventilated, illuminated locked rooms.
- The storage area should be dry and protected from freezing, extreme heat and excessive humidity.
- Storage shelves and cabinets should be designed to contain leaks and spills. Where shelves are not so designed, chemical containers may be placed in plastic tubs.
- Incompatible materials should be stored seperately. (See label and MSDS for incompatible chemicals.)
- Portable containers of flammable chemicals having a flash point below 200° F should be stored in:
  - unoccupied buildings, or
  - approved safety cans, or
  - approved flammable liquid storage cabinets.
- Old chemicals in deteriorated containers or that have passed their recommended shelf life should be disposed properly.

Lesson 6

Objectives

1. Recognize safe procedures for labeling, mixing, disposing and storing chemicals.
2. Identify precautions for opening systems containing hazardous materials.

STORING PORTABLE CONTAINERS

Portable containers of flammable and combustible chemicals having a flash point below 200° F should be stored in:

- unoccupied buildings, or
- approved safety cans, or
- approved flammable liquid storage cabinets.

Spills and Leaks

Handle spills and leaks according to your company's emergency action plan. You must receive training that is beyond the scope of this manual to clean up major chemical spills.

The following procedures are appropriate for many moderately hazardous chemicals. Talk with your supervisor about the procedures in your area.

Minor Chemical Spill

- Identify the chemical.
- Alert people in the immediate area of the spill.
- Put on appropriate personal protective equipment for the chemical as required by the MSDS.
- If the material is flammable, shut off electric equipment, pilots, furnace and air conditioner if it can be done without walking in the material and if it will not cause a spark.
- Refer to the MSDS for ventilation instructions.
- Isolate the spill by using absorbent material. Neutralize the spill, or absorb using absorbent materials. Shovel or place used absorbent materials inside an approved container.

Major Chemical Spill

- Identify the chemical.
- Call 911 and attend to injured or contaminated persons and remove them from the area if you can do so safely.
- Alert people to evacuate the building/area.
- If the material is flammable, shut off electric equipment, pilots, furnance and air conditioner if it can be done without walking in the material and if it will not cause a spark.
- Only properly trained persons should clean up the spill.

Disposal

Federal and state regulations restrict the disposal of hazardous chemicals. Ask your supervisor about your company's procedure.

Accident Report
Employee Severely Burned From Steam

Summary of OSHA Accident Investigation 119973899

An employee was cleaning an ultra high termperature pasteurizer. The system was in the sanitize mode and contained hot water at about 250° F. As the employee opened the top of the balance tank to clean it, he was engulfed in a cloud of steam which severely burned his arm, shoulder, and back.

Follow lockout/tagout procedures and make a plan with your supervisor to protect yourself and others before servicing pipes and equipment that contain hazardous substances.

Servicing Pipes and Equipment that Contain Hazardous Substances

Opening systems that contain hazardous materials can be dangerous. Pressure must be relieved, fluids must be drained or returned to reservoirs, gases must be vented, flared or collected and temperatures must be reduced. The following general procedures apply in most instances. Talk with your supervisor about procedures in your area.

1. Wear goggles, gloves or any other necessary protective equipment, such as a face shield, apron or boots.
2. Use a rubber mat or other appropriate shielding to protect against escaping pressure or contents.
3. Use the buddy-system – have a coworker close by in case you need help.
4. Be careful not to spill or drip hazardous contents on yourself or others when moving pipes or fittings.
5. When working overhead, move people and equipment away in case the piping contents spill out.
6. Perform necessary lockout/tagout procedures.
   a) Disconnect and lock out any heating mechanism and allow hot parts or fluids to cool before performing maintenance work.
   b) Block chemicals, gas, steam or hot water by shutting off and locking control valves or by capping or blanking the lines.
   c) If valves or relief devices cannot be used to release pressure, highly qualified personnel must use appropriate work practices to control hazards if pressure is to be relieved at fittings.
   d) Do not vent toxic, flammable or explosive substances directly in to the air – lines should be purged and cleaned by qualified personnel using special techniques.
   e) Allow sufficient time for venting and draining after opening lines.
   f) Prevent buildup of additional pressure by maintaining an open bleed.
7. Loosen bolts and fittings slowly and away from yourself and others. Always be prepared to deal with escaping pressure or contents.
8. For pipes that contain liquids, loosen the bottom bolts first to determine if there will be any leakage of contents.
9. If flanges are suck together, separate them carefully with wedges or other appropriate tools.

You must receive lockout/tagout training that is beyond the scope of this manual to service pipes and equipment that contain hazardous materials. Do not attempt to service pipes and equipment containing hazardous materials without proper training and supervisor approval.

Quiz Yourself

Answers can be found on page 43.

Use the list of words to fill in the blanks:

MSDS
remove
supervisor
overhead
buddy-system
dangerous

1. Opening systems that contain hazardous materials can be _____.

2. Never _____ the label from a chemical container.

3. Check the _____ for chemical incompatabilities.

4. Ask your _____ about your company's procedure for chemical disposal.

5. Use the _____, have a coworker close by in case you need help.

6. When working _____, move people and equipment away in case the piping contents spill out.

Conclusion

There are risks involved when you work with hazardous substances. But by working safely, you can avoid accidents and prevent tragedy on the job. Take control of your own safety by following the practices outlined in this manual. Use this information to keep your work experience safe.

Quiz Yourself

Answers can be found on page 43.

Use the list of words to fill in the blanks:

ignite
label
unlabeled
eyes
break

1. Combustible and flammable materials may _____ if exposed to high temperatures.

2. Always read the _____ and MSDS and follow directions.

3. A face shield protects your skin, not _____.

4. Wash your hands with soap and water at every _____.

5. Never store chemicals in _____ containers.

Quiz Yourself Solutions

Lesson 1, Page 8

1. Hazardous substances may enter the body through contact with the nose, mouth or skin and _eyes_.

2. If there is no _label_ or MSDS you should report it to your supervisor immediately.

3. A _reactive_ substance is unstable and should be used with extreme caution.

4. The MSDS gives more detailed information on how to handle, use and _store_ chemicals safely.

Lesson 2, Page 16

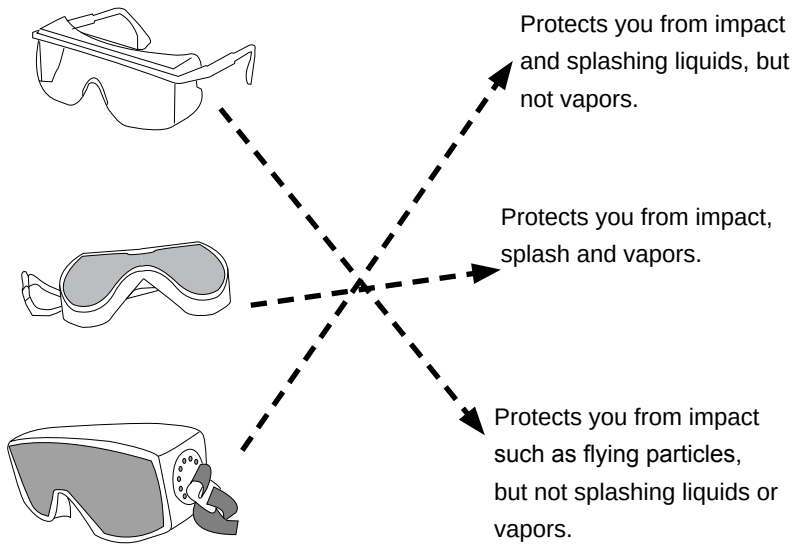
1. Wash your hands with soap and water immediately _after_ removing gloves.

2. If you wear a face shield, you must also wear _eye protection_.

3. When treating a burn from a hot liquid, place the affected area under cool running water or in a container of cool water for at least _15_ minutes.

4. Your eye protection must bear a _Z87_ label.

5. Use a _funnel_ to prevent spills when pouring.



Lesson 3, Page 21

1. What important things should you remember if you should have to rescue someone who has breathed in a hazardous substance?
   a. Do not endanger yourself.
   b. If the area is safe to enter, bring the person to fresh air.
   c. Call for help immediately.
   d. All of the above are important.

2. In order to wear a respirator, you must _____ _____.
   a. have a medical evaluation.
   b. be in your employer's respiratory protection program.
   c. have a respirator fit test.
   d. All of the above.

3. Which type of ventilation is more effective when working with hazardous substances.
   a. exhaust
   b. general

4. When working with a hazardous substance, always keep the work _____ the exhaust hood.
   a. away from
   b. close to
   c. None of the above, it doesn't matter.

Lesson 4, Page 26

1. Do not induce vomiting unless instructed by emergency response personnel, the MSDS or label.

2. Chemicals are often transferred from the hands to the mouth by poor hygiene.

3. Keep surfaces clean and free of chemicals.

4. Wash your hands before you eat.

Lesson 5, Page 34

1. The flash point is the lowest temperature at which a liquid gives off enough vapor to become flammable.

2. Wipe up all fuel spills before starting the engine.

3. Always consult a physician for burns that cover a large area of the body.

4. Splashing liquids can create static charge.

5. Store solvent-soaked rags in steel oily waste cans with self-closing lids.

Lesson 6, Page 38

1. Opening systems containing hazardous materials can be dangerous.

2. Never remove the label from a chemical container.

3. Check the MSDS for chemical incompatabilities.

4. Ask your supervisor about your company's procedure for chemical disposal.

5. Use the buddy-system, have a coworker close by in case you need help.

6. When working overhead, move people and equipment away in case the piping contents spill out.

Conclusion, Page 40

1. Combustible and flammable materials may ignite if exposed to high temperatures.

2. Always read the label and MSDS and follow directions.

3. A face shield protects your skin, not eyes.

4. Wash your hands with soap and water at every break.

5. Never store chemicals in unlabled containers.

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