Environmental Health and Safety
UNIVERSITY OF COLORADO
COLORADO SPRINGS

Hazardous Materials Management Plan

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1 Introduction

The purpose of the Hazardous Materials Management Plan (HMMP) is to describe the proper use, handling and storage practices and procedures to be followed by people working with hazardous materials anywhere on UCCS property to assist in protecting them from potential health and physical hazards presented by hazardous materials present in the workplace, and to keep chemical exposures below specified limits.

It is intended to fulfill the requirements of the following regulations:

- Hazard Communication Plan – 29 CFR 1910.1200
- Hazardous Materials Management Plan – Colorado Springs Fire Department

For purposes of this document hazardous materials is defined as any item or agent (biological, chemical, or radiological), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Hazardous materials are defined and regulated in the United States primarily by laws and regulations administered by the U.S. Environmental Protection Agency (EPA), the U.S. Occupational Safety and Health Administration (OSHA), the U.S. Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC). Each has its own definition of a "hazardous material."

OSHA's definition includes any substance or chemical which is a "health hazard" or "physical hazard," including: chemicals which are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents which act on the hematopoietic system; agents which damage the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapors, mists or smoke which may have any of the previously mentioned characteristics. (Full definitions can be found at 29 Code of Federal Regulations (CFR) 1910.1200.)

EPA incorporates the OSHA definition and adds any item or chemical which can cause harm to people, plants, or animals when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment. (40 CFR 355 contains a list of over 350 hazardous and extremely hazardous substances.)

DOT defines a hazardous material as any item or chemical which, when being transported or moved in commerce, is a risk to public safety or the environment, and is regulated as such under its Pipeline and Hazardous Materials Safety Administration regulations (49 CFR 100-199), which includes the Hazardous Materials Regulations (49 CFR 171-180). In addition, hazardous materials in transport are regulated by the International Maritime Dangerous Goods Code; Dangerous Goods Regulations of the International Air Transport Association; Technical Instructions of the International Civil Aviation Organization; and U.S. Air Force Joint Manual, Preparing Hazardous Materials for Military Air Shipments.

The NRC regulates materials that are considered hazardous because they produce ionizing radiation, which means those materials that produce alpha particles, beta particles, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other particles

capable of producing ions. This includes "special nuclear material," by-product material, and radioactive substances. (See 10 CFR 20).

Attachment A provides definitions for all other terms used throughout the HMMP.

2 Duties and Responsibilities

An essential component of any hazardous materials management program is to clearly articulate and clarify the different roles and responsibilities of all the stakeholders. Clarifying roles and responsibilities for implementing the Hazardous Materials Management Plan (HMMP) will establish accountability, streamline processes, enhance safety and avoid confusion and questions in meeting the HMMP's objective.

Departmental Responsibility

Each department is responsible for hazardous materials management including but not limited to the following:

- Allocate the personnel and financial resources to facilitate a safe working environment, safe working practices and safe handling of hazardous materials.
- Decontaminate areas where hazardous or radioactive materials are used or stored. Thorough decontamination using EHS approved methods must occur prior to maintenance, renovation, reallocation of space, or closure. It is the responsibility of the lab coordinator, principal investigator and their department to arrange proper disposal of all hazardous materials prior to personnel relocations or facility closure.
- Delegate responsibility for safety to principal investigators and staff personnel (such as a safety liaison, lab coordinators, lab proctors, chemical hygiene officer or supervisors) in a clear and unambiguous manner and hold them accountable for those areas to which their responsibility pertains.
- Require participation in the Lab Safety Program, if applicable. This program may require the development of a Lab Specific Safety Plan that should include personnel training, standard operating procedures, hazard identification, emergency action plans and record keeping.

Departmental Safety Representative

- Ensure all activities related to the use of hazardous materials in the workplace are conducted in a safe manner as well as in compliance with OSHA regulations as specified in 29 CFR Part 1910, University Policy and Procedures and the UCCS HMMP
- Participate in the campus Safety Management Committee.
- Work with principal investigator’s (PI’s) or supervisors to develop, review and approve Job Hazard Analysis and Standard Operating Procedures detailing all aspects of proposed research or work activities that involve hazardous materials.
- Work with the PI’s or supervisors on the approval process for the purchase of highly toxic, reactive, or carcinogenic or other inherently hazardous materials.
- Investigate and complete a report for chemical or physical hazard related incidents and exposures in their department.
- Provide guidance with personal protective equipment (PPE) selection based on the findings in the job hazard analysis and in accordance with the campus PPE program.

- Disseminate chemical hazard safety information throughout their department through emails, posting, and other forms of communications.
- Provide general chemical hazard safety guidance to department staff, students and faculty.

Employees, Students and Volunteers

- Follow all safety and health procedures specified in the UCCS HMMP and by their supervisor.
- Complete required health and safety training sessions.
- Report accidents, unhealthy and unsafe conditions, near misses, and minor injuries to their supervisor,
- Notify their personal physician if any personal health conditions could lead to serious health situations in the laboratory. For example, someone with a compromised immune system may need to take extra precautions when working with biological agents.

Environmental Health & Safety (EHS)

- Review evaluate and revise (if necessary) initially, and annually thereafter the UCCS HMMP;
- Submit the HMMP to the Safety Management Committee for review and adoption.
- Review and approve those procedures and/or hazardous chemicals specified in the HMMP as requiring prior approval. This review process will also determine and specify conditions under which such procedures and/or hazardous chemical use may be conducted;
- Review ongoing and proposed programs in laboratory chemical safety and health and provide recommendations for program enhancements and improved compliance;
- Eliminate or curtail any activity considered to constitute a significant danger to the health and safety of a member of the University community or the environment.
- Oversee the administration of the HMMP and training;
- Provide advice and clarification regarding the HMMP;
- Conduct periodic unscheduled and planned inspections of University facilities to ensure compliance with the HMMP.
- Serve as a liaison on behalf of the University to regulatory agencies concerning regulatory compliance with occupational safety and health and environmental concerns, and
- Ensure that adequate records are kept of all inspections, exposure monitoring, emergency responses, and hazardous materials.

3 Hazardous Materials Awareness

Potentially hazardous materials can be found everywhere. There are an estimated 575,000 existing chemical products, hundreds of new ones are introduced annually. Almost 32,000,000 workers are potentially exposed to one or more hazardous materials in the workplace. Many of these materials have properties that make them hazardous; they can create physical (fire, explosion) and/or health (toxicity, chemical burns) hazards. Depending upon magnitude, hazardous material exposure may cause or contribute to serious health effects including cancer, heart disease, burns, rashes, kidney and lung damage. There are many ways to work with hazardous materials which can both reduce the probability of an

accident to a negligible level and reduce the consequences of minimum levels should an accident occur. The fact that these same hazardous materials are available at your local hardware store does not mean they are without hazard. Risk minimization depends on safe practices, appropriate engineering controls for hazardous material containment, the proper use of personnel protective equipment, the use of the least quantity of material necessary, and substitution of a less hazardous material for the more hazardous one.

To be classified as hazardous, a substance must be capable of producing adverse effects on humans or the environment. Before using any hazardous material, even if it is something that you have worked with at home or elsewhere, it is important to understand what the potential exposure hazards may be and how to use the material safely. To assess the hazards of a material, both the physical and health hazards of the material must be considered. Generally, more accurate information is available about a material's physical hazards than about its health hazards.

You need to be familiar with the hazardous materials you are working with. Being able to recognize the physical and health hazards of a material before you handle it is very important. Once the potential hazards of a material have been determined, you can take the appropriate steps in the handling and storage of that material to protect yourself and others.

Hazardous Material Labeling

An integral part of hazard communication is hazards identification. With few exceptions, hazardous material containers used and stored at UCCS must be labeled to identify their contents. Labeling is important to prevent accidental misuse and inadvertent mixing of incompatible materials. Proper labeling facilitates quick decision-making and action in an emergency (i.e., spill, exposure, fire, etc.), avoiding the expense of handling, management, and disposal of unknown chemicals.

Everyone who works with hazardous materials should know how to read and interpret hazard information. Signs, labels, placard, and symbols alert employees to the known hazards in a location.

Labeling Systems

Labels on containers can also be a source of safety information. There are several standardized labeling systems which workers may see in the work place. The most common types of labeling system encountered are the Department of Transportation (DOT), the National Fire Protection Association (NFPA), and the Hazardous Materials Information Systems (HMIS). While the NFPA and HMIS systems are relatively common, some vendors have created their own label system which incorporates information from one or both labels. When looking at containers, look for the common elements rather than the differences (e.g., are the hazard ratings high or low, special equipment, etc.).

NFPA and HMIS Labeling Systems

Workers will probably see both types of labels used on containers. At first glance, these labeling systems appear quite similar. On both the NFPA and HMIS label, each color represents a specific type of hazard:

- Blue stands for health hazard
- Red means flammability hazard
- Yellow is reactivity hazard (NFPA) or Orange is physical hazard (HMIS)

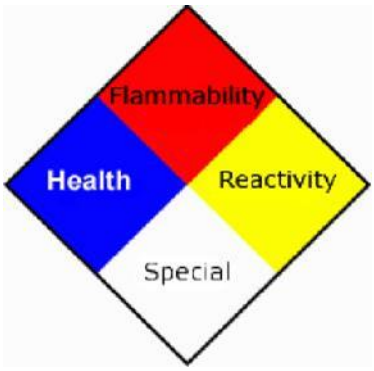
- White stands for special hazard information or special notice

The blue, red, and yellow/orange sections also contain a number from 0 to 4 that tells the degree of hazard. The number 4 is for the most serious hazard, 0 the least serious. The white section of the label uses no numbers. If a material presents a special hazard, then a symbol or phrase may be placed in the white section giving special attention. The HMIS label will sometimes note personal protective equipment using specially designated icons.

However, there are significant differences between the two systems. The HMIS system attempts to convey full health warning information to all employees while the NFPA diamond conveys hazard information to fire fighters and other emergency responders. HMIS is not intended for emergency circumstances. The HMIS label attempts to convey full health warning information to the user just as it is listed on an SDS. Let's look at the information each of the sections of the label provide.

3.1.1 NFPA Labels

The popular NFPA diamond was developed by the National Fire Protection Association to aid emergency responders in recognizing potentially hazardous situations. The label contains 4 colored diamond shapes. Each colored diamond is associated with a different type of physical or health hazard. However, because this system refers to the hazards associated with the material under fire-type conditions, the information is of limited value for routine laboratory use of the chemical.



Health Hazard (Blue). Degree of hazard; level of short-term protection.

- **0** Ordinary Combustible Hazard in a Fire
- **1** Slightly Hazardous
- **2** Hazardous
- **3** Extreme Danger
- **4** Deadly

Flammability (Red). Susceptibility to burning.

- **0** Will Not Burn - Any material that will not bum in air when exposed to a temperature of 815.5 °C (1500 °F) for a period of 5 minutes.
- **1** Will Ignite if Preheated - Materials that will bum in air when exposed to a temperature of 815.5 °C (1500 °F) for a period of 5 minutes or less; liquids, solids, and semi-solids having a flash point above 93.4 °C 11200 °F (i.e., Class IIIB combustible liquids)].
- **2** Will Ignite if Moderately Heated - Liquids having a flash point above 37.8 °C (100 °F), but not exceeding 93.4 °C [200 °F (i.e., Class II and Class IIIA combustible liquids)]; solid materials in a dust, fibrous, or shredded form that may bum rapidly or readily give off flammable vapors, but do not form explosive atmospheres with air.
- **3** Will Ignite at Ambient Conditions - Liquids having a flash point below 22.8 °C (73 °F) and having a boiling point at or above 37.8 °C (100 °F) and those liquids having a flash point at or above 22.8 °C (73 °F) and below 37.8 °C [100 °F (i.e., Class IB and Class IC flammable liquids)]; materials that can form explosive mixtures with air and materials that bum with extreme rapidity.
- **4** Burns Readily at Ambient Conditions - Flammable gases; flammable cryogenic

materials; any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8 °C (73 °F) and a boiling point below 37.8 °C [100 °F (i.e., Class IA flammable liquid)]; materials that ignite spontaneously when exposed to air.

Reactivity, Instability (Yellow). Energy released if burned, decomposed, or mixed.

- **0** Stable Even Under Fire Conditions and Not Reactive with Water
- **1** Unstable if Heated
- **2** Violent Chemical Change
- **3** Shock and Heat May Detonate
- **4** May Detonate at Normal Temperatures and Pressures

Special Hazard (White).

- OX = Oxidizer
- COR = corrosive (either acid or base)
- ☢= radioactive
- ACID = acid (pH <7.0)
- ALK = alkaline or base, caustic (pH > 7.0)
- ~~W~~ = Use No Water, reacts!
-  = poison / highly toxic
-  = explosive metal

3.1.2 HMIS Labels

Another popular system was developed by the National Paint and Coatings Association. It contains 4 different colored rectangular shapes that are related to different hazards. As opposed to the NFPA label, the Hazard Materials Information System (HMIS) rates the material risks under normal use conditions.

Health Hazard Rating (blue)

- **0** Minimal – No significant risk to health.
- **1** Slight - Irritation or minor reversible injury possible
- **2** Moderate - Temporary or minor injury may occur.
- **3** Serious - Major injury likely unless prompt action is taken, and medical treatment is given.
- **4** Severe - Life-threatening, major or permanent damage may result from single or repeated exposures.

Flammability Hazard Rating (red)

- **0** Minimal - Materials that are normally stable and will not burn unless heated.
- **1** Slight - Materials that must be preheated before ignition will occur. Flammable liquids in this category have flash points (the lowest temperature at which ignition can occur) at or above 93.4 °C [200 °F (NFPA Class MB)].
- **2** Moderate - Materials that must be moderately heated before ignition will occur, including flammable liquids with flash points at or above 37.8 °C (100 °F) and below 93.4 °C [200 °F (NFPA Class II and Class IIA)].

- **3** Serious - Materials capable of ignition under almost all normal temperature conditions, including flammable liquids with flash points below 22.8 °C (73 °F) and boiling points above 37.8 °C (100 °F) and liquids with flash points between 22.8 °C (73 °F) and 37.8 °C [100 °F (NFPA Class IB and IC)].
- **4** Severe - Very flammable gases or very volatile flammable liquids that have their flash points below 22.8 °C (73 °F) and boiling points below 37.8 °C [100 °F (NFPA Class 1A)].

Physical Hazard Rating (orange)
-water reactives -compressed gases -oxidizers
-organic peroxides -pyrophoric materials -unstable reactives
-explosives

- **0** Minimal - Materials that are normally stable, even under fire conditions and will not react with water
- **1** Slight - Materials that are normally stable but can become unstable at high temperatures and pressures. These materials may react with water, but they will not release energy violently.
- **2** Moderate - Materials that, in themselves, are normally unstable and that readily undergo violent chemical change but will not detonate. These materials may also react violently with water.
- **3** Serious - Materials that are capable of detonation or explosive reaction, but which require a strong initiating source, or which must be heated under confinement before initiation; or materials that react explosively with water.
- **4** Severe - Materials that are readily capable of detonation or explosive decomposition at normal temperatures and pressures.

Chronic Effects Information
Chronic health effects are not rated because of the complex issues involved and the lack of standardized classifications and tests. However, based on information provided by the manufacturer/supplier, chronic effects may be indicated by (1) use of an asterisk (*) or other designation after the Health hazard rating corresponding to other information that may be available; or (2) written warnings in the upper white section of the HMIS label.

Personal Protective Equipment
Information provided by the manufacturer/supplier is used to determine the proper personal protective equipment. This is represented by a letter coding system which refers to a series of protective equipment configurations. In some instances, icons may be used instead of the codes. Although use of icons is not endorsed by HMIS, the icons are more specific than having employees try to remember a bunch of codes or consult a chart, something that could lead to confusion and/or a fatality.

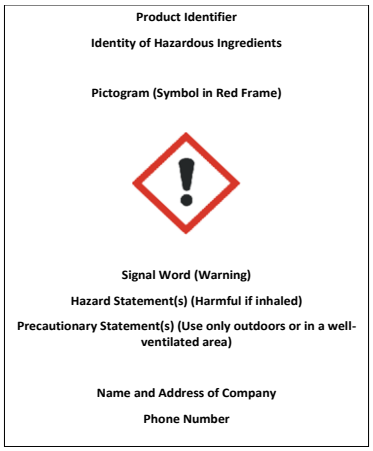
3.1.3 DOT Labels

When hazardous materials are shipped or transported in the public sector, there must be labels to satisfy DOT rules. Many larger containers (e.g., 5-gallon cans) are also individually labeled with the standard DOT labels. These labels are designed to identify DOT classes of hazardous materials. These DOT labels are diamond-shaped and color-coded by hazard. The hazard class or division number appears in the lower corner. If you are involved in the shipment or receipt of

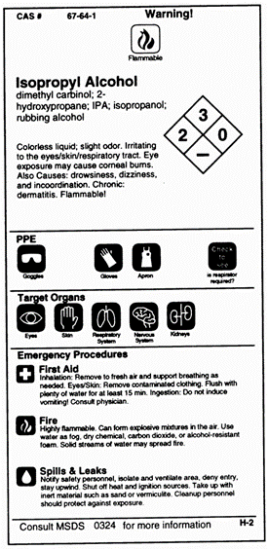
hazardous materials, you must be trained to DOT standards. Contact EHS for DOT training information.

3.1.4 Manufacturer Labels

The manufacturer's label will contain 6 categories of information.



1. Product identification:
   Names or numbers used on a hazardous product label or in a safety data sheet. They provide a unique means by which the product user can identify the chemical substance or mixture.
   - Chemical identity required for substances
   - For mixtures either:
     - All the ingredients contributing to the hazard of the mixture/alloy, or
     - All the ingredients contributing to any health hazards presented by the product other than irritation and aspiration.
2. Pictograms of the hazards for this product:
   It is a symbol inside a diamond with a red border, denoting a hazard class (e.g., acute toxicity/lethality, skin irritation/corrosion, etc.).
3. Signal Word – Warning or Danger:
   One word used to indicate the relative severity of hazard and alert the reader to a potential hazard on the label and safety data sheet. The GHS includes two signal words:
   - "Warning" for less severe hazard categories and;
   - "Danger" for more severe hazard categories.
4. Hazard Statements about the specific hazards of this product:
   Phrases assigned to each hazard category that describes the nature of the hazard. Examples of hazard statements are: "Harmful if swallowed," "Highly flammable liquid and vapor" and "Harmful to aquatic life."
   - Describe the hazards covered by the GHS
   - Indicate the degree of severity of the hazard
   - Text of the statements has been harmonized
   - Harmonized statements are assigned to each hazard class and category, and have been codified (a numbering system has been applied to them for ease of reference)
     Physical Hazards – H2XX
     Health Hazards – H3XX
     Environmental Hazards – H4XX
     Example: H318 Causes serious eye damage



5. Precautionary statements regarding handling or storage of this product:
   Phrases that describe recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a

hazardous product, or improper storage or handling of a hazardous product. These phrases cover prevention, response, storage, and disposal of products

- Precautionary statements are required. The GHS includes possible statements, but they have not yet been harmonized
- There are 5 types of statements:
  General – P1XX
  Prevention – P2XX
  Response – P3XX
  Storage – P4XX
  Disposal – P5XX
- These have been assigned to hazard classes and categories, and codified (numbered).
  Example: P280 Wear eye protection/face protection.
- Some systems may choose to illustrate precautionary information using pictograms. These are not harmonized in the GHS.

6. Manufacturer's name and contact information:
   Under the GHS supplier identification would include the name, address and telephone number of the manufacturer or supplier of the substance

   Labels must be legible, in English, and prominently displayed. Other languages may be displayed in addition to English. Chemical manufacturers, importers, and distributors who become newly aware of any significant information regarding the hazards of a chemical must revise the label within six months

   Whenever possible a date of receipt needs to be added by the user to the label.

Exceptions

Exceptions to the labeling requirements include the following items:

- Consumer products (e.g., hair spray)
- Food and food products labeled in accordance with the Food, Drug and Cosmetic Act
- Samples and specimens received in a lab for testing when the exact composition is not known
- Pesticides labeled in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act
- Non-toxic and harmless chemicals are also exempt from other labeling requirements so long as they are labeled with the chemical name. If you have a labeling question, please refer to EH&S.

3.1.5 Labeling Secondary Containers

Sometimes workers need only a small amount of material for a specific task and may transfer the amount of chemical they need from the original container to a smaller, more portable, secondary container. If all the material is to be used immediately by the employee who transferred the material, the secondary container need not have a label. However, the chemical can only be used by the worker who transferred it and it must be only used on that shift. It is better to label any secondary container with all the necessary information

Labeling Requirements by Type of Container

Specific labeling requirements vary with the type of container. Any media can be used to label containers if it is resistant to smearing and fading. Old labels must be completely defaced or removed when reusing containers, unless the old label accurately describes the new contents.

- **Permanent/Manufacturer containers -** those containers as received from the manufacturer or containers to which you have transferred a material for storage. Permanent containers must be labeled with specific information as discussed in the previous section.
- **Durable/Secondary containers -** containers that are not provided by the manufacturer, but which hold chemicals that will be used only in one work area[4], usually for longer than one day and by more than one person. Examples include stock solutions and dilutions of chemical products. Durable containers must be labeled with the following information: chemical name and concentration; NFPA diamond. It is also good practice to include the date of preparation and preparer's initials.
- **Transient containers -** containers that will be used to hold chemicals for one work shift or less *and* that will be under the direct control of the person filling the container. No labeling is required for these containers until they are no longer under the control of the person who prepared the material. Examples include solutions that will be used immediately in an experiment, cleaning solutions or paint that will be used by the end of a shift. Transient containers can easily be inadvertently left unlabeled at the end of the day, so consideration should be given to labeling them in accordance with the requirements for durable containers whenever possible. If a transient container is left unattended in an unsecured area, it must be labeled as for durable containers

The table below summarizes the information required on different container labels.

Information Required on Label	Permanent Container	Durable Container	Transient Container
Product Name	•	•	•
Hazard Symbols (classification)	•	✪	
Signal Word	•	✪	
Hazard Statements	•	✪	
Precautionary Statements	•	✪	
Supplier Identification	•	•	
Date of preparation		•	
Preparer's initials		•	

✪ a NFPA label can be utilized to meet these requirements

Labels must be replaced if they become illegible.

Special Circumstances

Small containers, such as vials and test tubes, can be labeled as a group by labeling the outer container (*i.e.* rack or box). Alternatively, a placard can be used to label the storage location for small containers (*i.e.* shelf, refrigerator, *etc*.)

Other Identification requirements

- Refrigerators and freezers need content identification and whether they are explosion-proof.
- Chemical storage cabinets are required to have content identification signage with one of more of the Hazardous Class symbols.

Many chemicals fall under more than one hazard class. Extra care should be taken when handling or storing chemicals with multiple hazards.

Safety Data Sheets

A Safety Data Sheet (SDS) for each hazardous chemical must be readily available to anyone in the work area. Each work area should have a sign posted that indicates where the SDSs are kept and/or how to access the SDSs. It is expected that any worker/student should be able to access a SDS, without assistance, within 5 minutes of a request being made.

3.1.6 Obtaining and Maintaining SDS

It is the PI or supervisor's responsibility to obtain an SDS for each hazardous material in their work area. The first time you purchase a hazardous material directly from a vendor, you should receive an SDS. If you do not, then you need to either contact the vendor directly or otherwise obtain an SDS. If you purchase hazardous materials directly from another source (i.e. Lowe's, home depot, etc.), then you need to either obtain an SDS from that supplier or from an online source.

UCCS's preferred method of SDS retention and availability is through the www.quartzy.com inventory system. To use this preferred method the following must be true:

a. SDSs must be readily accessible with no barriers to employee access. This always means reliable devices accessible without the employee needing to ask anyone for permission. The employee must be a part of the quartzy group and have login access to quartzy.
b. Workers must be trained in the use of these devices, including specific software. Employees need to have at least once logged into quartzy and located an SDS.
c. There must be an adequate back-up system and written plan for rapid access to hazard information in the event of an emergency including power-outages, equipment failure, on-line access delays, etc. EHS does maintain a digital copy of SDSs from the campus on a flash drive.
d. Employees and emergency response personnel must be able to immediately obtain hard copies of the SDSs, if needed or desired.

If the above criteria cannot be met, then the work area must maintain hard copies of their SDSs. Older versions of SDSs or Material Safety Data Sheets (as they were previously known) may still need to be maintained as an employee exposure record. Please consult with EHS prior to disposing of any older SDSs/MSDSs.

Internet searches are not considered as acceptable method to obtain an SDS which should be readily available in the work area.

SDS must be updated on a periodic basis. All SDSs should be dated. EHS attempts to review SDSs to ensure that they are latest version available; however, if a supervisor or PI becomes aware of a more recent version of an SDS, then they should upload this to the quartzy system. EHS attempts to review the SDSs for completeness and will seek out additional information regarding the material to ensure that appropriate precautions are being utilized based on the hazard information available.

3.1.7 Use of SDS in work/process planning

Workers and students should consult SDS resources for every chemical they plan to use before they start the experiment or procedure. This review will be used in the development of the SOP and process safety review. If the worker/student feels that information which may be pertinent to their process is blank on the SDS, they should first contact the supervisor, who may in tern contact EHS for assistance.

An annual review of all SDS should be included as part of the annual chemical safety training refresher. Accidents involving chemicals will require an SDS be provided to emergency response personnel and to the attending physician so proper treatment can be administered. The "rule of thumb" is that a person working in a laboratory should be able to produce an SDS for any hazardous chemical found in the laboratory within five minutes.

3.1.8 What is an SDS

An SDS is a document that details information about chemicals and along with the container label is a good source of information for chemical safety. It consists of 16 sections and provides the following information:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use. If one generic SDS is used to cover various grades of a material, all grades must be listed as well as known synonyms. If an optional number or code is used by the manufacturer to help identify the SDS, it should appear in this section and on every page of the SDS. Remember, thousands of materials with many similar names are found in workplaces. A mistake on the supplier's part in sending you the wrong SDS needs to be caught immediately before you put your trust in the wrong information.

Section 2, Hazard(s) identification includes all hazards regarding the chemical; required label elements. This section is divided into two parts. The first part describes the material's physical appearance and provides the most significant immediate concerns for emergency personnel. This information is important to both workers and emergency responders since it describes a chemical's normal appearance and odor and describes how the chemical will behave when it is released. Workers are expected to be trained in recognizing a chemical's hazard.

The second part of this section provides information on the most significant immediate concerns including emergency overview, OSHA regulatory status, potential health effects and symptoms associated with exposure to the material, and potential environmental effects.

Here is a list all the routes of entry (i.e., eye, skin, inhalation, ingestion) pertinent to this material and it also lists the actual health hazard of the chemical, both acute (effects that show up immediately after exposure) and chronic (effects that develop over time, usually following prolonged exposure). If the material is Particularly Hazardous and considered a confirmed or suspected carcinogen by IARC, NTP, or OSHA, a teratogen (causes physical defects in a developing embryo or fetus), a mutagen (causes genetic mutations), toxic to aquatic life or a danger to the environment, this fact may be included here or in other sections of the SDS.

Signs and symptoms of exposure are noted here. They can range from minor skin irritation to chronic lung disease. Some chemicals may harm a target organ such as the heart, liver, lungs, etc. Chronic effects are particularly dangerous because workers may not experience discomfort in the presence of the material but may develop severe health problems later in life because of the exposure. There is a possibility that exposure to some chemicals will aggravate preexisting medical conditions such as heart or respiratory problems. Remember, sickness and even death from improper exposure can be prevented if workers are aware of the potential hazards before they use a chemical.

Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims. This section describes what is hazardous in the chemical. It identifies the chemical by both its common and scientific name. If it is a chemical compound, this section describes the percent composition of the substance, listing chemicals present in the mixture which contribute to its hazardous nature. Otherwise, it lists all carcinogens and ingredients making up more than 1%. This section may also include the chemical family or group of chemicals with related physical and chemical properties, the chemical formula, and the Chemical Abstract Services (CAS) Registry number

Section 4, First-aid measures includes important symptoms/ effects, acute, delayed; required treatment. This describes medical and first aid treatment for accidental exposure by route of exposure inhalation, skin, eye, ingestion). Clear instructions including known antidotes that may be administered by a lay person or specially trained health care professional will be indicated. In accidents, give a copy of the SDS to attending physicians. A subsection entitled Note to Physicians may also be found here. This will provide specific medical information on treatment and diagnostic procedures which trained medical personnel can apply

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire. This section describes the fire and explosive properties of the material, the proper extinguishing materials, and the precautions and procedures to safely and effectively fight the fire. If a chemical has a high fire or explosion potential, the work area should be inspected carefully before it is used, and all ignition sources should be removed.

The flammable properties combined with the physical and chemical properties give a good indication of how hazardous a material is in a fire situation. The flash point of a chemical is the lowest temperature at which the chemical's vapors are concentrated enough to ignite if an ignition source is present. The lower the flash point, the more dangerous the material. The autoignition temperature is the lowest temperature at which a liquid will give off enough flammable vapors or heat energy to ignite and burn by itself.

Thus, it tells how hot a material must be before it will set itself on fire without a flame or spark. Other properties include the upper and lower flammable limits, the concentration in the air between which the substance is likely to ignite, and the upper and lower explosion limits (UEL and LEL), the minimum and maximum concentration of the chemical's vapor in the air where an explosion could occur.

With most fires, often the greatest danger to human life comes not from the heat of the fire, but from the toxic smoke that can quickly fill a work area. Known or anticipated hazardous products of combustion would be listed here. Thus, carbon disulfide, when burned, produces toxic gases and irritants, including carbon monoxide and sulfur oxides.

There is also a discussion of the best way to safely and quickly extinguish fires. Some burning materials may react with water and are best smothered with foam, carbon dioxide gas, or a dry chemical.

Certain chemicals may also present unusual fire hazards (e.g., strong oxidizer, explosive potential), these would be discussed here.

Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities. Under safe handling, the precautions listed are specific for the material's unique properties. There may be general warnings, "Do not breathe dust" and general practices to prevent continued exposure, "Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics." Handling practices, such as how to prevent vapor release, the need for a totally enclosed system, and recommendations to prevent injury would also be found here. Information like, "To avoid sudden release of pressure, loosen closure cautiously before opening" and "To reduce potential for static discharge, bond and ground containers when transferring materials" are warnings about the substance which must be followed.

Information about appropriate storage practices, including explanations of necessary storage conditions to avoid damage to containers, contact with incompatible materials and subsequent dangerous reactions, evaporation or decomposition of stored material, or flammable and explosive atmospheres in the storage area. Examples of specific storage procedures to avoid dangerous conditions include, "Keep away from oxidizing materials," "Keep containers closed, store in the dark at temperatures less than 20 °C (68 °F)," and "Protect these containers from physical damage, shield them from direct sunlight, and maintain their temperature at less than 38 °C (100 °F)."

Section 8, Exposure controls/personal protection lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE). Methods that safety professionals and employers can employ for reducing worker exposure to hazardous materials are presented. Control measures are often divided into engineering and administrative controls.

Engineering controls include things like ventilation, process controls (e.g., isolation, enclosure, etc.), sampling devices and concentration monitoring. These are important

because they do not require any action by the workers to be protected. Administrative controls include training, labeling, warning devices, operating procedures, etc. Administrative controls require the workers to take an active part in their safety. Guidance for appropriate personal protective equipment (PPE) is also found here. Protection of the workers is the employer's responsibility. To accomplish this, employers must provide engineering and administrative controls and PPE. The workers must be trained to use the right PPE correctly. Employees are responsible for handling chemicals as instructed and using the PPE provided. Both managers and workers are responsible for insuring protection systems are inspected and properly maintained to provide the proper amount of protection.

The chemical's exposure limits are also listed here. There may be several values and types of limits.

The most common are: Permissible Exposure Limit (PEL), Time Weighted Average (TWA), Threshold Limit Value (TLV), Short Term Exposure Limit (STEL) and Ceiling Limit (CL). OSHA and other organizations establish exposure limits. OSHA sets the permissible exposure limit (PEL). The threshold limit value (TLV) is recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). Both the PEL and TLV specify the maximum amount of exposure a worker can have to a substance averaged over an 8-hour workday. The limits are usually expressed in parts per million parts of air (ppm) or milligrams of dust or vapor per cubic meter of air (mg/m1). OSHA's PEL is the enforceable standard while others are recommendations and may be different than OSHA. When comparing hazards, the lower the ppm value, the more hazardous the chemical. Thus, a chemical with a PEL or TLV of 2 ppm is far more hazardous than one listed as 200 ppm. The PEL is often expressed as a time weighted average (TWA). TWA is a technique for averaging individual variant measurements over an 8-hour workday. The short-term exposure limit (STEL) is a term used by the ACGIH to express the maximum concentration most workers can tolerate for a 15-minute exposure period without adverse effects (with a maximum of four periods a day and at least 60 minutes between exposure periods). The ACGIH also establishes a ceiling limit (CL), the exposure limit that should never be exceeded, even instantaneously.

If established, the chemical's exposure limits are listed. Some compounds may not have an established exposure limit, and this would be blank. If the MSDS shows "8-hr TWA: 100 ppm or 300 mg/m3" it is a guideline establishing an exposure limit which should not be exceeded when averaged over an 8-hour workday. If the MSDS shows "STEL: 100 ppm" it is a guideline for an exposure level not to be exceeded over a 15-minute continuous exposure. A "skin" notation means that skin exposure is significant in contributing to the overall exposure. These exposure levels are set for healthy adult workers, based on the average 150-pound male, age 25 - 44. Lower exposure levels may be necessary for workers at higher risk (e.g., those who are young or elderly, pregnant, smokers, etc.) or for those who have already been exposed to other materials for which exposure limits have been set. Exertion increases the effects of exposure. Exposure to more than one hazardous substance at a time may be especially harmful because the combined effects of more than one material may be more damaging than the additive effects of each material. Thus, both smoking and asbestos can cause lung cancer; however, if a smoker is also exposed to asbestos, the danger of lung cancer is far greater (e.g., by a factor of 10) than just adding the separate risks from the two exposures.

Section 9, Physical and chemical properties lists the chemical's characteristics. This section lists the physical and chemical properties that characterize the material. Physical data such as evaporation rate, vapor density, etc. is important because it tells what circumstances (e.g., temperature) could change a chemical's normal state. It can also be used to determine conditions for exposure and allow workers to judge how a chemical will react to changes in condition and how it will disperse into the atmosphere. For example, certain kinds of jobs could increase the temperature in the work area and that could change the chemical and its hazards. Some of the common characteristics listed for a chemical are:

- Appearance/Odor - color, physical state at room temperature, size of particles, consistency, odor, etc. Odor threshold refers to the concentration required in the air before vapors are detected or recognized.
- Melting Point - the temperature at which a solid begins to change to a liquid
- Boiling Point - the temperature at which liquid changes to a gas or to its vapor state
- Evaporation Rate - how fast the chemical turns into a vapor, usually expressed as a time ratio with ethyl ether (or butyl acetate) = 1, unless otherwise specified. A chemical with a higher number evaporates faster; one with a lower number evaporates slower.
- Solubility in Water - the percentage of material that will dissolve in water, usually at ambient temperature. Since much of the human body is made of water, water soluble substances are more readily absorbed and distributed.
- Specific Gravity - the ratio of volume weight of material to equal volume weight of water (water = 1).
- Vapor Density - the weight of a gas or vapor compared to the weight of an equal volume of air (air = 1). A vapor density greater than 1 indicates it is heavier than air, less than 1 indicates it is lighter than air (i.e., it will rise in air). Vapors heavier than air can flow just above ground, where they may pose a fire or explosion hazard or may displace breathable air.
- Vapor Pressure - a measure of how volatile a substance is and how quickly it evaporates. For comparison, the VP of water (at 20 °C) is 17.5 mm Hg, Vaseline (nonvolatile) is close to 0 mm Hg, and diethyl ether (very volatile) is 440 mm Hg. The higher the number the faster it evaporates.
- Viscosity - internal resistance to flow exhibited by a fluid, normally measured in centiStoke time or Saybolt Universal Secs.

Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions. There are many ways that materials may react with one another. Some substances are unstable and can react with other substances or under specific kinds of situations and/or changes in conditions (e.g., temperature, humidity, light, etc.). The SDS would list materials and circumstances that could be hazardous when combined with the material covered by the SDS.

The SDS will warn about the possibility of reactions and the conditions that create them. Some unstable chemicals will react when the temperature changes, or when they are exposed to sunlight, air, or water. Many chemicals will react violently when exposed to water. If the chemical is incompatible with another chemical, the SDS lists the materials so they are not stored near and they are kept far apart on the job. For example, if the material reacts with metal, it should be stored on nonmetal shelves. If the material reacts

with natural rubber, you shouldn't wear a respirator or gloves made of natural rubber or use a rubber stopper to close the bottle.

Decomposition products or hazardous byproducts, such as toxic gases that the chemical could generate, along with their hazards, are also listed here. It is common knowledge that mixing bleach (sodium hypochlorite) with an acid gives off toxic and irritating chlorine gas; bleach mixed with an ammonia solution produces toxic and irritating chloramines. Polymerization is also a reactivity hazard. In this instance the material changes form usually releasing a lot of heat.

Knowledge of the physical and chemical properties and a chemical's stability and reactivity potential can be used in selecting proper personal protective equipment, storage or shelving, and choice of containers

Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity. Here information on toxicity testing of the material and / or its components is discussed. Usually the information reflects animal testing, although some human data will be available if accidental human poisonings have occurred and the exposure amounts are known, or if epidemiological studies have been conducted. The information is intended for medical and health and safety professionals. Data includes acute, sub-chronic, and chronic studies through various routes of exposure (inhalation, ingestion, skin, etc.). A typical example of data might be "Rat, Oral, LD50: 200 mg/kg" which means that 200 milligrams of the chemical per each kilogram of body weight is the lethal dose that killed 50% of a group of test rats following oral administration. These data are then used to help estimate the degree of hazard to humans.

Section 12, Ecological information* This information assists in evaluating the effect a chemical may have if it is released to the environment. Ecotoxicity data may include information on acute and long-term toxicity to fish and invertebrates, or plant and microorganism toxicity. Chemical behavior in the air, soil, or water is also important data when evaluating environmental contamination. Other information may include persistence and degradation, soli mobility, bioaccumulation, and photolytic (i.e., decomposition by light) stability.

Section 13, Disposal considerations* The SDS provides proper disposal information for environmental professionals or persons responsible for waste management activities. The information may include special disposal methods or limitations per Federal, state, or local regulations, and waste management options (e.g., recycling, reclamation) and may include RCRA waste classification and / or EPA waste identification numbers and descriptions.

Section 14, Transport information* This section provides basic classification information and special precautionary information to help a knowledgeable user prepare the material for shipment. It is not intended to contain every regulatory detail involving the transportation. If the material is regulated, shipping information includes DOT hazardous materials description / proper shipping name, hazard class, and identification numbers. This information helps shippers properly prepare materials for shipment.

Section 15, Regulatory information* Regulatory information useful for employers and personnel to assure compliance with health, safety and environmental regulations is listed. This includes reportable quantities (RQ) for spills or discharges and threshold planning quantities (113Q). All of this helps management to comply with various regulatory requirements. The content and organization of this section depends on where the material is manufactured or used but is not intended to be a comprehensive list of all regulations that may apply.

Section 16, Other information, includes the date of preparation or last revision. This section provides a location for additional information that may be useful. It may include label text, a list of references, keys/ legends explaining abbreviations used in the MSDS, or preparation and revision indicators. Hazard ratings defining the acute health, flammability, and reactivity hazards of a material may also be included

Chemical manufacturers and distributors must provide the purchasers of hazardous chemicals with an appropriate SDS for each hazardous chemical/product purchased. If an SDS was not provided with the shipment of a hazardous chemical, one must be requested from the manufacturer or distributor in a timely manner. Each person working with chemicals should have access to the SDS for all chemicals they use. “Access” may be achieved via any of the ways listed below:

- SDS may be managed as printed hard copies in an organized fashion such as a binder. If SDS are managed as hard copy, then laboratories are strongly urged to print the SDS sheets for their chemicals from the manufacturer that produced them and keep them in a clearly marked three ring binder in the laboratory on a bookshelf where they will be visible to all employees. These printed SDS must be updated and current.

- SDS may be maintained through a bookmarked Internet site. If the Internet is used, each person in the lab who uses chemicals must be registered, if required by the site, and trained to use the site to access and print an SDS. A functioning computer with internet access and a functioning printer must be available in the laboratory. If a laboratory chooses to use electronic access, the SDS website link must be posted on the computer or in another conspicuous location to facilitate easy access. Online SDSs are generally updated frequently by the provider. SDS provided by the ChemWatch System, the Canadian Center for Occupational Health and Safety, Fisher Scientific, Sigma-Aldrich and Acros are kept up to date. Researchers will need to assure that the SDS provided by other sources are current. Provisions are needed for dealing with long-term interruptions to power, the network, or the server which would make electronic versions unavailable.

- SDS may be stored on a computer as an electronic file. If this method is used, each person in the laboratory must be trained to access and print an SDS. A functioning computer and a functioning printer must be available in the laboratory. If a laboratory chooses to use electronic access, desktop icons or shortcuts must be used on the computer or posted in a conspicuous location to facilitate easy access. These electronic copies must be updated and current. Provisions are needed for dealing with long-term interruptions to power, the network, or the server which would make electronic versions unavailable.

- During power or ventilation outages, laboratories must be evacuated due to the loss of laboratory ventilation and possible loss of containment of hazardous materials. Although the laboratories must evacuate, there may still be a need for a researcher to access an SDS. Although the University Internet and Network Systems are very reliable, outages have occurred. Laboratories must develop a plan to access an SDS in the event of an outage. Training on accessing SDS during an outage must be provided.

- Options for accessing an SDS during these outages include, but are not limited to:
  - Maintaining a backup electronic file of the SDS on a laptop computer with a fully charged battery.
  - Contacting the appropriate vendor and requesting a CD loaded with the SDS. Access is also needed to a laptop with a fully charge battery.

- Accessing the online internet site through a laptop with a charged battery provided the network or server is functional.

Chemical substances developed in the laboratory

- If the composition of a chemical substance produced for laboratory use is known and determined to be hazardous, the PI or CHO shall supply appropriate training

- If the chemical produced is a by-product whose composition is not known, the PI or CHO shall assume that it is hazardous and implement the guidelines found in this Manual.

- If the chemical substance is produced for another user outside of the laboratory, the PI shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for the preparation of a Safety Data Sheet and labeling

Classification of Hazardous Materials

The hazard a hazardous material presents depends on its physical and toxicological properties. Hazardous materials are considered a physical hazard if they are flammable or reactive (i.e., unstable—including explosives, organic peroxides, monomers, pyrophorics, and water reactives), or if they are combustible liquids, oxidizers or compressed gases. Hazardous materials that present a physical hazard are classified according to their hazardous properties. Hazardous Materials that can cause reversible or irreversible damage to the human body are considered health hazards and are classified as toxics. This classification includes systemic poisons, irritants, carcinogens, asphyxiates, teratogens, mutagens, anesthetics and corrosives. Be aware that many hazardous materials exhibit multiple hazards, in which case, the more prevalent hazard must be considered. Contact EHS for help in identifying chemical hazards if you are unsure or need further guidance on proper handling.

Attachment B - Classification of Hazardous Materials Hazards.
Attachment C - Toxicity and Hazard Exposure.

The new GHS system has identified groups of hazards. Defined criteria are used to assign a hazard classification

Physical Hazards	16 categories
Health Hazards	10 categories
Environmental Hazards	2 categories

The following diagram depicts the pictograms used in the GHS, with the hazard classes they are applied to. Whenever they appear on a label or safety data sheet, they need to be contained within a red border.

GHS Pictograms and Hazard Classes		
		
• Oxidizers	• Flammables • Self-reactives • Pyrophorics • Self-heating • Emits flammable gas • Organic peroxides	• Explosives (1.1-1.4) • Self-reactives • Organic peroxides
		
• Acute toxicity (severe)	• Corrosive to metals • Skin corrosion • Serious eye damage	• Gases under pressure
		
• Carcinogenicity • Respiratory sensitization • Toxic to reproduction • Specific target organ toxicity (repeated) • Germ cell mutagenicity • Aspiration hazard	• Aquatic toxicity (acute) • Aquatic toxicity (chronic)	• Acute toxicity (harmful) • Skin/eye irritation • Skin sensitization • Specific target organ toxicity (single) • Hazardous to the ozone layer

Duel Use of Research Materials

Under the Policy for Institutional DURC Oversight, the identification of DURC-related risks and the management of those risks begin with the identification, by PIs, of research that directly involves nonattenuated forms of 1 or more of the 15 listed agents. Any such

research that is identified must then be assessed for whether the research produces, aims to produce, or can be reasonably anticipated to produce one or more of seven listed experimental effects.

a. Identification and Assessment by PIs of Research That Requires Institutional Review

As noted above, PIs are required to submit research for Institutional review as soon as any of the following three criteria are met:

- The PI's research directly involves nonattenuated forms of one or more of the listed agents; or
- The PI's research with nonattenuated forms of one or more of the listed agents also produces, aims to produce, or can be reasonably anticipated to produce one or more of the seven listed experimental effects; or
- The PI concludes that his or her research with nonattenuated forms of one or more of the listed agents that also produces, aims to produce, or can be reasonably anticipated to produce one or more of the seven listed experimental effects may meet the definition of DURC and should be considered (or reconsidered) by the IBC for its DURC potential.

b. Research Involving the Listed Agents

To initiate the institutional review process, PIs are to notify the IBC if they are conducting research that directly uses nonattenuated forms of one or more of the following agents:

- Avian influenza virus (highly pathogenic)
- Bacillus anthracis
- Botulinum neurotoxin (in any quantity)
- Burkholderia mallei
- Burkholderia pseudomallei
- Ebola virus
- Foot-and-mouth disease virus Francisella tularensis
- Marburg virus
- Reconstructed 1918 influenza virus
- Rinderpest virus
- Toxin-producing strains of Clostridium botulinum
- Variola major virus
- Variola minor virus
- Yersinia pestis

c. Experimental Effects

When a PI determines that his or her research does directly involve nonattenuated forms of one or more of these listed agents, he or she must also assess whether the research produces, aims to produce, or is reasonably anticipated to produce one or more of the experimental effects listed below, and this assessment should be provided to the institution for its consideration during the review of the research.

The categories of experimental effects are as follows:

- Enhances the harmful consequences of the agent or toxin;
- Disrupts immunity or the effectiveness of an immunization against the agent or toxin without clinical and/or agricultural justification;
- Confers to the agent or toxin resistance to clinically and/or agriculturally useful prophylactic or therapeutic interventions against that agent or toxin or facilitates their ability to evade detection methodologies;
- Increases the stability, transmissibility, or the ability to disseminate the agent or toxin;
- Alters the host range or tropism of the agent or toxin;
- Enhances the susceptibility of a host population to the agent or toxin; and
- Generates or reconstitutes an eradicated or extinct listed agent or toxin.

4 Hazardous Materials Handling and Storage

Use and storage of hazardous materials is regulated by federal, state, and local regulations. These regulations include OSHA worker protection standards, emergency response and planning regulations and local building and fire codes. Each of these place limitations on how much materials can be used, where they can be used or stored, or require information on inventory to be available for emergency planning and response. Proper hazardous material storage is as important to safety as proper hazardous material handling.

The university must meet the requirements outlined in International Fire Code (IFC), by its adoption by the City of Colorado Springs Fire Department (CSFD) – subject to modification as described in the City of Colorado Springs Fire Prevention Code. CSFD also enforces sections of the National Fire Protection Association (NFPA) standards since these have been adopted by IFC reference. Finally, OSHA 29 CFR 1910.106 “Flammable and Combustible Liquids” is also enforceable. Together, these place limitations on use and storage of compressed gases, cryogenic fluids, highly toxic and toxic materials, flammable and combustible liquids, and water reactive solids, to name a few. The CSFD performs routine inspections of buildings and has the authority to cite any situation that they deem in violation of the relevant codes.

This section will provide generic guides for safe handling and storage of hazardous materials. Detailed guidelines by hazard classification are available in Attachment D – Handling and Storage of Hazardous Materials.

General Storage Guidelines

Follow these guidelines for safe hazardous material storage:

a. Hazardous materials must be stored in secured areas, i.e., not accessible to the public.
b. Highly toxic and reactive materials need additional means of security such as lockable cabinets.
c. Read hazardous material labels and the SDS for specific storage instructions.
d. Store hazardous materials in a well-ventilated area; however, do not store hazardous materials in a fume hood.
e. Label all new material with the date in which it was received and the date in which it was opened. This will help prevent the accumulation of outdated hazardous materials and ensure that older hazardous materials are used first.

f. Maintain an inventory of all hazardous materials in storage. This should be maintained in digital format at www.quartzy.com. You may elect to also maintain a hard copy of the inventory.
g. Promptly discard outdated hazardous materials or hazardous materials no longer needed by the laboratory/unit. Contact EHS for disposal
h. Return hazardous material containers to their proper storage location after use.
i. Store glass hazardous material containers so that they are unlikely to be broken. Glass containers should never be stored directly on the floor.
j. Large metal containers can be stored on the floor in an isolated location.
k. Store all liquid hazardous materials below eye level of the shortest person working in the area.
l. Never store hazardous materials in a public area or corridor. Hazardous materials must be kept in a secured area.
m. Do not store hazardous materials near heat sources or in direct sunlight.
n. Periodically inspect storage locations for signs of corrosion or leakage and misplaced hazardous materials
o. Flammable liquid storage cabinets should have an FM approval and meet OHSA and NFPA standards.
p. Nothing should be stored/placed on top of a flammable liquid storage cabinet. Exception is for those storage cabinets designed for under counter use.
q. Shelves and cabinets in flammable liquid storage cabinets should be anchored solidly to the wall and safety lips should be installed along the front edges of exposed shelves to keep materials from falling.
r. Heavier items should always be stored closer to the ground.
s. To minimize risks, limit the amounts of hazardous materials on your benchtop to the minimum required for the day's work and safely store the remainder.
t. Liquid hazardous material storage must have adequate secondary spill containment devices in place. Priority should be given to acids, reactives, flammables, toxic compounds, radioactive and any other materials that could present a hazard or affect your ability to work in case of a spill.
    1. Secondary containment can be provided using plastic tubs or storage cabinets with containment features to prevent the spread of spilled or leaking hazardous materials.
    2. Containment materials used should not be reactive with the hazardous materials stored in them.
u. If you make solutions, synthesize products or transfer hazardous materials to another container, make sure all containers are labeled.
v. OSHA and EPA rules and regulations imply that if a container has an expiration date on the label, then the hazardous material must be used or disposed by that date. If you are going to hold hazardous materials past their expiration date, the viability of the hazardous material compound should be evaluated and documented for containers past their "expiration" date (e.g., write on the container a reevaluated expiration date and initial it).
w. Inspect storage areas periodically. It is not unusual to find hazardous material containers that are more than 20 years old, some with labels that are unreadable.

Separating Hazardous Material During Storage

In addition to the guidelines above, there are storage requirements for separating hazardous materials. Follow these guidelines to ensure that hazardous materials are stored safely:

a. Group hazardous materials according to their hazard category (i.e., corrosives, flammables, toxins, etc.), not alphabetically, and separated by some sort of physical barrier. An alphabetical storage system may place incompatible hazardous materials next to each other. Attachment D provides more guidance on segregation by incompatibilities.
b. Separate acids from bases and inorganic acids or bases from organic acids or bases. Store these hazardous materials near floor level.
c. Isolate perchloric acid from all other hazardous materials and from organic materials. Do not store perchloric acid on a wooden shelf or spill paper.
d. Separate highly toxic hazardous materials and carcinogens from all other hazardous materials. This storage location should have a warning label and should be locked.
e. Time-sensitive hazardous materials, such as those that form peroxides, should not be kept longer than twelve months from purchase or six months after opening. If they are kept longer, then they need to be measured and monitored for peroxide development. If stratification of liquids, precipitate formation, and/or change in color or texture is noted, contact EHS immediately.
f. Picric acid must be stored under a layer of liquid, as picric crystals are highly explosive. If picric acid dries out (forming yellow crystals), do not touch the container! Contact EHS immediately!
g. Hazardous materials may be stored in the cabinets underneath a hazardous material fume hood provided the cabinetry is designed for that use.
h. Flammables should be stored in a well-ventilated area and large quantities in a flammable storage cabinet. Refer to Attachment D for more information on allowable storage of flammable liquids per NFPA Code.
i. Flammable, volatile hazardous materials should be kept in a cool place, away from sources of heat and ignition.
j. If flammables are stored in refrigerators/freezers, the units should be designed, manufactured and UL-approved to have spark-free interiors. Any refrigerator or freezer not designed for the storage of flammables needs to have "EXPLOSION HAZARD: Do Not Store Flammables in This Refrigerator" marked on the outside of the door. Two kinds of refrigerators are approved for storage of flammables:
    a. Flammable liquid storage refrigerators. These have no spark sources within the refrigerator cabinet. There are, however, spark sources outside the refrigerator cabinet from switches, motors, relays, etc. These spark sources can ignite flammable vapors present outside of the refrigerator. A bottle of flammable liquid that drops and breaks near one of these refrigerators can easily be ignited by the sparks.
    b. Explosion-proof refrigerators. These refrigerators are considerably more expensive because they have all spark sources completely sealed inside and are safe for flammable atmospheres both within and outside of the refrigerator cabinet.
k. The total volume of flammable solvents in the laboratory should be limited to the amount needed for approximately one week of operations or the limit prescribed by NFPA (National Fire Protection Association), UBC (Uniform Building Code), and UFC (Uniform Fire Code), whichever is more restrictive.
l. No food is to be stored in the same refrigerator as hazardous materials, film or batteries. Hazardous substances can be absorbed by the food and subsequently ingested by individuals.

m. Corrosives should be stored in a corrosive storage cabinet. However, acids and bases should be stored separately to prevent their mixing and reacting violently in the event of an accident.
n. Strong oxidizing agents should be stored away from organic materials and strong reducing agents to prevent the risk of fire and/or violent reactions in the event of an accident.
o. Cyanides and sulfides should be stored well away from acids to prevent the generation of the respective toxic gases in the event of an accident.

Compressed Gas Cylinders:

Below are a few general requirements for gas cylinder usage. Due to the hazards posed by highly toxic, corrosive, and pyrophoric gases all procedures involving these gases must be reviewed by EHS staff prior to use (see Attachment D for details concerning the campus compressed gas policy). To ensure safe use and storage, all gas cylinders must be:

- Stored within a well-ventilated area, away from damp areas, salts or corrosive atmospheres, and away from exit routes;
- Stored in an upright position with full cylinders separated from empty cylinders;
- Secured with a chain or appropriate belt above the midpoint but below the shoulder. Laboratory cylinders less than 18” tall may be secured by approved stands or wall brackets;
- Capped when not in use or attached to a system (if the cylinder will accept a cap);
- Kept at least 20 ft. away from all flammable, combustible or incompatible substances.

Storage areas that have a noncombustible wall at least 5 ft. in height and with a fire resistance rating of at least 30 minutes may be used to segregate gases of different hazard classes near each other

Moving Hazardous Materials

A hazardous material sitting on a shelf in its original container presents less hazard than when that same container is moved. Whenever a hazardous material is moved there is a risk of the container breaking resulting in an uncontrolled release.

Whether you are transporting hazardous materials across your lab or across the campus, take precautions. Use secondary containment. No matter how careful you are, containers can drop, and bottles can break. An unprotected hazardous material container breaking in an elevator could be disastrous. Use a tray or a bucket to hold your hazardous materials in transit and contain any possible accident. Good secondary containment can mean the difference between a small inconvenience and a major building evacuation. Check a laboratory safety catalogue to find other secondary containment equipment to suit your needs.

Extra precautions for vehicles.

The transportation of hazardous materials in vehicles on public roads presents additional safety and legal problems. A container of flammable solvent or toxic material ruptured in a road accident drastically increases the risk to your health and makes rescue difficult. Hazardous materials should never be transported in the passenger compartment of a vehicle. The state's Department of Transportation (DOT) regulate the transportation of hazardous materials on public roads. Depending on the type and quantity of material transported, the person driving may be required by law to have a special (e.g., commercial)

driver's license, carry proper shipping papers and use specified packaging. If you must transport hazardous materials on public roads, at a minimum you must participate in the EHS DOT awareness training.

Shipping Hazardous Materials.
Many different government agencies regulate hazardous materials. If a hazardous substance is to be sent or transported off campus (e.g., FedEx, etc.), Department of Transportation (DOT) rules and regulations apply. The International Air Transport Association (IATA) sets rules for air transport of hazardous materials. You must attend a training class and be certified to ship (i.e., give to a commercial carrier like FedEx) any hazardous material. EHS offers training classes which will certify you for shipping hazardous materials or biological materials. Call for additional information and a schedule of the training.

5 Hazardous Material Inventory

Individuals who use, store or handle hazardous materials are responsible for maintaining a current inventory. This inventory shall be in an electronic format at www.quartzy.com . It needs to be updated whenever a new hazardous material is introduced into the work place/laboratory. It should be reviewed annually, and quantities updated at that time.

The inventory items need to provide enough detail (vendor, part number, description, etc.) that it can be distinguished from other similar items. For example, the item cannot simply say spray paint or solvent.

A designated person, such as the laboratory manager or a student assistant, may physically conduct the inventory but the individual responsible for the laboratory or work area (Primary Investigator, Director, Department Chair, supervisor, etc.) is ultimately responsible for accuracy and must ensure the inventory is submitted in a timely manner.

During the inventory, the individual should check the following:

- Condition of containers (no leakage, corrosion, or crystallization)
- Verify that highly toxics are stored in secondary containment (adequate to contain the contents in catastrophic failure of the primary container) when required
- Hazards are indicated on the individual containers (see labeling section)
- That excess or unused hazardous materials are returned to stock or properly disposed
- That hazardous materials are properly stored with incompatibles segregated
- That highly toxics are stored in a locked cabinet and that the cabinet is kept locked

EHS will review these inventories on a periodic basis to submit regulatory reports. In addition, EHS will assist in updating the inventories with safety information and associated documents such as SDSs.

As stated throughout this document, the university is subject to numerous regulations. Below are some of the codes and regulations requiring that laboratory staff have knowledge of their hazardous material inventories:

Emergency Planning and Community Right-to Know Act (EPCRA)

EPCRA is a federal statute that requires all entities that store, use or process hazardous materials to report this information to the State Emergency Response Commission and Local Emergency Planning Committees and in some cases the local fire department. EPCRA has four major provisions which are largely independent of each other and involve different hazardous material lists with different threshold reporting quantities.

Department of Homeland Security (DHS) Chemicals of Interest

The DHS has issued regulations related to security of high-risk chemical facilities. These regulations, released in 2007, require facilities to determine if they have specific chemicals above screening threshold quantities. 300 chemicals (and respective thresholds) were identified. While most of the thresholds were set at thousands of pounds, some of the threshold amounts were significantly lower. This is one of the items the EHS evaluates on a periodic basis by reviewing your inventories.

Biological Toxins

The Public Health Security and Bioterrorism Preparedness and Response Act of 2002, Subtitle A of Public Law 107–188 requires the Department of Health and Human Services (HHS) to establish and regulate a list of biological toxins (and biological agents) that have the potential to pose a severe threat to public health and safety. The biological toxins, listed in the table below, are regulated if inventory levels exceed – at any time – the amounts indicated. Users that anticipate exceeding the listed thresholds must register with the university's Select Agent Program. Users who maintain quantities below the listed threshold are still required to maintain inventory logs containing the date of access, name of individual accessing the toxin, the quantity used, the purpose of use and the amount remaining. The toxins must be kept in a locked area with access limited to those who need it. The biological inventory logs must be sent on a quarterly basis to the Select Agent Program Manager. Unregistered individuals exceeding these limits face severe federal penalties. Use of biological toxins must also be included in biosafety protocols.

HHS Toxins [§73.3(d)(3)]	Amount
Abrin	100 mg
Botulinum neurotoxins	0.5 mg
Short, paralytic alpha conotoxins	100 mg
Diacetoxyscirpenol (DAS)	1000 mg
Ricin	100 mg
Saxitoxin	100 mg
Staphylococcal Enterotoxins (Subtypes A, B, C, D, and E)	5 mg
T-2 toxin	1000 mg
Tetrodotoxin	100 mg

Drug Enforcement Agency (DEA) Scheduled Drugs

The Congress of the United States enacted into law the Controlled Substances Act (CSA) as Title II of the Comprehensive Drug Abuse Prevention and Control Act of 1970. Use of controlled substances in animal research is common in animal research where pain medication is required.

Use of controlled substances for research requires obtaining both federal (DEA) and state (CDPHE Use Authorization) registration. Penalties for using such drugs without proper registration can be severe. The regulations strictly limit who can handle or administer the drugs and imposes both physical security requirements as well as inventory requirements. Some key points concerning the regulations:

- The permitting process is between an individual researcher and the DEA and State;
- Registrants cannot share controlled substances with non-registered users who are not under their supervision (e.g., another research laboratory in their department);
- Possession of expired drugs also poses a risk to researchers from the USDA since administration of expired controlled substances is not allowed;
- Disposal is also strictly regulated. Only the DEA Special Agent in Charge can authorize the disposal of controlled substances.

EH&S has no role in the permitting process, though it can provide limited guidance upon request. Sewer disposal of any DEA drug is no longer an acceptable option

6 Biological Hazards

Before any work is undertaken using biological agents, a determination of the potential hazard must be made and approved by the Institutional Biosafety Committee. It may be necessary to develop a written Biosafety Plan which includes the standard microbiology procedures and practices to be followed; special facilities and equipment needed; and safe handling, transportation, storage, and treatment procedures. Bio-research labs may require special placarding on their entrance doors including the universal biohazard symbol.

Bloodborne Pathogens

UCCS has adopted the OSHA 1910.1030 Bloodborne Pathogen Standard to protect workers who may be exposed to blood from microorganisms that can cause disease in humans. Such pathogens include the hepatitis B virus (HBV) and the human immunodeficiency virus (HIV), which causes AIDS.

Since exposure to blood could potentially be fatal, the standard covers student, staff and faculty who may be reasonably anticipated to come into contact with human blood and other potentially infectious materials in order to perform their jobs. "Good Samaritan" acts such as assisting a co-worker who has a nosebleed would not be covered

Workers at risk who may be exposed to blood or other potentially infectious materials may include:

- Physicians, Nurses and Medical Technologists including students during practicums
- Research laboratory scientists including student workers and volunteers
- Some Maintenance and Custodial staff
- Law Enforcement staff

Biological and Animal Safety

Many laboratories on campus use biological materials, including biological pathogens, toxins and allergens derived from biological agents, and recombinant DNA materials. Some

laboratories work with animals in their research or in clinical settings. In these laboratories, Biological and/or Animal Safety is integral to overall laboratory safety.

Three committees within the Office of Sponsored Programs oversee and grant approval for conducting such research.

- The Institutional Review Board (IRB) manages research involving human subjects.
- The Institutional Animal Care and Use Committee (IACUC) oversees any research involving the use of animals.
- The Institutional Biosafety Committee (IBC) manages research involving recombinant DNA materials, biological pathogens, and biological toxins (including those on the Select Agent List).

Some research may be subject to more than one of these boards. Information regarding all three of these boards is available on the OSP website.

A separate Biosafety Management Manual (Attachment E) has been developed to address bloodborne, biological and animal safety requirements.

7 Radiological Hazards

The Nuclear Regulatory Commission (NRC) regulates radioactive materials used in research or academic applications at the University. The State of Colorado has entered into an agreement with the NRC to govern the safe use of radioactive materials, designating the Colorado Department of Public Health and Environment (CDPHE) as responsible for developing and implementing applicable State regulations. The University of Colorado Boulder has been issued a radioactive materials license and is responsible for the safe use of these materials on the Boulder and the Colorado Springs campuses through the Radiation Safety / Health Physics Unit at Environmental Health and Safety at CU Boulder. The Radiation Safety Handbook provides details on the program as implemented.

If you are utilizing radioactive material and/or radiation generating equipment, this needs to be coordinated with both UCCS EHS and CU-Boulder Radiation Safety group.

8 Hazardous Material Procurement

The primary control of hazardous materials is through the procurement process. Individuals will use discretion in purchasing hazardous materials, limiting purchases only to those amounts required for the specific activity.

The decision to purchase a hazardous material shall be a commitment to handle and use the hazardous material properly from initial receipt to ultimate disposal. For those individuals or departments planning to use hazardous materials for the first time, hazardous material purchases must be coordinated in advance with the EHS to ensure that appropriate handling & storage facilities, as well as personal protective equipment as required, are in place.

The lab managers and supervisors (i.e. chemistry, biology, etc.), who have enough training and have previously addressed environmental and safety concerns, may independently

order hazardous materials without review by EHS. This designation is training specific and cannot be delegated.

The purchase of hazardous materials for academic instruction or routine maintenance should be handled through a centralized stockroom to ensure minimum quantities of hazardous materials are in laboratories or in storage. Hazardous material purchases should be made in conjunction with the UCCS preferred vendor programs whenever possible.

Hazardous material purchases should not be determined by the cheaper unit price basis of large quantities. This cheaper price is often offset by the large cost of disposal when the product goes out of date or is no longer required. Therefore, hazardous materials should be ordered in minimum quantities to suffice for the current use. In addition, users should explore the availability of less hazardous materials for the same operation.

The size of the container may also determine how much to buy. Certain fire codes regulate flammable solvent container size per square feet of laboratory (see Attachment D).

All hazardous materials delivered to the respective stockroom(s) are opened and verified for container and label integrity by authorized, trained personnel only. A date of receipt and additional hazard labels may be placed on the container. Once the hazardous material is ready to be stored, it is entered inventory or transferred to the appropriate Principal Investigator if ordered for a specific R&D laboratory.

For purposes of the management of hazardous materials, procurement by donation must be controlled in the same manner as hazardous material purchases. No individual may accept donation of hazardous materials that are regulated as hazardous without the prior approval of EHS. A request for approval of donations must include the specific hazardous material names (with CAS number of constituents 20% or greater), associated hazards, ORIGINAL purchase date, expiration date and the appropriate Safety Data Sheet (SDS).

UCCS does have a license to purchase non-denatured Ethyl Alcohol. If you have a need for non-denatured Ethyl Alcohol, then please contact EH&S for the license number and record keeping requirements.

9 Mitigating Hazards

For the general safety of personnel, all hazardous material usage must be conducted in adherence with the general safe practices below. The methods used to specifically control hazardous material exposures are categorized as follows: Engineering Controls, Administrative Controls, and Personal Protective Equipment.

Engineering Controls

Exposure to hazardous materials must be controlled to the greatest extent feasible by use of engineering controls. Engineering controls to reduce or eliminate exposures to hazardous materials include:

- Substitution of less hazardous equipment, hazardous materials or processes (e.g. safety cans for glass bottles)

- Isolation of the operator or the process (e.g. use of barriers when handling explosives, or completely enclosing the process in a glove box or other enclosure)
- Local and general exhaust ventilation (e.g. use of hazardous material fume hoods)
- Micro-scaling the size of the experiment to reduce the amount of hazardous material usage.
- Scale up reactions in small steps and evaluate safety issues after each step to fully understand the reactive properties of the reactants and solvents, which may not have been evident at a smaller scale.

Administrative Controls

Administrative controls are procedural measures which should be taken to reduce or eliminate hazards associated with the use of hazardous materials. Administrative controls include the following:

- Careful planning of experiments and procedures with safety in mind. Planning includes the development of written work procedures for safe performance of the work.
- Restricting access to areas in which hazardous materials are used.
- Using signs or placards to identify hazardous areas (designated areas).
- Use of labels on hazardous materials.
- Good housekeeping. Do not limit egress with clutter. Maintain a 36” aisle space throughout the laboratory. Do not stockpile hazardous materials
- Good hygiene (e.g., Decontaminate before eating, drinking, smoking, applying cosmetics, lip balm, or going to the bathroom)
- Prohibiting eating, drinking, and smoking in areas of hazardous material use, and providing break areas for this purpose.
- No mouth pipetting.
- Adding acid to water, never water to acid.
- Assuring employees are provided adequate training for safe work with hazardous materials.
- Adhering to safe lab practices as taught by instructors
- Disposing of waste in designated containers
- Do not block lab windows.
- Use secondary containers during storage of liquids
- Store hazardous materials by hazard class in appropriate cabinets. Do not store liquids above eye level
- Restrict access to laboratory. Lock laboratory doors when no one is present in the laboratory. Challenge all visitors, maintenance staff to assure that they are permitted in the laboratory.
- Do not work alone with hazardous materials. Do not perform hazardous operations alone. Assure that another trained researcher is available in the same laboratory or adjacent room to provide emergency assistance as needed.
- DO NOT wear contact lenses. Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. Wear eye protection that is designed to go over prescription glasses. EHS recommends that researchers purchase prescription safety glasses or splash goggles or utilize eye protection with prescription inserts

Personal Protective Equipment

In addition to both engineering and administrative exposure controls, personal protective equipment (PPE) may be necessary to ensure an adequate margin of safety in case of

incidental/accidental hazardous material release or contact. Personal Protective Equipment (PPE) includes all clothing and work accessories designed to protect employees from workplace hazards. Protective equipment should not replace engineering, administrative, or procedural controls for safety — it should be used in conjunction with these controls. Employees must wear protective equipment as required and when instructed by a supervisor.

IMPORTANT: Personal protective equipment is used to prevent exposure or contamination. PPE should always be removed before encountering other individuals or before going in or near elevators, break rooms, classrooms, bathrooms, etc.

Specific requirements related to PPE are detailed on the UCCS PPE web page (https://ehs.uccs.edu/personal-protective-equipment)

Hygiene and Hazardous Material Safety

Good personal hygiene will help minimize exposure to hazardous materials. When working with hazardous materials, follow these guidelines:

- Wash hands frequently and before leaving the work area. Also, wash hands before eating, drinking, smoking or applying makeup.
- Wear appropriate personal protective equipment (PPE). Always wear protective gloves when handling any hazardous materials.
- Remove PPE before leaving the work area and before washing hands.
- Remove contaminated clothing immediately. Do not use the clothing again until it has been properly decontaminated.
- Follow any special precautions for the hazardous materials in use.
- Do not eat, drink, smoke or apply makeup around hazardous materials.
- Tie back long hair when working in a laboratory or around hazardous materials.
- Do not keep food, beverages, or food and beverage containers anywhere near hazardous materials or in laboratories where hazardous materials are in use.
- Do not use laboratory equipment, including laboratory refrigerators/freezers, to store or serve food or drinks.
- Do not wash food and beverage utensils in the same sink where hazardous materials are used.
- Do not sniff or taste hazardous materials.
- Do not touch door knobs, telephones, computer keyboards, etc. with contaminated gloves.

Training

Departments should ensure that all employees receive proper training for the hazards in their work areas and that such training is properly documented and filed. Refer to the UCCS EHS Training web page (https://ehs.uccs.edu/training) to identify the types of training that may apply to a particular employee/ volunteer/ student.

Activities Requiring Prior Approval

Attachment F goes into detail about specific hazardous materials which require prior approval.

9.1.1 Activities Requiring Prior Approval

OSHA requires each employer to identify those activities which the employer believes to be of a sufficiently hazardous nature to warrant prior "employer approval" before implementation. Departments need to identify activities which involve extremely toxic hazardous materials, select carcinogens and reproductive hazards, and those activities with a high potential for personal injury and property damage. Departments will also need to identify existing activities subject to the requirements of this section.

Except for the most hazardous activities, "employer approval" will occur at the local level (e.g. Principal Investigator, Department Chemical Hygiene Officer, area supervisor). The EHS staff is available for assistance. Examples of activities requiring prior approval of the Principal Investigator, Department Chemical Hygiene Officer or area supervisor:

- Large scale operations (e.g. 22-liter volume or greater)
- Unattended operations, or longer than a normal eight-hour shift
- High pressure/low pressure operations (explosion/implosion hazards)
- After-hours work (before 7:00 am or after 6:00 pm)

9.1.2 Activities Requiring Approval of Environmental Health and Safety

- Reactions using highly toxic, radioactive or carcinogenic hazardous materials
- Installation, removal, moving or changes to a laboratory exhaust ventilation unit (hazardous material fume hood, exhaust trunk, canopy hood, etc.)
- Purchase of a Class 3B or IV Laser
- Potentially explosive reactions
- Experiment or process that impact building or laboratory design, i.e. a large piece of equipment or apparatus that blocks sprinkler heads.
- Purchase or use of a respirator.

9.1.3 Process Hazard Analysis

A hazard analysis is a step-by-step review of the procedures used by a work area and functions to predict hazards and risks to personnel and property and the environment. The hazard analysis also assists in defining control methods to prevent exposures to hazards.

The analysis should include the following:

- Work Area Use Evaluation
- Hazardous Material Use Evaluation
- Personal Protective Equipment Evaluation
- Pollution Prevention Analysis
- Evaluation for the need of a Prior Approval form

Process Hazard Analysis should take place during the work planning process. Process Hazard Analysis should be based on information provided during safety training. EH&S is available to assist with this endeavor. PIs, Lab Managers and supervisors should conduct

Process Hazard Analysis on any new process or procedure. Hazard Analysis reviews should be reviewed with the employees involved in the process.

10 Emergency Response

Be prepared for hazardous material emergencies and know what action to take in the event of an emergency. Examples of emergencies are power failure, exhaust ventilation failures, spills, fires, explosions, etc. Assure necessary equipment and supplies are available for handling small spills of hazardous materials.

Know the location of safety equipment: emergency shower, eyewash, fire extinguisher, fire alarm pull station.

Plan for an emergency.

- What possible emergencies could occur during your work, e.g., fire, spill, high level chemical exposure, ventilation failure?
- Are systems available to indicate an emergency, e.g., chemical exposure monitoring systems, chemical fume hood audible/visual alarms?
- What supplies, and equipment should be maintained in the area to assist emergency response personnel in the event of an emergency, e.g., eyewash and safety shower, spill control materials, personal protective clothing?
- What training is required to handle an emergency in the area, e.g., emergency first aid or respirator use training?
- Is it safe for you to work alone?

Help prevent emergencies in work areas by doing the following:

1. Post emergency phone numbers and floor plans
2. Know locations of shutoffs for equipment including electrical, gas, water
3. Train personnel to retrieve SDSs for hazardous materials.
4. Separate incompatible hazardous materials and put them in secondary containment
5. Frequently dispose of chemical wastes, and clean out unneeded chemicals and surplus or dispose of unneeded items
6. Ensure electrical wires and equipment are in good condition
7. Discuss accidents and near misses to prevent future accidents
8. Complete the laboratory inspection checklist periodically
9. Discuss safety topics periodically in staff meetings

Develop a written plan for each experiment or process, detailing the steps to take should an emergency occur. This plan should reference and answer the questions listed above. This plan can be integrated into an experiment procedure document.

Fire Safety Procedures

Fire in a university building is the most likely campus emergency that could result in loss of property and threat to lives. It is, therefore, most critical that individuals react quickly and responsibly to any indication of fire in their surroundings.

PROCEDURES

If you SMELL smoke or gas

- From the nearest phone call the Department of Public Safety, at ext. 3111 or 255-3111.

If you OBSERVE fire or smoke

- Do not shout "Fire!" Remain calm.
- Pull the nearest fire alarm. Notify those in immediate danger.
- From the nearest phone, in a safe location, call the Department of Public Safety at ext. 3111 or 255-3111 to notify the department of the exact location of the fire.
- If possible and safe to do so after initiating the fire alarm, attempt to extinguish the fire with a fire extinguisher.
  - Never use a fire extinguisher on a fire that is large enough to frighten you or when you do not have a way of escape.
  - No matter how small the fire, never use an extinguisher without sounding the fire alarm, in case you are overcome.
  - If you cannot extinguish the fire by yourself with one extinguisher, leave the area and let the professionals handle it.
- Do not prop open any fire doors. (Fire doors have automatic closers on them.)
- Evacuate, using appropriate exits and escape routes (do NOT use elevators). Help those who need it.
- If the fire alarm sounds
- All alarms should be treated as a valid fire alarm until Public Safety personnel verify that it is a false alarm.
- Stop what you are doing immediately, remain calm and follow instructions.
- Do not look for other people or attempt to take along belongings (other than your purse or backpack) - don't take the time to gather up your "stuff," your life is more important!
- Do not prop open any fire doors.
- Using the nearest exit or escape route (do NOT use the elevators), leave the building quickly and calmly.
- Persons with disabilities should be assisted out of the building or removed to a safe area to await evacuation by emergency responders.
- Proceed to safe ground at least 25 feet away from the building and out of the fire lane(s). The Director of Emergency Management should notify emergency response personnel of missing or disabled persons.
- Do not obstruct fire hydrants or any fire/rescue workers.
- Do not re-enter the building until informed by a uniformed officer (fire or police).

Reporting
After contacting Public Safety, and after meeting with the University Police, contact your supervisor.

Acting
If fire is observed or smoke smelled, **DO NOT HESITATE** to pull the fire alarm to evacuate the building. Notify Public Safety immediately as to the specific problem and its location.

If the fire appears no larger than a trash can, and there is an extinguisher nearby, **AND** you feel confident about putting the fire out, use the following instructions remembering the

acronym PASS.

Pull the plastic tab off the fire extinguisher handle

Aim the nozzle at the base of the fire

Squeeze and hold the handle to discharge the dry chemical inside the extinguisher toward the **BASE** of the fire

Sweep the nozzle back and forth at the BASE of the fire

Use the entire contents of the extinguisher or stop when the fire is out. If the fire continues after emptying the extinguisher, evacuate **IMMEDIATELY**.

Ventilation Failure/Power Failure

Develop a written plan for each experiment or process, detailing the steps to make the operation safe should a ventilation or power failure occur. The chance of a power or ventilation failure occurring is much higher especially during the summer months. It is a prudent measure to have a separate plan to handle these types of emergencies

Be sure after a power outage, that the fan units in the ventilation system are operational before starting or resuming work.

Gas Leaks and Unknown Odors

All staff need to know what gases and volatile chemicals in their work area may produce an odor. Identify contents of pipes, hoses or gas lines with labels. Staff should know the location of control valves used to shut off gas flow. Previous incidents with odors as well as possible odors from adjacent laboratories should be discussed during staff meetings if they are issues.

10.1.1 Natural Gas Leaks

1. Natural gas leaks are a potential cause of explosions. Natural gas contains an odorant that enables recognition even at low concentrations. If you smell natural gas in the laboratory, do the following:
   - Turn off all sources of ignition (open flames, electrical equipment.)
   - Check area gas outlets for open valves.
   - Call Facilities Services to have the location of the gas leak identified.
2. For strong, widespread and/or quickly worsening odor:
   - Pull the emergency alarm at a pull station.
   - Turn off all sources of ignition (open flames, electrical equipment).
   - Close the emergency gas valve for your floor or area if one exists.
   - Evacuate the building immediately and go to your assembly area.
   - If your assembly area is downwind of the building, move to an alternate assembly area up wind at least 300 feet from the building.
   - Do not return to an evacuated building unless told to do so by the on-scene authority (fire department, police department or other personnel).

- Submit an incident report

10.1.2 Leaking Gas Cylinders

Do not over-tighten the valve in an attempt to stop the leak. If the valve continues to leak, consider whether room evacuation and building evacuation is necessary. Take the following actions as appropriate:

1. Flammable, oxidizing or inert gases – Wear PPE as necessary. If possible, allow the cylinder to exhaust into a well-ventilated area (such as a fume hood) with few or no combustible absorbent materials in the vicinity (such as cardboard). Post a sign warning of the leaking cylinder. Avoid sparks and open flames.
2. Toxic or corrosive gases – Wear PPE as necessary. Exhaust cylinder into an absorbent or neutralizer if possible. If no absorbent or neutralizing system is available, exhaust the cylinder into an operating fume hood. If escaping gas is leaking out of the control device or no control device is available, evacuate the area. Post a sign warning of the leaking cylinder.

10.1.3 Unknown Odors

Check with co-workers to determine if they are doing something to produce an odor. If not, check adjacent areas to determine if the odor is widespread or if the source is obvious. Try to relate the odor to possible causes – such as whether it smells like a sewer, or rotting food, or over-heating electronics, or a distinct hazardous material. If the source is obvious, take action if possible to eliminate the cause or control the odor, such as taking a chemical reaction off the bench top and putting it into a working fume hood.

If the odor isn't immediately found but appears to be appreciably stronger in one location, there is likely a source nearby, which can be a dried sink drain or floor drain (if a sewer-like or chemical-like odor), a chemical process gone wrong (if a rotting or unknown chemical odor), over-heating electronics (if devices are over-heating), or a hazardous material spill or a leaking process (if a distinct chemical). There are an unlimited number of potential sources, but familiarity with the lab's activities should help narrow the possibilities.

If the source of the odor continues to be unknown and appears to be having adverse effects on workers, be sure to evacuate the area and notify Campus Police at 719-255-3111. If the source is known and exposure to the odor does not create an unhealthy or dangerous situation, then you may attempt to mitigate the source. Do not attempt to mitigate the source until you have notified someone else about the odor. If it is not safe, you do not feel comfortable mitigating the source, or the source continues to remain unknown then evacuate the area and contact Campus Police at 719-255-3111.

Exposure Evaluations

EHS will conduct or ensure sampling and monitoring activities are conducted to measure employee exposure to any hazardous material if there is any reason to believe exposure levels for the hazardous material routinely exceeds established acceptable levels. The decision to conduct monitoring is based on review of procedures conducted in individual work areas in response to requests received from deans, directors, chairs, departmental chemical hygiene officers, Laboratory Manager, supervisors and employees, or on information obtained during an inspection process.

OSHA has specific mandates for several substances that may pose serious health risks to employees. For any work area use of a hazardous material for which there is a specific OSHA health standard, EHS may monitor for potential exposures if:

- There is a reason to believe that the exposure levels for that substance routinely exceed the action level or, in the absence of an action level, the permissible exposure limit.
- A request for monitoring is made by the supervisor or employee when there is reason to believe that the exposure levels for that substance routinely exceed the action level, or in the absence of an action level, the permissible exposure limit.

EH&S may recommend or conduct initial exposure monitoring when:

- When there is reason to believe that the maximum airborne concentration of a specific hazardous material could be above the short-term exposure limit (STEL) action level or PEL; and
- The combination of hazardous materials could be above the STEL, action level or PEL.

Initial monitoring by direct reading methods may be conducted by EHS. These methods include, but are not limited to, colorimetric tubes, test paper strips and direct reading vapor monitors. Active monitoring may be performed for materials which there are no direct monitoring methods. If initial monitoring reveals employee exposure over the STEL, action level or PEL, EH&S must immediately comply with OSHA exposure monitoring provisions established for the specific contaminant.

If direct measurements indicate exposures may exceed the acceptable limits, additional monitoring may be required, and active testing of individual breathing zones will be conducted using accepted OSHA methods and AIHA accredited laboratories.

EHS may not recommend monitoring if or when:

- Initial monitoring does not indicate any exposure above the action levels;
- There is no source of contamination;
- Monitoring does not demonstrate exposures above the ceiling or short-term action levels;
- The source is noncontiguous;
- If engineering and/or administrative controls have maintained exposures below action levels.

The employee must be notified in writing by posting the test results in an appropriate location within 15 working days after the receipt of results. Notification and posting will be completed by EHS.

Medical Consultation and Examination

- All employees who work with hazardous materials shall be provided an opportunity to receive medical attention under the following circumstances:
  - When the employee develops signs and/or symptoms that may be associated with a hazardous material to which the employee was exposed in the work area;
  - When routine monitoring reveals an exposure above the PEL or action level;

    - When an event takes place in the work area such as a spill or leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.
- All medical examinations and consultations shall be performed by a licensed physician or under his/her direct supervision.
- The employer shall provide the following information to the physician:
    - The identity of the hazardous materials to which the employee may have been exposed;
    - A description of the conditions under which the exposure occurred; and
    - A description of the signs and symptoms of exposure the employee is experiencing, if any.
- The Physician shall provide a written opinion which shall include
    - Any recommendation for further medical follow-up;
    - The results of the examination and any associated tests;
    - Any medical condition which may be revealed during the examination which may place the employee at increased risk; and
    - A statement that the employee has been informed by the physician of the results of the examination and any medical condition that may require further examination or treatment.
    - The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.
- All medical consultations shall be coordinated by the University Risk Management.

Spill Clean-up Procedures

The Hazardous Materials Spill Clean Up Procedures were created to give employees and supervisors a starting point for developing a hazardous material spill kit and providing guidance for cleaning up hazardous material spills. Hazardous material spills and accidents need to be minimized as much as possible. If a hazardous material spill should occur, a quick response with a stocked hazardous material spill kit will help minimize potential harm to personnel, equipment and laboratory space. Listed herein is the minimal equipment required for a spill kit. You may add equipment to the kit, provided all personnel are proficient in its use.

Recommended hazardous material spill kit contents

- Universal Hazardous material Absorbent Pads
    - High Capacity
    - Hazardous materially Inert
    - Absorbs aggressive hazardous materials as well as non-aggressive compounds such as water
    - Good for all hazardous materials; acids, bases, flammable liquids, formaldehyde
- Universal Hazardous material Absorbent Powder
    - High Capacity
    - Hazardous materially Inert
    - Absorbs aggressive hazardous materials as well as non-aggressive compounds such as water
    - Good for all hazardous materials; acids, bases, flammable liquids, formaldehyde
- Polyethylene Bags
    - Strong Construction
    - Leak Proof
    - At least 7-gallon capacity

  - 4 mm in thickness
- Anti-Static Polypropylene Plastic Scoop
- Nitrile/Silver Shield Combination Gloves
  - .011 thick Nitrile Gloves under Silver Shield Gloves
  - At least two pairs
- Two Pairs Indirect Venting Hazardous Material Splash Goggles
- Hazardous Waste Labels

Note that most hazardous material spills can be prevented or minimized by:

- Maintaining a neat and organized work area;
- Performing a work procedure review prior to conducting new processes;
- Storing liquid hazardous materials in secondary containment bins;
- Keeping reagent hazardous material containers sealed or closed at all times, except when removing contents;
- Ordering reagent hazardous materials in plastic- or plastic-coated glass containers whenever possible;
- Using secondary containment to store and move hazardous materials.

10.1.4 Large Spill Protocol

If the spill is too large for you to handle, involves materials listed in the table below; is a threat to personnel, students or the public; involves radioactive material; involves an infectious agent; or involves a corrosive, highly toxic, or reactive hazardous material, call for assistance.

Hazardous material Class	Example
Strong Acids - Any acid that is concentrated enough to fume or emit acid gases	Fuming Sulfuric Acid Red Nitric Acid **Hydrofluoric Acid** Perchloric Acid
Strong Bases - Any base that is concentrated enough to emit vapors	Ammonium Hydroxide
Poison by Inhalation - Any hazardous material that readily emits vapors / gases at normal temperature and pressure that are extremely toxic by inhalation	Phosphorous Oxychloride Titanium Tetrachloride Formates Isocyanates
Reactive - Any hazardous material that is sensitive to air, water, shock, friction and/or temperature	Dry Picric Acid Lithium Aluminum Hydride Sodium Borohydride Phosphorus Metal Organic Peroxides

Mercury - Any mercury compound. Do not use a domestic or commercial vacuum cleaner. Uses of powder sulfur or mercury spill cleanup kits are not as effective as the specialized equipment EHS has on hand. This spill cleanup methods also increase the disposal cost.	Metallic Mercury Mercury Salts Aqueous Mercury Solutions
Extremely Toxic - Any hazardous material that is readily absorbed through the skin and is extremely toxic at small concentrations	Benzene Sodium Cyanide

- If the spill occurs in a room, evacuate the room and call on DPS at 255-3111. Follow the University Police's directions and stay by the room until EHS responders arrive.
- If the spill occurs in a public space (hallway, stairwell, elevator, etc.) or involves a large amount of flammable liquids (greater than four liters), flammable gas, or has the potential to threaten people outside of the room, pull the building fire alarm and evacuate the building. Follow the University Police's directions and stay by the facility until EHS responders arrive.
- For specific spill clean-up information, contact your supervisor, instructor or Environmental Health and Safety.

Toxic Gas Generation

Certain compounds when mixed, as in a spill or breakage of containers in a package, may react to produce toxic gases. This danger is present when at least one component is a liquid or a dissolved solid, usually as an aqueous solution. This toxic gas can be produced from either acid or base incompatibility

Acid Incompatibilities		
Solid .... mixed with	**Liquid .... produces**	**Gas**
Azide salts, soluble	Concentrated acid	Hydrazoic acid vapor
Bromide salts, soluble	Sulfuric acid > 95%	Sulfur dioxide and bromine
Bromate salts	Strong, conc. acid	Bromine, oxygen, hydrogen bromide and heat
Chloride salts, soluble	Sulfuric acid > 95%	Hydrogen chloride
Chlorate or chlorite salts	Strong, conc. acid	Oxygen, hydrogen chloride and heat
Cyanide salts, soluble	Any acid	Hydrogen cyanide
Cyanometal salts (potassium ferricyanide)	Strong, conc. acid	Hydrogen cyanide
Fluoride salts, soluble	Strong, conc. acid	Hydrogen fluoride
Silica or silicate salts	Hydrofluoric acid	Silicon tetrafluoride
Bleaching powder (CaC1(0C1))	Acid	Chlorine
Acid	Clorox solution	Chlorine

Nitrite salts, soluble	Concentrated acid	Nitrogen oxides
Sulfide salts, soluble	Acid	Hydrogen sulfide
Sulfide, transition metal	Strong acid	Hydrogen sulfide
Sulfite salts, soluble	Acid	Sulfur Dioxide
Manganese dioxide Permanganate salt Cobaltic oxide Nickel sesquoxide Lead dioxide Ceric oxide Hydrogen peroxide	Hydrochloric acid concentrated	Chlorine

There are some fine points to note when reviewing this table:

- Where the word "Acid" is listed as the incompatible liquid, aqueous solutions of these salts can slowly liberate the product gases from reaction with carbon dioxide that is normally in the air.
- Bromate, chlorate, chlorite, permanganate and nitrite salts made acidic with concentrated sulfuric acid may ignite or explode. Also, these salts, if intimately mixed with ammonium salts, may ignite or explode.
- Concentrated nitric acid used to clean metal residues or to reduce material from glass or ceramic surface will first be reduced to nitrous acid, which then decomposes to nitrogen oxides producing a brown or orange vapor that is often observed from the process.

Base Incompatibilities		
Solid .... mixed with	**Liquid .... produces**	**Gas**
Ammonium Salts	Concentrated base solution	Ammonia
N-methyl-N-nitroamides (Diazald)	Base solution	Diazomethane

- Chlorine bleach is made by reacting chlorine with a base solution; it produces a hypochlorite - chloride mixture which is stable as a base solution or salt mixture. Adding acid, even carbon dioxide will regenerate the chlorine.
- Hydrofluoric acid or materials that on contact with moisture produce hydrofluoric acid will react with silica in glass to form silicon tetrafluoride. If there is excess moisture in a container, this gas production can pressurize a sealed container and cause it to burst.
- Concentrated sulfuric acid appears to oxidize bromide to bromine. What seems to drive this reaction is that sulfuric acid wants water and will take it from the sulfurous acid that is produced in a weak equilibrium of bromide reduction of sulfate. This leaves the sulfur dioxide stranded with bromine. Concentrated sulfuric acid also will "char" cellulose and sugars by simply removing water and leaving the carbon molecules behind.

10.1.5 Low Hazard Material Spills – Incidental Spills

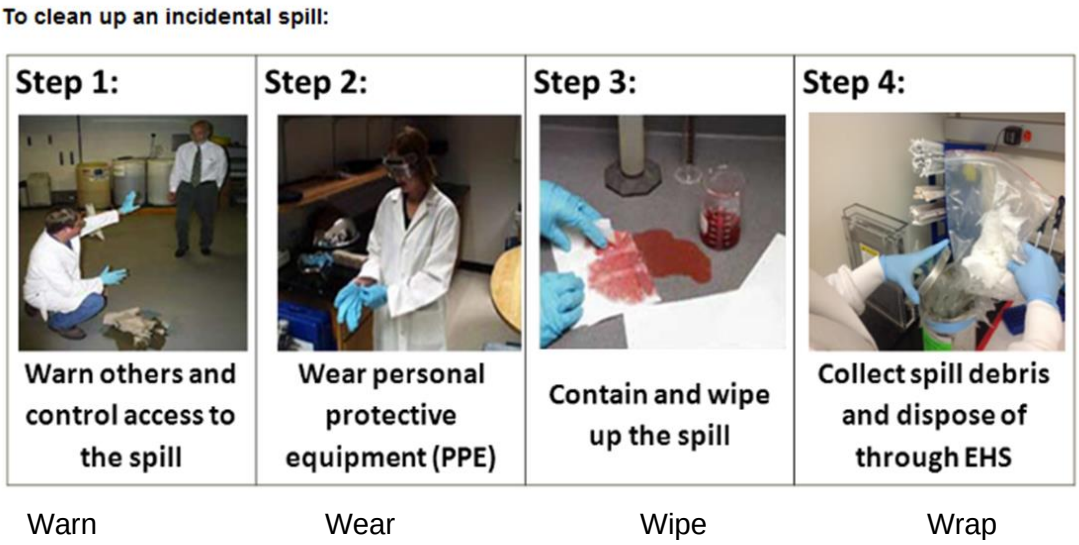
Employees who have had the proper training and possess the appropriate equipment can safely and effectively handle most hazardous material spills that occur in the work area. In addition, spills involving multiple hazardous materials may pose various hazards. Always contact EHS if multiple hazardous materials are involved in a spill. Except for the hazardous material classes listed in the previous table, labs can handle spills involving one liter or less of liquid and one pound or less of a solid. If the spill is large, contact EHS to assist with the cleanup. The following procedures are specific guidelines for using the recommended spill cleanup materials. Contact EHS with any questions or concerns about proper spill clean-up practices.

a. In the event of a hazardous material spill, first decide if you are trained, knowledgeable and equipped to handle the incident. Immediately evacuate the area and notify DPS if there is a possibility of an acute respiratory hazard present or if you need assistance to clean up the spill. Never proceed to clean up a spill if you do not know the hazards associated with the hazardous material or if you are unsure of how to clean up the spill. If anyone is injured or contaminated, immediately notify DPS and begin decontamination measures or first aid, if trained.
b. Don the personal protective equipment from the spill kit; splash goggles and appropriate protective gloves. Always ask a fellow employee for assistance. They should also don splash goggles and gloves. Make sure that all forms of local exhaust, i.e. fume hoods, are operating. It is normally not advisable to open the windows. If broken glass is involved, do not pick it up with your gloved hands. Use the scoop or tongs to place it in the bag, then place the bag in a strong cardboard box or plastic container. Follow the procedures provided below based on the class and type of hazardous material.
    - Liquid Spills other than flammable liquids - Spread the hazardous material spill powder over the spill starting with the edges first. This will help to confine the spill to a smaller area. Spread enough powder over the spill to completely cover the liquid. There should be no free liquid. Use plastic scoop to ensure that the liquid was completely absorbed by the powder. Pick up the powder with scoop and place in the polyethylene bag. Wipe the area down with a wet paper towel. Dispose of paper towel with the waste generated from the spill cleanup. Seal bag with tape and attach a completed hazardous waste sticker on the bag and arrange for EHS to collect the bag.
    - Flammable Liquid Spills - Control all sources of ignition. Lay the hazardous material spill pads over the spill. These pads are design to suppress the vapors emitted by a volatile liquid. Allow pads to completely soak up liquid. Pick up pads with tongs or other device that minimizes direct contact with a gloved hand. Place in the polyethylene bag. Wipe the area down with a wet paper towel. Dispose of paper towel with the waste generated from the spill cleanup. Seal bag with tape and attach a completed hazardous waste sticker on the bag and arrange for EHS to collect the bag.
    - Solid Spills - Use the plastic scoop to place the spilled material into the polyethylene bag. Care should be taken so as not to create dust or cause the contaminated powder to become airborne. After the bulk of the material is cleaned up, wet a spill pad and wipe the area down. Place the pads into the polyethylene bag. Wipe the area down with a wet paper towel. Dispose of paper towel with the waste generated from the spill cleanup. Seal bag with tape and attach a completed hazardous waste sticker on the bag and arrange for EHS to collect the bag.

c. If the spilled material leaves the area slick, you may need to mark the area off and request that facilities clean the area.
d. All tools used in the cleanup need to be decontaminated (plastic scoop, tongs, etc.). Remove all gross contamination with a wet paper towel. Dispose of the contaminated paper towels as hazardous waste. Rinse the tools off with copious amounts of water. Dispose of the gloves as waste. Dry the tools off and place back into the spill kit along with the splash goggles

Note: Precautions must be taken to minimize exposure to the spilled hazardous material. Be careful not to step in the spilled material and track it around. Contact EHS and DPS if an exposure to a hazardous material occurs.

We use the 4 W's as reminders of how to manage an incidental spill.



Warn Wear Wipe Wrap

10.1.6 Mercury Spills

Most mercury spills at UCCS are small and can be readily cleaned up by personnel working in the area where the spill occurs. All work areas that use mercury must have mercury spill kits available, and train workers in their proper use.

Commercial Mercury Spill Response Kits and Devices

- **Amalgamating kits**: sold by safety and lab supply vendors, amalgamating powder is sprinkled over the droplets of mercury, wetted to initiate the amalgamating reaction; the mixture is scooped up and placed in a container for disposal. Some kits are equipped with a small hand pump for collecting large mercury droplets before amalgating and for difficult to reach areas.
- **Sponges:** specially designed sponges that pick-up mercury droplets when firmly pressed against the surface of the spill, work best on non-porous, smooth surfaces. **Use of a sponge alone is not recommended** -- the area should also be treated with an amalgamating powder to reduce any mercury vapors from residual mercury.
- **Mercury vacuum:** essential only for responding to large mercury spills and not an economical choice for minor spills resulting from broken thermometers or

other small mercury-containing items. These devices are specially designed to purify exhaust air and capture the elemental mercury for recycling. A HEPA vacuum is not suitable for mercury spill cleanup.

➢

Small Mercury Spills (5 ml's or less from small devices such as thermometers)

- ➢ If the spill is onto or within a heated surface, do not attempt to clean it up.
  - Turn off the heat-producing device,
  - Turn on fume hoods or open windows to ventilate the area,
  - Isolate the room from others by shutting connecting doors,
  - Evacuate the room, and shut the door,
  - Placard the door(s) to the room "Mercury Spill - Do Not Enter.",
  - Contact EHS for assistance.
- ➢ If the spill is not onto a heated surface, access the spill kit and follow the enclosed instructions. In general, this should include:
  - Turn on fume hoods or open windows to ventilate the area,
  - Isolate the room by shutting all doors,
  - Wear protective latex or nitrile gloves,
  - Consolidate the mercury droplets using the scrapers provided, two small pieces of stiff cardboard, index cards or plastic "credit cards",
  - Collect droplets using hand pump, mercury sponge, or amalgamating powder,
  - Place the recovered mercury and other contaminated materials in a heavy-walled, polyethylene screw-cap bottle; labeled "MERCURY SPILL RESIDUE."
  - Remove gloves and place them in the mercury spill residue bottle.
  - Wash hands, arms and face thoroughly.
  - Tag the spill residue bottle for collection as a hazardous waste.

Large Mercury Spills
IF MORE THAN 5 ML OF MERCURY IS INVOLVED IN THE SPILL CONTACT EH&S @ 255-311

Safety Showers and Eye Wash Stations

Most of the areas where extensive hazardous materials are utilized are equipped with eye wash and/or emergency showers. The eye wash/showers need to remain unobstructed. The eye washes should be run at least weekly by work area personnel. This helps to ensure that the unit is operational and that the water is not stagnant.

Be aware that emergency showers do not have drains. If one is activated, besides assisting the victim, you also need to put down barriers (from your spill kit) to help contain the water. Likewise, be aware of electrical sources or other equipment which may be impacted by the water.

Injury, Illness, Personal Contamination, Minor First Aid

10.1.7 Serious Injures, Serious Illnesses or Hazardous Materials Exposures

a. For serious injuries, serious illnesses or hazardous material exposures, call 911 and DPS 255-3111. Unless otherwise specified by Environmental Health & Safety, all injuries, regardless of severity, involving hazardous material or other hazardous materials will be reported. The University Police will contact EHS staff
b. Tell emergency and medical personnel:
    i. Your name, location and nature of the emergency
    ii. Name of the hazardous material involved
    iii. The amount involved
    iv. Area of the body effected
    v. Symptoms
    vi. If you have any questions regarding injury and illness procedures, contact your supervisor, instructor, or the Department of Environmental Health and Safety.
c. Do not move a seriously injured person unless they are in further danger.
d. Follow the appropriate steps outlined in section

10.1.8 Non-life-threatening injuries, illness or non-serious issues

a. Students should report to the Student Health Service, if medical attention is required. Students should be accompanied by a friend, teaching assistant, or instructor.
b. Employees should consult with Risk Management regarding medical services
c. When in doubt as to what should be done, telephone the University Police for assistance.

10.1.9 Personal Contamination

Hazardous materials Spilled Over a Large Area of the Body

a. The “buddy” or work partner should assist the person to a safety shower and contact 719-255-3111 immediately.
b. Remove potentially contaminated clothing, jewelry, and other items while in the safety shower. Flush the affected area in the safety shower with water for at least 15 minutes unless otherwise specified. Wash off hazardous material with water but do not use neutralizing hazardous materials, unguents, creams, lotions, or salves, unless indicated and approved by Environmental Health and Safety
c. The “buddy” or work partner should retrieve the SDS and provide to EMS
d. Seek medical attention promptly.
e. Localized spills can be flushed under a faucet. Call Public Safety at 719-255-3111
f. Notify your supervisor, teaching assistant or principal investigator.

Hazardous materials in the Eyes

a. The “buddy” or work partner should assist the person to an eyewash and contact 719-255-3111
b. Flush eyes with water for at least 15 minutes using an eyewash station unless otherwise instructed. Hold your eyelids open when using the eyewash. Remove contact lenses if not already removed by the water.
c. The “buddy” or work partner should retrieve the SDS and provide to EMS.
d. Seek medical attention promptly.
e. Notify your supervisor, teaching assistant or principal investigator.

Inhalation of Vapors, Mists, Fumes or Smoke

a. The “buddy” or work partner should assist the person to fresh air and contact
b. In the event of an inhalation exposure, remove victim to fresh air only if it is safe to do so. Do not enter the area if a life-threatening condition still exists:
   - Oxygen depletion
   - Explosive vapors
   - Cyanide gas, hydrogen sulfide, nitrogen oxides, carbon monoxide or other toxic gases, mists, vapors or fumes
c. Utilize the safety shower or eyewash and flush effect areas as need for 15 minutes if applicable
d. If trained and necessary, provide Rescue Breathing or CPR
e. The “buddy” or work partner should retrieve the SDS and provide to EMS.
f. Notify your supervisor, teaching assistant or principal investigator.

Burning hazardous materials on Clothing

a. Extinguish burning clothing by using the drop-and-roll technique or by dousing with cold water or use an emergency shower.
b. Remove contaminated clothing; however, avoid further damage to the burned area. Do not remove any clothing or material that is stuck to the victim
c. The “buddy” or work partner should assist as necessary and when safe contact
d. Cover injured person to prevent shock.
e. Get medical attention promptly.

Ingestion of hazardous materials

a. Identify the hazardous material ingested and obtain the SDS
b. The “buddy” or work partner should contact
c. Call the Poison Information Center (1-800-722-7112).
d. Provide the ambulance crew and physician with the Safety Data Sheet, the hazardous material name and any other relevant information. If possible, send the container or the label with the victim.

10.1.10 Minor First Aid

First Aid Kits

a. Departments should obtain a first aid kit for treatment of minor first aid cases (cuts, scratches, minor burns).
b. First aid kits must be readily accessible. If the kit is not visible, the area where it is stored must be clearly marked.
c. First aid kits must always be fully stocked.
d. Do not dispense or administer any medications, including aspirin.
e. Do not put any ointments or creams on wounds or burns. Use ice, cold pack or cold water.
f. The SDS contains special first aid information.
g. After giving first aid, direct or transport the victim to a medical facility for evaluation.
h. Non-emergency student first aid cases are treated at the Student Health Services
i. Non-emergency employee first aid cases are treated at the designated facilities after consultation with Risk Management
j. Seriously injured individuals (employees or students) should be transported in accordance with emergency medical services recommendations
k. For specific first aid information, contact your supervisor, instructor, or EHS

Work Area Floods

If your work area is flooded, find the source of the water. Shut the water off. If safe, also shut down any equipment that could cause a dangerous electrical situation during a flood. Cover equipment and desks if water is dripping onto them. Then, get help quickly. During work hours, contact your building coordinator. After hours, call UCCS Police at 719-255-3111. Also, notify the supervisor, principal investigator or department administrator in charge of the flooding work area as soon as possible.

If the water is contaminated by hazardous materials, call EHS through UCCS Police at 719-255-3111.

The best method to clean up uncontaminated water is by using one water vacuum on the scene of the flood and another on the affected area below. Saturated materials (fabrics and cardboard, for example) need to be dried within 48 hours or will need to be discarded to prevent mold growth.

After the cleanup, submit an accident report.

Accident and Near Miss Reporting

Principal Investigators, Lab Managers or supervisors must submit accident and near miss reports to EHS for any accident or near miss situation regardless of whether there was an injury or not. Employees will be free from any reprisals for reporting accidents. Accident/Near Miss Reports, corrective actions and suggestions regarding possible improvements can be help UCCS as they strive to improve future work area safety.

For accidents/near misses including those related to worker's compensation also, please complete the Accident/Near Miss Report form (https://surveyuccs.co1.qualtrics.com/jfe/form/SV_0Tk4mb7gJCTRSnj). To report an accident related to an employee regarding an injury or illnesses refer to https://www.cu.edu/risk/workers-compensation.

11 Waste Management

Disposal of solid waste (this includes gas and liquid) is regulated by various federal and state agencies. Hazardous materials very often include hazardous chemical, biological, or radiological materials. Thus, proper disposal of hazardous material waste is not only prudent, it is mandatory. Environmentally sound disposal methods prevent harm to the water, land, and air and by extension, to people as well. Proper disposal techniques also protect waste handlers from harm.

Refer to the UCCS Waste Management Plan (https://ehs.uccs.edu/waste-management) for proper waste management guidelines.

12 Transportation, Shipping and Receiving of Hazardous Materials

The U.S. Department of Transportation regulates the shipment of hazardous materials. Anyone who packages, receives, unpacks, signs for, or transports hazardous materials must be trained and certified in Hazardous Materials Transportation. Warehouse personnel, shipping and receiving clerks, truck drivers, and other employees who pack or unpack hazardous materials must receive this training as well. Contact EHS or refer to the EHS website for more information on shipping and receiving hazardous materials.

Receiving Procedures

Receivers must be trained to examine packages, check documentation and respond to emergencies such as spills. This is to ensure that materials are received in safe, intact containers and accompanying hazard information and documentation is complete.

Receiving dangerous goods (DG) involves the following steps:

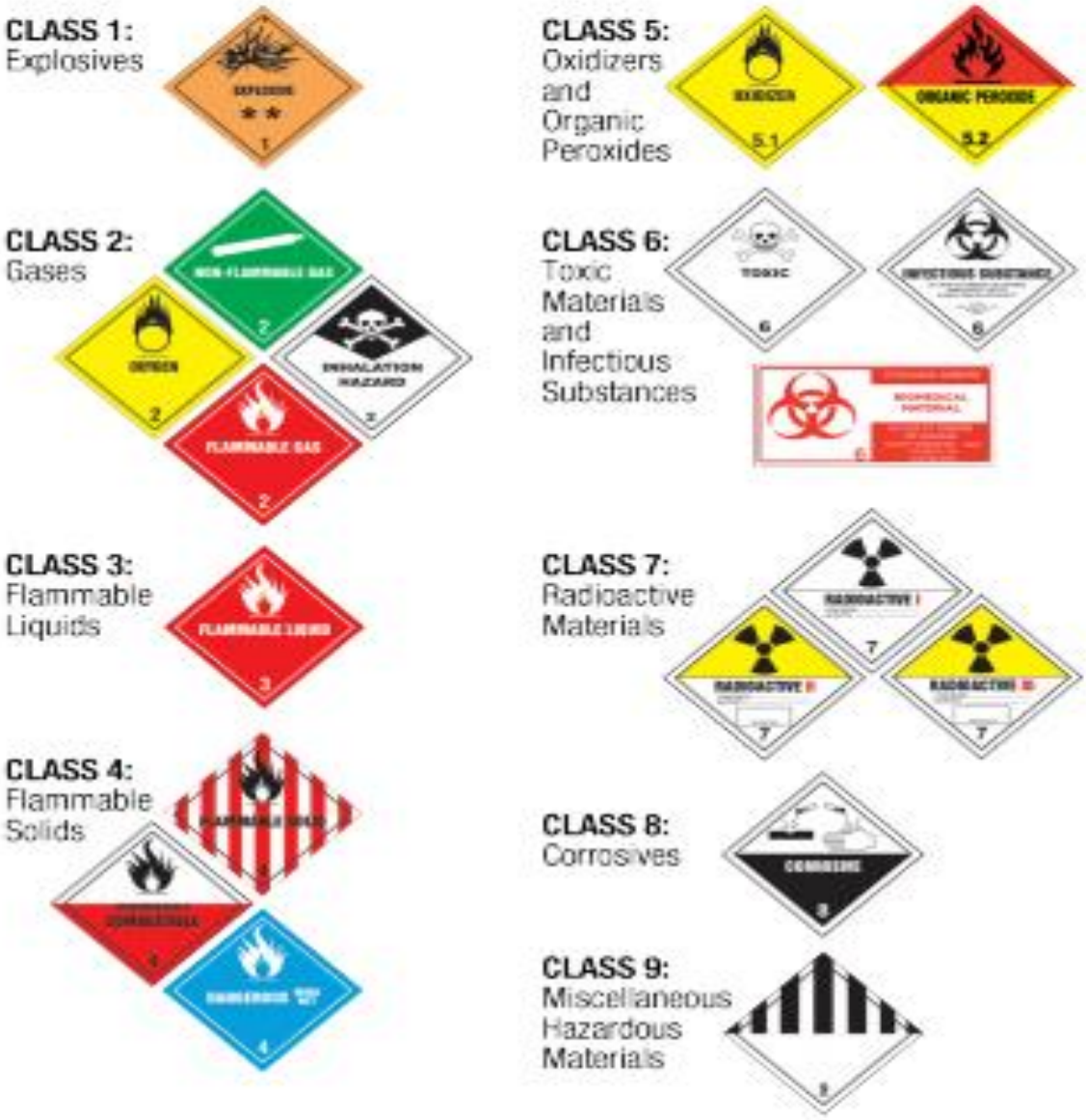
1. Each package containing DG must be examined to ensure the packaging is intact and the DG have not leaked or spilled from the container.
2. Each package should have the appropriate safety symbols and labels attached.
3. The labels and shipping documents should match. Any errors on classification should be corrected.
4. The package must be stored safely until used.
5. File shipping documents for a minimum of two years.
6. Respond to and report any dangerous occurrences.

Dangerous Goods Hazard Categories

There are nine hazards classes recognized under DOT. The following table lists the classes and their hazard symbols.

Anyone receiving goods classified as explosive must contact EHS to determine appropriate procedures and storage facilities required.

Anyone receiving a good classified as a radioisotope must obtain certification through the UC Boulder Radiation Safety Program.



Shipping Description

Each package must display the following information:

a. The name of the material in the package. For example —hydrochloric acidǁ
b. The TDG hazard class name and subsidiary classes. For example —Class 8 corrosiveǁ
c. A four-digit material identification number. For example, —UN 1789ǁ is the number
d. for hydrochloric acid.
e. The packing group designation; I, II, III
f. Special handling information such as —Keep from freezingǁ or —Keep uprightǁ

Safety Symbols and Labels

Each package must display the appropriate safety symbols. Examples are provided in the above table.

Symbols and labels may not be removed until the goods are removed from the packaging. Empty containers must have labels defaced or removed, or the boxes flattened. The symbols are to be placed on the packages in a diamond orientation with the corner of the labels pointing upwards. Reduced size labels may be used on compressed gas cylinders and are often located on a reinforced tag attached to the neck of the cylinder.

Documentation Required

All dangerous goods shipments must be accompanied by DOT shipping papers and must be retained by the receiver for at least two years. DOT shipping papers may be combined with commercial documents such as a Bill of Lading for convenience.

A receiver is responsible for ensuring that information on the document matches the safety marks and label information on the packages. A diligent receiver may also object to poorly prepare shipping papers.

Handling and Transporting

Transportation of dangerous goods, loading, unloading, or storage should be in a way that could not cause the discharge, emission or escape of the dangerous goods from the means of containment that could constitute a danger to health, life property or the environment.

Handlers and transporters must follow any special instructions relating to safe handling and storage, e.g. —Refrigeration required; keep away from heat and flames.

Received materials must be segregated by hazard classes in accordance with the University‘s hazardous materials storage guidelines (see Attachment D).

Dangerous Occurrences

If any of the following incidents occur:

1. Any transportation accident involving infectious or radioactive substance;
2. Any unintentional explosion or fire involving dangerous goods; or
3. A spill of a dangerous goods

Immediately contact Public Safety at 719-255-3111

Packaging Damaged in Transport

Damaged gas cylinders can be extremely dangerous if rapid release occurs. Leaking cylinders must be returned and may be handled and transported in a road vehicle. Keep the cylinder in a safe (outdoor) location. Contact the supplier immediately to arrange for its return.

Damaged packages containing solid materials of hazard classes 4, 5, 6.1, 8, or 9 may be handled and transported in a road vehicle provided the damage package is repaired. Packages will be marked with the words —FOR SALVAGEǁ and are transported directly to the consignee or to a point for repackaging or disposal.

Damaged packages containing liquid materials of hazard classes 3, 5, 6.1, 8 or 9 may be handled and transported in a road vehicle provided the damaged package is placed in a steel or plastic drum over-pack.

List of Attachments

Attachment A – Glossary of Hazardous Materials Terms.
Attachment B - Classification of Hazardous Materials Hazards.
Attachment C - Toxicity and Hazard Exposure.
Attachment D – Handling and Storage of Hazardous Materials.
Attachment E – Biosafety Management Manual.
Attachment F – Hazardous Materials Requiring Prior Approval