Appendix A

Hazard Communication Program

HAZARD COMMUNICATION PROGRAM

ENERGY FUELS RESOURCES

PIÑON RIDGE MILL

MSHA ID # TBD

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Energy Fuels Piñon Ridge Mill
Hazard Communication Program

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1.0 GENERAL

Hazard Communication (HazCom) is the training, labeling and other ways that miners, mill workers, contractors and visitors are warned about the hazardous chemicals stored, used, or produced on the Piñon Ridge Mill site. All persons who come to this site have the "Right to Know" about any hazardous chemicals to which they may be exposed.

This written program complies with the Hazard Communication requirements of the Mine Safety & Health Administration (MSHA), 30 CFR Part 47.

The Radiation Safety Officer (RSO) is the person designated to coordinate the HazCom program at the Piñon Ridge Mill.

A list of the primarily hazardous chemicals stored at the Mill is provided in Appendix A.

1.1 Availability

A current copy of this written hazard communication program will be available in the following locations:

- Administration Building
- Change Room
- Warehouse

1.2 Applicability

This program is applicable to:

- All work areas of this Mill site.
- Every hazardous chemical brought to the Mill or produced at the Mill which the RSO has deemed to be hazardous based on the Hazard Determination Criteria; to which a person can be exposed under normal working conditions or in the event of an accidental spill or release and which is not exempted from the program by MSHA under 30 CFR Part 47.81.
- Every employee, contractor and their employees, visitor or any other person who could be exposed at the Mill site.

1.3 Tasks, Frequencies and Responsibilities

This written program should be reviewed at least annually to assure its accuracy. Every chemical brought onto the Mill property must be evaluated to determine if it is hazardous and to ensure that the label is legible and in English. A master inventory of hazardous chemicals will be maintained. Whenever a new chemical is brought onto the Mill site it will be added to the master inventory. If a chemical will no longer be used at the site it must be disposed of properly and removed from the master inventory. The RSO and Assistant RSO should coordinate this list.

If the chemical is hazardous, the Purchasing Agent or RSO should collect the Material Safety Data Sheets (MSDS) or request one from the supplier and distribute copies to the administration office, the warehouse and the portion of the Mill where the material will be handled. If the chemical is new to the Mill site, affected personnel must be trained in the safe handling and of the hazards associated with the chemical before it is used. The master inventory of hazardous chemicals should be checked to see if the new chemical is listed and, if it is not, it should be added by completing the appropriate forms and submitting them to the Safety Department.

The Safety Department will maintain current, legible and accessible MSDSs for each hazardous chemical in the master inventory. When a revised MSDS is received it must replace the outdated MSDS; damaged

or illegible MSDS must be replaced; copies of revised or replacement MSDS must be distributed to all individuals who handle or use the chemical.

Labels on hazardous chemicals shall be checked prior to use for legibility and accuracy (chemical in the container must be the same as indicated on the label). This is the responsibility of all employees handling or using the hazardous chemicals. New labels must be requested from the Safety Department if the current label is in poor condition.

If a chemical is no longer on the site, the affected Mill personnel must be notified that the chemical's MSDS will be disposed of in 3 months. This will be done by the Safety Department.

2.0 DETERMINING CHEMICAL HAZARDS

Chemicals at the Mill site will be considered hazardous for the purpose of this program if the chemical has the potential to harm persons as indicated by any of the following:

- The chemical's label or MSDS indicates that it is a hazard.
- The chemical is produced at the Mill and scientifically valid evidence indicates that it can be a hazard to exposed persons.
- The chemical is a mixture produced at the Mill which contains at least 1% of a hazardous chemical or 0.1% of a carcinogen.
- The chemical is listed as hazardous or carcinogenic on any of the following lists:
  - MSHA standards in 30 CFR chapter 1
  - Occupational Safety and Health Administration (OSHA) "Toxic and Hazardous Substances"
  - American Conference of Governmental Industrial Hygienists (ACGIH) "Threshold Limit Values and Biological Exposure Indices"
  - U.S. Department of Health and Human Services, National Toxicology Program (NTP) "Ninth Annual Report on Carcinogens"
  - International Agency for Research on Cancer (IARC) "Monographs and Related Supplements" Volumes 1 through 77

If scientifically valid evidence is otherwise unavailable for a chemical produced at the Mill, the chemical must be tested to determine its physical and health hazards.

The RSO will decide whether a chemical at the Mill is within the scope of this program by addressing the following criteria:

- Does it have a warning label or an MSDS indicating a hazard?
- Can a person be exposed to it under normal work conditions, or if misused, or in the case of an accidental release or spill?
- Is it at least 1% of a mixture produced at this Mill, or if it is cancer-causing, does it make up at least 0.1% of a mixture?

If the answer is YES to any of these questions, and the material is not exempted by Section 3.0, it should be on the Mill's chemical list (see Appendix A).

3.0 CHEMICALS AND PRODUCTS EXEMPT FROM HAZCOM

The following chemicals (and substances) are exempt from the HazCom standard:

- An article is exempt from these HazCom standards if it:
  - Releases no more than insignificant amounts of a hazardous chemical, and
  - Poses no physical or health risk to exposed miners
- All biological hazards, such as poisonous plants, insects, and micro-organisms are exempt.
- Consumer products or hazardous substances regulated by CPSC are exempt if:

    - Personnel use it for the purpose the manufacturer intended, and
    - Such use does not expose personnel more often or for longer periods than ordinary consumer use
- Cosmetics, drugs, food, food additives, color additives, drinks, alcoholic beverages, tobacco and tobacco products, or medical or veterinary device or product, including materials intended for use as ingredients in such products (such as flavors or fragrances) are exempt when intended for personal consumption or use.
- All ionizing or non-ionizing radiation, such as alpha or gamma, microwaves or x-rays, are exempt.
- Wood or wood products are exempt if they do not release or otherwise result in exposure to a hazardous chemical under normal conditions of use (e.g. wood is not exempted if it is treated with a hazardous chemical or if it will be subsequently cut or sanded).

4.0 LIST OF HAZARDOUS CHEMICALS

Appendix A contains a current list of all hazardous chemicals used, stored, or produced at this Mill, including hazardous chemical waste. Each hazardous chemical on this property will be clearly identified in exactly the same way on the list, its container label, and its corresponding MSDS.

5.0 LABELING

The labeling system at this Mill is National Fire Protection Association (NFPA). Every hazardous chemical at this Mill should normally be kept in the original container and have a label that:

- Clearly identifies it.
- Is legible, accurate, obvious and in English.
- Warns of specific hazards (such as flammability, skin irritation, cancer, etc.).

Employees will immediately report to their supervisor any container or bulk storage of chemicals found with a missing, defaced or illegible label. If the identity of the chemical is known with certainty, the Radiation/Security Technician (RST) will create or obtain a replacement label or temporary label before the chemical is next used. If the identity is not known with certainty, the RSO or Assistant RSO should be notified so that identification can be made or the chemical can be disposed of in a safe manner.

Pipes carrying chemicals will be labeled according to the latest version of ANSI A13.1 and A535.1. These standards include color coding, naming of components and flow direction.

If the chemical is an EPA regulated hazardous waste, it will be labeled in accordance with Resource Conservation and Recovery Act (RCRA) regulations. When a label or tag must be created on this mill property, use the format for an appropriate label in Appendix B.

6.0 EXCEPTIONS TO LABELING REQUIREMENTS UNDER HAZCOM

A placard, sign, process sheet, operating procedures, or other suitable alternative may be used instead of a label for bins, hoppers, tanks, or other stationary process containers that hold a hazardous chemical. The alternative must identify the container to which it applies and contain the same information as a label and be readily available to workers throughout the work shift and in the work area.

Portable containers (such as a glass beaker in the lab, or a pan of solvent or used oil in the shop) do not require a label if used during a single work shift, and the user knows the identity of the chemical, its hazards, and any protective measures needed. However, before the end of the shift, that person must either place a proper label on the container, transfer any remaining chemical in the container to a properly labeled container, or completely use the chemical, leaving the container empty.

All chemicals kept in manufacturer's or supplier's original packaging labeled under other federal labeling requirements do not need to be further labeled under the HazCom standard.

Any "hazardous substance" covered by the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and any "hazardous waste" covered by the RCRA are exempt from HazCom labeling requirements.

Wood or wood products do not need to be labeled in most instances. However, it must have an MSDS if it releases harmful amounts of a hazardous chemical or is cut or sanded, producing wood dust.

Vehicles driven onto Mill property, which contain hazardous chemicals, must have as a minimum a U.S. Department of Transportation (DOT) approved placard or label, plus an appropriate manifest or bill of lading to identify the chemical specifically. The DOT Hazard codes are:

- **1 Explosive**
- **2.1 Flammable Gas**
- **2.2 Non-Flammable Gas**
- **2.3 Poisonous Gas**
- **3 Flammable Liquid**
- **4.1 Flammable Solid**
- **4.2 Spontaneously Combustible**
- **4.3 Dangerous when Wet**
- **5.1 Oxidizer**
- **5.2 Organic Peroxide**
- **6.1 Poison – Keep away from food**
- **6.2 Infectious Material**
- **7 Radioactive**
- **8 Corrosive**
- **9 Miscellaneous**

7.0 MATERIAL SAFETY DATA SHEETS

Every hazardous chemical on this property will have a current, legible, and accessible MSDS. Each MSDS must be clearly cross-referenced to its corresponding label and chemical list described under the "Labeling" section above. If a chemical arrives on the mill property with no MSDS, and it is either known or suspected to be hazardous, the RSO, Assistant RSO, or Purchasing Agent must be contacted immediately. The individual will contact the manufacturer for an MSDS. Likewise, if a chemical is found stored or in use with no MSDS on file, the same procedure should be followed.

Whenever an MSDS is received on a new hazardous chemical, the RSO will schedule a meeting with affected supervisors and/or mill operators to review the information in the MSDS prior to use of the chemical. The supervisor must assure that the employees in the area are thoroughly familiar with the subjects covered in the MSDS pertaining to hazardous chemicals in their work areas. When a revised MSDS is received the outdated MSDS should be replaced as follows:

- Remove the outdated MSDS from the Notebook and replace it with the revised MSDS.
- The outdated MSDS should be kept on file for 3 months before destruction.

A master file of MSDSs is kept in the RSO's office and in the Warehouse. In addition, MSDS for chemicals used in particular areas are accessible in these locations. MSDSs are accessible by at least one of the following:

- By computer
- By paper copies
- By fax-on-demand service
- By calling the manufacturer

If it is necessary to create an MSDS at the Mill use the format in Appendix C.

Any discrepancies discovered in an MSDS should be reported to the RSO or Assistant RSO, who will contact the supplier for clarification or replacement of the MSDS.

Any employee or contractor may obtain a free copy of the Mill chemical list or any MSDS at the Mill by contacting the RSO, Purchasing Agent or Warehouse Clerk. If a copy of a HazCom-related document is requested that reveals a Trade Secret at the Mill, the following procedure will be followed:

- The requestor will be required to sign a confidentiality agreement concerning the Trade Secret.
- If possible, information will be redacted so that the confidential information will not be revealed.

8.0 TRAINING REQUIREMENTS

The RSO or Assistant RSO is the authorized instructor for HazCom training at the Mill. Training will be conducted in accordance with the approved MSHA training plan. All new employees will receive HazCom training during the initial new hire training and additional training in the specific hazardous chemicals they will be working with during their task training. If a new chemical is introduced into the work area, affected employees will receive training on the hazards associated with this chemical.

HazCom training will include the following items:

- The physical and health hazards of the chemicals in the individual's work area.
- The requirements of HazCom.
- The Mill's HazCom program, including labeling and MSDS locations.
- The operations or areas of the Mill where hazardous chemicals are present.
- How to tell if a chemical is present.
- What protective measures to take.
- The work practices, engineering controls, emergency procedures, and the use of personal protective equipment available at the Mill.

Records of training must be recorded on MSHA Form 5000-23.

Sample HazCom training materials are presented in Appendix D

Piñon Ridge Mill HazCom Procedure

Appendix A

Hazardous Chemicals Stored on Site

Hazardous Chemicals Stored On Site

1. Sulfuric Acid
2. Ammonia
3. Ammonium Sulfate
4. Sodium Hydroxide
5. Sodium Carbonate
6. Flocculent
7. Kerosene
8. Sodium Chlorate
9. Hydrogen Peroxide
10. Alamine 336
11. Isodecanol
12. Diesel Fuel
13. Gasoline

NOTE: Refer to the Piñon Ridge Mill Materials Containment Plan for chemical information sheets and MSDS's

Piñon Ridge Mill HazCom Procedure

Appendix B

Chemical Label/Tag – Blank

Chemical/Substance Name:

_____

Specific Hazards:

☐ Flammable

☐ Caustic

☐ Carcinogenic

☐ Reactive (with _____)

☐ Other (_____)

PPE Required:

Piñon Ridge Mill HazCom Procedure

Appendix C

Material Safety Data Sheet (MSDS) - Blank

Piñon Ridge Mill HazCom Procedure

Appendix D

Sample HazCom Training Material

Material Safety Data Sheet

Section 1:	**Chemical Product and Company Identification**
Product Name:	Manufacturer/Distributor Information
Synonyms:	Name:
Catalog Code:	Address:
CAS Number:	
Chemical Formula:	Telephone:
Intended Use(s):	Emergency:
	Date Prepared:
	Preparer's Signature:

Section 2: **Composition/Information on Ingredients**

Composition:

Name	OSHA PEL	ACGIH TLV	Other Limits	Percent by Weight

Other Information:

Section 3: **Hazards Identification**

Potential Acute Health Effects:

Potential Chronic Health Effects:

Carcinogenic Effects:

Mutagenic Effects:

Teratogenic Effects:

Developmental Toxicity:

Environmental Hazards:

NFPA Hazard ID:	Health:	Flammability:	Reactivity:
HMIS Hazard ID:	Health:	Flammability:	Reactivity:

Other Comments:

Section 4:	First Aid Measures

Inhalation:

Skin Contact:

Eye Contact:

Ingestion:

Section 5:	Fire/Explosion Measures

Flammability Properties

Flash Points: Flammable Limits: LEL: UEL:

Auto-Ignition Temperature:

Fire/Explosion Hazards:

Extinguishing Media:

Fire Fighting Instructions:

Unusual Fire/Explosion Hazards:

Section 6:	Accidental Release Measures

Notification Procedures:

Protective Measures:

Spill Management

Land Spill:

Section 6: Accidental Release Measures (continued)

Water Spill:

Environmental Precautions

Small Spill:

Large Spill:

Section 7: Handling and Storage

Precautions to be taken in Handling and Storage:

Proper Storage Method:

Suitable Containers/Packaging/Materials:

Unsuitable Materials and Coatings:

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Personal Protection

Respiratory Protection:

Hand Protection:

Skin and Body Protection:

Exposure Limits:

Chemical Name	ACGIH	OSHA	Supplier

Section 9 :	Physical and Chemical Properties	
Appearance and Odor, Taste:		
Molecular Weight:		
Melting Point:	Boiling Point:	Freezing Point:
Critical Temperature:		
Coefficient of Oil/Water:		
Evaporation Rate:	Specific Gravity:	
Percent Volatile:		
pH:		
Vapor Density:	Vapor Pressure:	
Solubility:		

Section 10:	Stability and Reactivity	
Stability:	Stable	Conditions to Avoid:
	Unstable	
Incompatibility (Substances to avoid):		
Hazardous Decomposition Products:		
Hazardous Polymerization:	May Occur	Conditions to Avoid:
	Will not Occur	
Special Remarks:		

Section 11:	Toxicological Information
Routes of Entry:	
Health Hazards (Acute and Chronic):	
Carcinogenity:	
Signs and Symptoms of Exposure:	
Medical Conditions Generally Aggravated by Exposure:	

Section 12:	Ecological Information

Ecotoxicity:

BOD5 and COD:

Products of Biodegradation:

Toxicity of Products of Biodegradation:

Special Remarks:

Section 13:	Disposal Considerations

Waste Disposal:

Section 14:	Transportation Information

Dot Classification

Proper Shipping Name:

Primary Hazard Class/Division:

UN/NA Number:

Packing Group:

Labels:

Placards:

Markings:

Identification:

Special Provisions for Transport:

Section 15:	**Other Regulatory Information**		
Federal and State Regulations:			
Other Regulations:			
Other Classifications:			
WHMIS (Canada):			
DSCL (EEC):			
HIMS (USA):			
Health Hazard:	Fire Hazard:	Reactivity:	Personal Protection:
National Fire Protection Association (USA):			
Health:	Flammability:	Reactivity:	Specific Hazard:
Protective Equipment:			

Section 16:	**Other Information**
References:	
Other Special Considerations:	
Date Created:	
Last Updated:	
Definitions/Descriptions:	

Hazard Communication

Energy Fuels Resources
Piñon Ridge Mill

Introduction

- Chemicals are fundamental to life, but can also cause sterility, cancer, burns, and heart, lung or kidney disease. They can cause fire and explosions, but can also help fight fire and control explosions
- The mining industry reported over 3,000 chemical burns and poisonings to MSHA between 1990 & 1999. The belief that this was excessive as well as the potential for long term health risks led MSHA to develop a Hazard Communication Standard

Program Basics

- Inventory chemicals at the Mill site and determine which are hazardous
- Keep a list of the hazardous chemicals
- Establish a written HazCom program
- Prepare a label and Material Safety Data Sheet (MSDS) for all products
- Make sure all containers are labeled
- Keep MSDSs for the hazardous chemicals at the mine site
- Train miners about the HazCom program

Hazard Determination

- Chemicals at the Mill must be identified to determine if they are a physical or a health hazard
- Physical Hazard – can cause injuries (combustible liquid or gas, organic peroxide, may be flammable, explosive)
- Health Hazard – can cause illnesses (may be acute – short term; or chronic – long term)

Exemptions from HazCom Rule

- Consumer Products – If an ordinary consumer product is purchased, it is exempt if you use it as the manufacturer intended it, and it does not expose the operator more often or for a longer duration than ordinary consumer use
- Articles – Manufactured goods such as plastic and metal pipes, conveyor belts, steel and tires are exempt if they release no more than insignificant amounts of a hazardous chemical, and pose no physical or health risk to exposed Mill personnel

Exemptions from HazCom Rule – cont'd

- Personal Items – Food, tobacco products, drugs, cosmetics, or other personal items are exempt if they are packaged and labeled for retail sale and intended for an individual's personal consumption or use

Examples & Variables on Exemptions

You purchase a case of cleaner with ammonia for your truck drivers to clean their windshields. The drivers clean them 2 or 3 times each shift. Should this be included in the HazCom program?

No – This is a consumer product being used as an ordinary consumer would use it

Examples & Variables on Exemptions

You purchase a case of cleaner with ammonia for your janitor to clean counters, mirrors, windows, bathroom tile and other parts of your plant. The janitor performs this work all day long. Should this cleaner be included in the HazCom program

Yes – The cleaner will be used as the manufacturer intended, but the janitor is exposed to ammonia for a longer time than an ordinary consumer would be

Examples & Variables on Exemptions

You decide to enlarge a platform constructed of galvanized steel. A welder adds to the frame by welding additional galvanized pipe to the existing frame. Would the galvanized pipe be a part of the HazCom program?

Yes – While the pipe is still an article, the welding releases zinc fumes and several other hazardous chemicals from the pipe and would therefore not be exempt

Labeling

- A label is an immediate warning about a chemical's most serious hazard
- Containers of hazardous chemicals must be marked, tagged or labeled with the identity of the hazardous chemical and appropriate hazard warnings
- Every hazardous chemical container must be labeled unless it is exempt under 30 CFR 47.92 Subpart J
- If a substance is transferred from a labeled container to a portable unlabeled container and will be completely used by the transfer person, the container does not have to be labeled.
- If the chemical is not used up by the end of the shift, it must be returned to the original container.

Labeling – cont'd

- If you have bins, hoppers, tanks, or other stationary process containers holding a hazardous chemical you may use signs, placards, process sheets, batch tickets, operating procedures or other suitable alternatives to a label
- The raw material being milled does not have to be labeled if no hazardous chemicals are added
- You have to label containers of hazardous chemicals produced during ore processing, such as a leach tank where sulfuric acid is added

Labeling – cont'd

- Labels must include:
  1. The chemical's identity that permits cross referencing between the label, the list of hazardous chemicals and the MSDS
  2. The appropriate hazard warning (skin irritant, carcinogen, flammable)
  3. Hazards should be prioritized based on severity
  4. Target organs affected should be included if applicable
  5. The name and address of a responsible party that can provide additional information

Labeling – cont'd

- Products that go off site (e.g. uranium and vanadium oxide) must be labeled
- Containers with damaged labels must be re-labeled immediately (during the shift when it was damaged)
- You are not responsible for inaccuracies on a label provided by the manufacturer of the chemical
- You should update your label when you learn new information about your product
- ***You must not remove or deface existing labels***

Material Safety Data Sheets

- The chemical MSDS provides comprehensive technical and emergency information
- It serves as a reference document for exposed Mill workers, health professionals and firefighters or other safety workers
- "Availability" means that you cannot have obstacles that delay access to HazCom information

Material Safety Data Sheets – cont'd

- The MSHA HazCom standard allows you to keep MSDSs in a way that you choose provided the information is available to employees
- Methods to maintain MSDSs:
  1. May use a 3 ring binder (can get very bulky at a plant with many MSDSs)
  2. May use a computer database (everyone must have computer access)
  3. May access them from an internet MSDS library (again computer availability a must)
  4. May use fax on-demand service

Material Safety Data Sheets – cont'd

- You must have a MSDS for your product or raw material if it is hazardous
- A MSDS must be maintained at the Mill for as long as the chemical is at the Mill, and Mill workers must be notified 3 months in advance before you dispose of the MSDS - notice can be verbal, or written
- The most current version of an MSDS must be made available if a manufacturer changes the contents of the MSDS

Material Safety Data Sheets – cont'd

- What information is required on an MSDS?
  - *Identity* – the chemical and common name if it is a single entity and all the hazardous ingredients if it is a mixture. It must permit cross-referencing between the list of hazardous chemicals, the chemical's label, and the MSDS
  - *Properties* – the physical and chemical properties such as boiling point, melting point, vapor pressure, evaporation rate, solubility in water, pH, appearance and odor, flash point and flammability limits

Material Safety Data Sheets – cont'd

- *Physical Hazards* - the potential for fire, explosion and reactivity
- *Health Hazards* – the potential to cause illness or injury, such as its acute and chronic health effects, the signs and symptoms of exposure, any medical conditions that are aggravated by exposure and the primary routes of entry
- *Carcinogenicity* – this information must be included

Material Safety Data Sheets – cont'd

- *Exposure Limits* – either the MSHA or the OSHA exposure limits must be included or any other limit set by an organization such as the ACGIH or NIOSH
- *Safe Use* – precautions for safe use such as hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks

Material Safety Data Sheets – cont'd

- *Control Measures* – ventilation, process controls, restricted access, protective clothing, respirators, and goggles
- *Emergency Information* – appropriate emergency procedures such as special instructions for fire fighters and first aid procedures; name address and phone number of a contact person who can provide additional information in case of emergency
- *Date Prepared* – preparation or revision date

Toxicology

You may be exposed to toxic substances while on the job. Some of these chemicals have been well-studied, while others have little information available. All chemicals should be handled as if they are hazardous.

Toxicology – cont'd

Toxicology is the study of the nature, effects and detection of poisons in living organisms. The toxicity of a substance is its ability to cause harmful effects to a single cell, an organ or an organ system, or to the entire body. Some effects may be easily and quickly seen – such as dizziness, nausea, shortness of breath or skin irritation. Other toxic effects may not show up for many years.

Toxicology – cont'd

- Dose-response – the greater the amount (dose), the more likely you are to be adversely affected (response). This is influenced by the length of time you are exposed, how the substance enters your body, and how quickly the substance is removed from your body
- Toxicity – the potential of a substance to cause harm

Toxicology – cont'd

- Entry routes for chemicals into the body:
  - ***Inhalation (breathing)***
  - ***Skin contact/absorption***
  - ***Eye contact/absorption***
  - ***Ingestion (swallowing)***
  - ***Injection or puncture***

Inhalation

- Materials pass through the major airways into the lungs ending at the air sacs. Chemicals can dissolve in the lungs and pass into the blood stream at this point.
- Substances such as respirable silica dust which don't move into the blood stream may remain in the lungs and cause damage there.

Skin Contact and Absorption

- The skin is the largest organ of the body and protects it from external hazards.
- Some chemicals, including many solvents and metals can cause an inflammation of the skin called dermatitis or result in other allergic reactions.
- Other chemicals such as acids can burn the skin.
- Substances can also enter the body through cut or cracked skin
- Other chemicals, like some solvents, dissolve the skin's protective oil barrier and pass into the blood supply through the small blood vessels or capillaries.
- Some workplace chemicals, including arsenic and tar, have been linked to skin cancer.

Eye Contact

- Chemical or foreign particles are likely to irritate or burn the eyes.
- Some substances can be absorbed through the eyes and cause problems elsewhere in the body.

Ingestion

- If a worker smokes, eats, or drinks around chemical substances the chemical may be swallowed.
- Uranium dust particles may be swallowed after they are trapped in the mucous in the airways and then moved to the back of the throat.

Injection & Puncture

- Injection is a major concern in health care or first aid settings, but puncture or cuts occur in many occupations.
- Bacteria, fungi, and other chemical substances may enter the body through a cut or puncture wound.

Health Effects of Chemical Hazards

- **Allergens** – Materials which affect the body's immune system causing reactions such as wheezing or dermatitis. Exposure to even a small amount of the substance may cause a reaction in a sensitized person.
- **Asphyxiants** – Materials such as carbon dioxide or acetylene which displace oxygen in the air.
- **Carcinogens** – Substances which act on the genetic material of cells, causing uncontrolled cell growth (cancer).

Health Effects of Chemical Hazards

- **Irritants** – Substances that cause pain and reddening of the exposed area, usually the skin and respiratory system. Effects usually immediate.
- **Mutagens** – Materials that change the genetic material of cells.
- **Neurotoxins** – Materials that damage the nervous system
- **Teratogens** – Materials that affect the developing embryo, resulting in birth defects.

Possible Sites for Disease

- Every organ and system is a possible site for occupational disease. The "routes of transport" through the body are the most likely parts to be effected:
  - **Portals of entry** (skin and lungs)
  - **Blood** (carries the chemicals throughout the body)
  - **Organs of exit** (kidney, liver, bladder)

Summary

- HazCom is a complex and detailed concept and a MSHA standard
- Know the process and procedures at the location where you work
- Know the location of the MSDSs
- Know how to read the MSDSs
- Know what chemicals are in the area where you work

SITE HAZARDOUS CHEMICALS

Sulfuric Acid

- A clear colorless to yellow oily liquid
- Reacts violently with many organic and inorganic chemicals and water
- Will cause severe burns to the skin and eyes upon contact
- In case of contact, flush with plenty of water for at least 15 minutes
- If swallowed, get medical attention immediately
- PPE should include full acid suit, goggles with face shield, acid-resistant gloves, and acid-resistant foot protection

Anhydrous Ammonia

- Colorless gas that is lighter than air and has a strong irritating odor
- Generally stable but reacts violently with strong acids
- May be flammable under certain conditions
- Contact with skin or eyes can cause severe burns
- Inhalation can cause irritation and severe burns to the mucous membranes and respiratory tract
- In case of skin or eye contact, flush with water for at least 15 minutes and seek medical treatment
- Wear face shields with goggles, chemical resistant gloves and suits, and have adequate ventilation or use approved respiratory protection

Hydrogen Peroxide

- Clear, colorless and odorless liquid
- Strong oxidizer – contact with combustibles may cause fire
- May cause irreversible tissue damage to the eyes including blindness
- May cause skin irritation or burns to the nose throat and lungs
- Upon contact, flush with water for at least 15 minutes and seek medical attention
- If ingested, rinse mouth with water, dilute by drinking 1 to 2 glasses of water and seek medical attention
- Wear chemical resistant goggles with a full face shield and chemical resistant clothing, boots and gloves

Sodium Hydroxide

- May be solid white pellets, or white solution with no appreciable odor
- Solutions are corrosive to body tissues and metallic materials and may react violently with acids
- Severe irritation and burns may result upon contact with the eyes, skin or respiratory tract
- If contact with skin or eyes occurs, flush with water for at least 15 minutes and get medical attention
- If ingested, rinse mouth and dilute with 1 to 2 glasses of water and seek medical attention
- Use goggles with full face shields and chemical resistant clothing, including shoes and gloves

Ammonium Sulfate

- Odorless solid (crystals), brownish gray to white in color
- May cause skin and eye irritation upon contact or respiratory irritation if inhaled
- In case of contact, flush eyes or skin with water for at least 15 minutes; in case of inhalation, remove to fresh air and get medical attention if necessary
- Use gloves, safety glasses with side shields or face shields, and respiratory protection (if necessary)

Kerosene

- Colorless to pale straw or red oily flammable liquid with a characteristic odor
- Causes irritation to the upper respiratory tract and eyes and skin contact can cause defatting of the skin along with irritation and burning
- If contact with eyes occurs, flush with water for at least 15 minutes and wash skin with soap and water upon contact
- If swallowed, seek medical attention
- Use face shields with goggles where splashing may occur and use nitrile gloves to protect hands; wash contaminated clothing before reuse

Alamine 336

- Pale yellow liquid with Ammonia odor
- Causes skin and eye irritation, may be harmful if swallowed
- Immediately flush eyes or skin with plenty of water for at least 15 minutes, move to fresh air and get medical attention
- Use local exhaust ventilation, safety glasses with side shields, and rubber or plastic gloves when handling

Isodecanol (Exxal 13)

- Clear, colorless, flammable liquid with distinct odor of alcohol
- Irritating to eyes, excessive exposure may result in eye, skin, or respiratory irritation
- If material is inhaled, remove from further exposure; seek medical attention if respiratory irritation, dizziness or unconsciousness occurs
- If exposure occurs, flush skin and eyes with water for at least 15 minutes, remove contaminated clothing, and seek medical attention if necessary
- Use goggles or face shields, chemical resistant gloves, and respiratory protection as required

Sodium Carbonate (Soda Ash)

- White, odorless, granular solid that reacts with acids to release carbon dioxide gas and heat
- Direct contact will cause irritation of the eyes and prolonged contact may cause skin irritation; excessive inhalation may cause irritation to the mucous membranes and respiratory tract
- Flush exposed areas with water for at least 15 minutes; if inhalation hazard exists, remove to fresh air
- Appropriate eye and face protection should be utilized; respiratory protection may be used when appropriate, and clothing with long sleeves and gloves should be worn when handling the material

Vanadium Products

- Vanadium products present at various stages of production at the facility include Ammonium Metavanadate and Vanadium Pentoxide
- Both products can cause severe respiratory irritation, coughing, bloody noses and wheezing
- Coloration of the tongue and mouth have been noted
- Eye and skin irritation may result from prolonged contact
- Protective clothing including gloves must be worn when handling these products
- Appropriate respiratory protection must be worn at all times when working in areas where these products are present

Sodium Chlorate

- White odorless crystals
- Will cause irritation to the eyes and skin upon contact
- Irritation to the respiratory tract (sore throat and coughing) and gastrointestinal tract (liver and kidney damage) will occur upon inhalation or ingestion
- Strong Oxidizer – contact with other materials may cause fire
- Wear chemical resistant clothing including gloves and boots, and face and respiratory protection where exhaust ventilation is inadequate
- Flush skin or eyes with water and get medical attention immediately if ingested or if severe inhalation is experienced