بوليتكنك أبوظبي
POLYTECHNIC Abu Dhabi
"Building the Future of UAE Technologies"

Laboratory & Workshop Safety Manual

7. Handling and storage

- Precautions for safe handling.
- Conditions for safe storage, including any incompatibilities.

8. Exposure controls/personal protection

- Control parameters, e.g., occupational exposure limit values or biological limit values
- Appropriate engineering controls
- Individual protection measures, such as personal protective equipment

9. Physical and chemical properties

- Appearance (physical state, color, etc.)
- Odor
- pH
- Flammability (solid, gas).

10. Stability and reactivity

- Chemical stability
- Possibility of hazardous reactions
- Conditions to avoid (e.g., static discharge, shock or vibration).
- Incompatible materials
- Hazardous decomposition products

11. Toxicological information

- Concise but complete and comprehensible description of the various toxicological (health) effects and the available data used to identify those effects, including:
- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact)
- Symptoms related to the physical, chemical and toxicological characteristics
- Delayed and immediate effects and also chronic effects from short- and long-term exposure
- Numerical measures of toxicity (such as acute toxicity estimates)

12. Ecological information

- Ecotoxicity
- Other adverse effects

Reactive and explosive substances are materials that decompose under conditions of mechanical shock, elevated temperature, or chemical action, and release of large volumes of gases and heat. Some materials, such as peroxide formers, may not be explosive, but may form explosive substances over time. These substances pose an immediate potential hazard and procedures which use them must be carefully reviewed. These materials must also be stored in a separate flame resistant storage cabinet or, in many cases, in laboratory grade refrigerator or freezer that are designed for flammable and reactive chemicals. Pyrophoric chemicals are a special classification of reactive materials that spontaneously combust when in contact with air and require laboratory specific training. Flame-resistant laboratory coats must always be worn when working with pyrophoric chemicals.

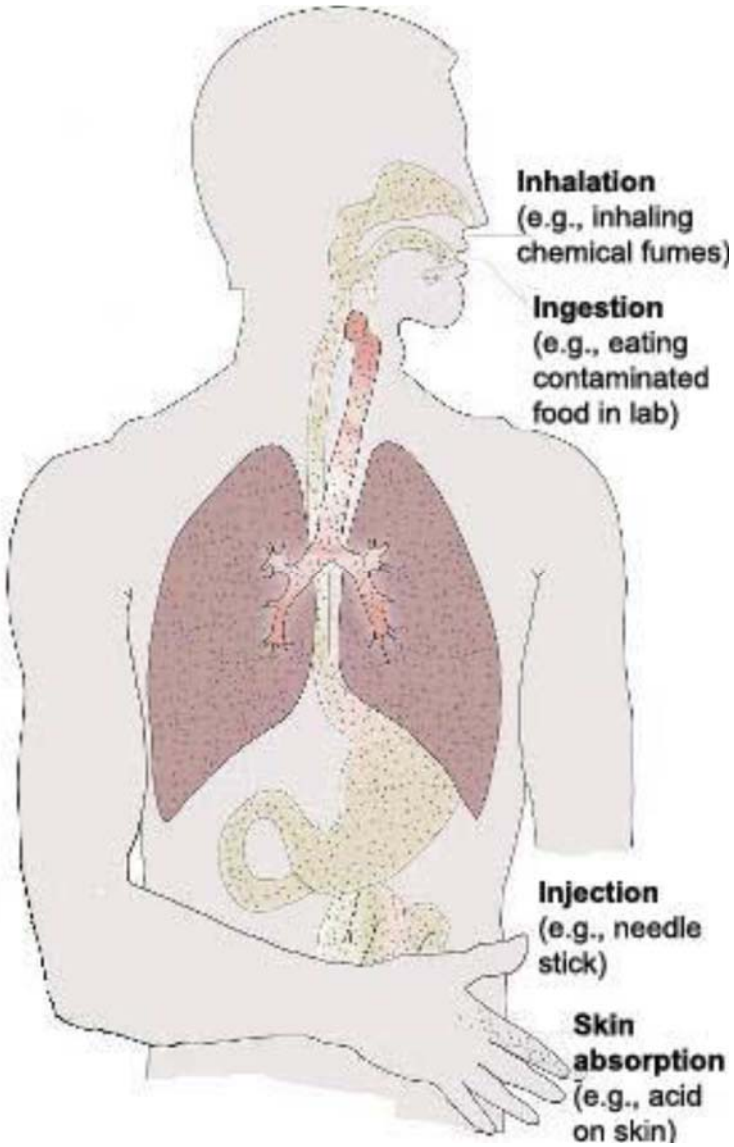
Health Hazards

The term ***health hazard*** includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems and agents which damage the lungs, skin, eyes, or mucous membranes.

CHAPTER 4: HOW TO REDUCE EXPOSURES TO HAZARDOUS CHEMICALS

Introduction

Hazardous chemicals require a carefully considered, multi-tiered approach to ensure safety. There are four primary routes of exposure for chemicals which have associated health hazards: Inhalation; Absorption (through the skin or eyes); Ingestion; and Injection (skin being punctured by a contaminated sharp object or uptake through an existing open wound).



Of these, the most likely route of exposure in the laboratory is by inhalation. Many hazardous chemicals may affect people through more than one of these exposure modes, so it is critical that protective measures are in place for each of these uptake mechanisms.

Safety Controls

Safety controls are divided into three main classifications that are used in a layered approach to create a safe working environment:

1. Engineering Controls;
2. Administrative Controls; and
3. Protective Apparel and Equipment.

Engineering Controls

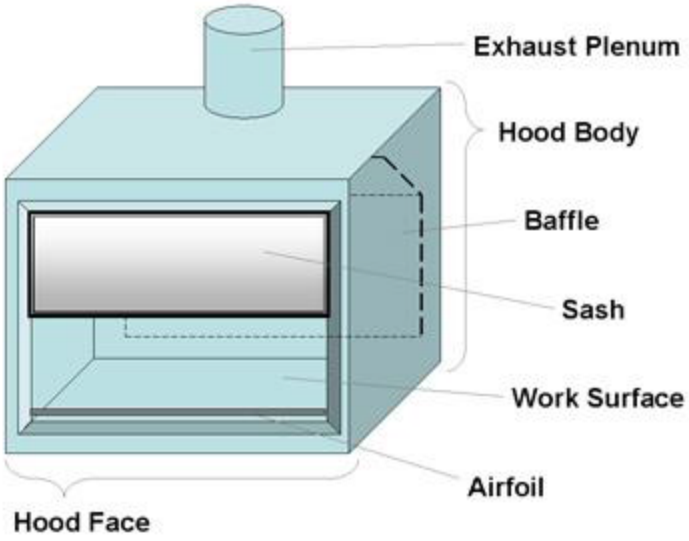
Engineering controls include all “built in” safety systems. These controls offer the first line of protection and are highly effective in that they generally require minimal special procedures or actions on the part of the user except in emergency situations. Additionally, engineering controls often involve the replacement or elimination of hazards for a work environment. A fundamental and very common example is the laboratory fume hood which is very effective at containing chemical hazards and protecting users from inhalation hazards. Other examples of engineering controls include general room ventilation, flammable material storage units, and secondary containment.

General Laboratory Ventilation

All laboratory rooms in which hazardous materials are used must have fresh air ventilation with 100% of the exhaust venting to the outside; laboratory rooms should not be part of recycled air systems.

Fume Hoods

Fume hoods are a commonly used local exhaust system. Some systems are equipped with air cleaning devices (HEPA filters or carbon absorbers). It is advisable to use a laboratory hood when working with all hazardous substances. In addition, a laboratory hood or other suitable containment device must be used for all work with "particularly hazardous substances."



A properly operating and correctly used laboratory hood can reduce or eliminate volatile liquids, dusts and mists. Fume hoods are evaluated for operation on an annual basis. These annual evaluations check the fume hood air flow velocity to ensure that the unit will contain hazardous vapors. Data on annual fume hood monitoring will be maintained by EH&S.

General Rules for Fume Hood Use

The following general rules should be followed when using laboratory hoods:

- Fume hoods should not be used for work involving hazardous substances unless they have a certification label that confirms certification has occurred within the past year
- Always keep hazardous chemicals >6 inches behind the plane of the sash
- Never put your head inside an operating laboratory hood. The plane of the sash is the barrier between contaminated and uncontaminated air
- Work with the hood sash in the lowest practical position. The sash acts as a physical barrier in the event of an accident. Keep the sash closed when not conducting work in the hood
- Do not clutter your hood with unnecessary bottles or equipment. Keep it clean and clear. Only materials actively in use should be in the hood
- Do not make any modifications to hoods, duct work, or the exhaust system
- Do not use large equipment in laboratory hoods unless the hood is dedicated for this purpose, as large obstructions can change the airflow patterns and render the hood unsafe

Other Engineering Controls

In addition, consideration must be given to providing sufficient engineering controls for the storage and handling of hazardous materials. No more than 10 gallons of flammable chemicals may be stored outside of an approved flammable storage cabinet. For refrigerated or frozen storage, flammable and explosive materials must be kept in refrigeration units specifically designed for storing these materials. Generally these units do not have internal lights or electronic systems that could spark and trigger an ignition; additionally, the cooling elements are external to the unit. These units should be labeled with a rating from a certifying organization.

Secondary containment must be provided for corrosive and reactive chemicals and is recommended for all other hazardous chemicals. Secondary containment should be made of chemically resistant materials and should be sufficient to hold the volume of at least the largest single bottle stored in the container.

Laboratories and workshops that use hazardous materials must contain a sink, kept clear for hand washing to remove any final residual contamination. Hand washing is recommended whenever a staff member who has been working with hazardous materials plans to exit the laboratory or work on a project that does not involve hazardous materials.

Administrative Controls

The next layer of safety controls are Administrative Controls that consist of policies and procedures. Each laboratory and workshop must have safety procedures, which include safety practices, for any work that involves hazardous materials. These safety procedures should be specific and communicated via specific trainings, Standard Operating Procedures and properly documented.

Standard Operating Procedures

Standard operating procedures (SOPs) that are relevant to safety and health considerations must be developed and followed, particularly when work involves the use of hazardous chemicals. SOPs are written instructions that detail the steps that will be performed during a given experimental procedure and include information about potential hazards and how these hazards will be mitigated. SOPs should be written by personnel who are most knowledgeable and involved with the laboratory or workshop process. The development and implementation of SOPs is a core component of promoting a strong safety culture and helps ensure a safe work environment.

While general guidance is contained in this plan, Laboratory and Workshop Supervisors are required to develop and implement specific SOPs for their laboratories and workshops. All personnel responsible for performing the procedures detailed in the SOP shall sign the SOP acknowledging the contents, requirements and responsibilities outlined in the SOP. The SOPs shall be reviewed by qualified personnel and shall be amended and subject to additional review and approval by the Department Head where changes or variations in conditions, methodologies, equipment, or use of the chemical occurs. For certain hazardous chemicals or specialized practices, consideration must be given to whether additional consultation with safety professionals is warranted or required.

Circumstances requiring prior approval must also be addressed in laboratory specific SOPs. These circumstances are based on the inherent hazards of the material being used, the hazards associated with the activity, the experience level of the worker, and the scale of the activity. Some examples of circumstances that may require prior approval include working alone in a laboratory or workshop, the use of highly toxic gas of any amount, the use of large quantities of toxic or corrosive gases, the use of extremely reactive chemicals (e.g., pyrophoric chemicals, water reactive chemicals), or the use of carcinogens.

PROTECTIVE APPAREL AND EQUIPMENT

Personal Protective Equipment

Personal protective equipment (PPE) safeguards against chemical exposures and is required by everyone entering a laboratory containing hazardous chemicals. The PPE policy outlines the basic PPE requirements, which include but are not limited to:

- Full length pants and close-toed shoes, or equivalent
- Protective gloves, laboratory coats, & eye protection when working with, or near, hazardous chemicals
- Flame resistant laboratory coats for high hazard materials, and flammables.

The primary goal of PPEs is to protect against hazards caused by exposure to hazardous substances. In some cases, additional, or more protective, equipment must be used. If a project involves a chemical splash hazard, chemical goggles are required; face shields may also be required when working with chemicals that may cause immediate skin damage. Safety goggles are different from safety glasses. Goggles form a seal with the face, which completely isolates the eyes from the hazard.

If a significant splash hazard exists:

- Heavy gloves
- Protective aprons and
- Sleeves may also be needed

Gloves should only be used under the specific condition for which they are designed, as there is no glove that offers a protection against all chemicals. It is also important to note that gloves degrade over time, so they should be replaced as necessary to ensure adequate protection against hazards.

Applicable PPE	Example	Type/Characteristics	Applications
Light latex, vinyl or nitrile gloves		**Disposable latex** Powdered or un-powdered	Working with biological hazards (human blood, body fluids, tissues, bloodborne pathogens, specimens), BSL1, BSL2, BSL2+, BSL3
		**Disposable nitrile** Puncture, abrasion resistant, protection from splash hazards	Working with biological hazards and chemical splash hazards
		**Disposable vinyl** Economical, durable, similar to latex	Working with biological hazards, BSL1, BSL2, BSL2+, BSL3
Light chemical resistant gloves		**Natural rubber latex** Chemical resistant, liquid-proof	Working with small volumes of corrosive liquids, organic solvents, flammable compounds
Light to heavy chemical resistant gloves		**Nitrile** Chemical resistant, good puncture, cut, and abrasion resistance	Using apparatus under pressure, air or water reactive chemicals
Heavy chemical resistant gloves		**Butyl** High permeation resistance to most chemicals	Working with large volumes of organic solvents; small to large volumes of dangerous solvents, acutely toxic or hazardous materials
		**Viton® II** High permeation resistance to most chemicals	Same as butyl gloves, plus hazardous material spills
		**Silver shield** Extra chemical and mechanical protection	Same as butyl and Viton II gloves, added mechanical protection, hazardous material spills
Insulated gloves		**Terrycloth autoclave** Heat resistant	Working with hot liquids and equipment, open flames, water bath, oil bath
		**Cryogen** Water resistant or water proof, protection against ultra-cold temperatures	Handling cryogenic liquids

How to Use and Maintain PPEs

Personal protective equipment should be kept clean and stored in an area where it will not become contaminated. Personal protective equipment should be inspected prior to use to ensure it is in good condition. It should fit properly and be worn properly. If it becomes contaminated or damaged, it should be cleaned or repaired when possible, or discarded and replaced.

Contaminated Clothing/PPE

In cases where spills or splashes of hazardous chemicals on clothing or PPE occur, the clothing/PPE should immediately be removed and placed in a closed container that prevents release of the chemical.

Heavily contaminated clothing/PPE should be disposed of as hazardous waste. Non-heavily contaminated laboratory coats should be cleaned and properly laundered, as appropriate. N**ever** take contaminated items home. Inform persons or companies hired to clean contaminated items of potentially harmful effects of exposure to hazardous chemicals and provide them with information on how to safely handle the contaminated items.

Respiratory Protection

Typically, respiratory protection is not needed in a laboratory. Under most circumstances, safe work practices, small scale usage, and engineering controls (fume hoods, biosafety cabinets, and general ventilation) adequately protect laboratory workers from chemical and biological hazards. Under certain circumstances, however, respiratory protection may be needed. These can include:

- An accidental spill such as:
    - A chemical spill outside the fume hood
    - A spill of biohazardous material outside a biosafety cabinet
- Performance of an unusual operation that cannot be conducted under the fume hood or biosafety cabinet
- When handling toxic chemicals outside a protective enclosure.
- When exposure monitoring indicates that hazards cannot be controlled by engineering or administrative controls
- As required by a specific laboratory protocol or as defined by applicable regulations

Documentation of PPE issuance

All labs are required to document the issuance of appropriate PPE to their personnel.

Laboratory Safety Equipment

New personnel must be instructed in the location of fire extinguishers, safety showers, and other safety equipment *before* they begin work in the laboratory. This training is considered part of the laboratory specific training that all staff members must attend.

Fire Extinguishers

All laboratories working with combustible or flammable chemicals must be outfitted with appropriate fire extinguishers. All extinguishers should be mounted on a wall in an area free of clutter or stored in a fire extinguisher cabinet. Lab personnel should be familiar with the location, use and classification of the extinguishers in their laboratory. Laboratory personnel are not required to extinguish fires that occur in their work areas and should not attempt to do so unless:

- It is a small fire (i.e., small trash can sized fire)
- Appropriate training has been received
- It is safe to do so

Any time a fire extinguisher is used, no matter for how brief a period, the Laboratory Supervisor, or most senior laboratory personnel present at the time of the incident, must immediately report the incident to the **EH&S**

Safety Showers and Eyewash Stations

All laboratories using hazardous chemicals must have immediate access to safety showers with eye wash stations. Access must be easily accessible and access routes must be kept clear. Safety showers must have a minimum clearance of 16 inches from the centerline of the spray pattern in all directions at all times; this means that no objects should be stored or left within this distance of the safety shower. Sink based eyewash stations and drench hoses are not adequate to meet this requirement and can only be used to support an existing compliant system.

In the event of an emergency, individuals using the safety shower should be assisted by an uninjured person to aid in decontamination and should be encouraged to stay in the safety shower for 15 minutes to remove all hazardous material. Safety shower/eyewash stations are tested by Facilities Management on a monthly basis. Any units which do not have a testing date within one month should be reported immediately to **Facilities Management.**

Fire Doors

Many areas of research buildings may contain critical fire doors as part of the building design. These doors are an important element of the fire containment system and should remain closed.

Safe Laboratory Practice

Personal Protective Equipment:

- Wear closed-toe shoes and full length pants, or equivalent, at all times when in the laboratory
- Utilize appropriate PPE while in the laboratory and while performing procedures that involve the use of hazardous chemicals or materials
- Confine long hair and loose clothing
- Remove laboratory coats or gloves immediately when contaminated, as well as before leaving the laboratory
- Avoid use of contact lenses in the laboratory unless necessary. If they are used, inform supervisor so special precautions can be taken
- Use any other protective and emergency apparel and equipment as appropriate. Be aware of the locations of first aid kits and the emergency eyewash and shower station

Chemical Handling:

- Properly label and store all chemicals. Use secondary containment at all times
- Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the Chemical Hygiene Plan
- Do not smell or taste chemicals
- Never use mouth suction for pipetting or starting a siphon
- Do not dispose of any hazardous chemicals through the sewer system
- Be prepared for an accident or spill and refer to the emergency response procedures for the specific material. Procedures should be readily available to all personnel.

- *Eye Contact*: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention
- *Skin Contact*: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist after washing, seek medical attention

Equipment Storage and Handling:

- Store laboratory glassware carefully to avoid damage.
- Use certified fume hoods, glove boxes, or other ventilation devices for operations which might result in release of toxic chemical vapors or dust.
- Keep hood closed when not in use
- Do not use glassware or equipment that are damaged
- Avoid storing materials in hoods
- Do not allow the vents or air flow to be blocked

Laboratory Operations:

- Keep the work area clean and uncluttered
- Seek information and advice about hazards, plan appropriate protective procedures, and organize equipment before beginning any new operation
- Be alert to unsafe conditions and ensure that they are corrected when detected
- Staff or students should never work alone on procedures involving hazardous chemicals, biological agents, or other physical hazards

Food/Drink:

- No food or drink may be present or consumed in a laboratory or any other space in which hazardous materials are stored or handled.
- Do not smoke, chew gum, or apply cosmetics in areas where laboratory chemicals are present
- Do not store, handle, or consume food or beverages in storage areas, refrigerators, glassware or utensils which are also used for laboratory operations
- Wash areas of exposed skin well before leaving the laboratory

CHAPTER 6: INVENTORY, LABELING, STORAGE, AND TRANSPORT

Regulatory Requirements

Implementation of the necessary work practices, procedures, and policies outlined in this chapter follow the guidelines set by Royal Decree (42) of 2009 concerning the Environment, Health and Safety Management System (EHSMS)

Chemical Inventories

Each laboratory group is required to maintain a current chemical inventory that lists the chemicals and compressed gases used and stored in the labs and the quantity of these chemicals. Chemical inventories are used to ensure compliance with storage limits and fire regulations and can be used in an emergency to identify potential hazards for emergency response operations. The chemical inventory list should be reviewed prior to ordering new chemicals and only the minimum quantities of chemicals necessary for the research should be purchased. As new chemicals are added to the inventory, each laboratory group must confirm that they have access to the Safety Data Sheets (SDS) for those chemicals. Where practical, each chemical should be dated so that expired chemicals can be easily identified for disposal. Inventory the materials in your laboratory frequently (at least annually) to avoid overcrowding with materials that are no longer useful and note the items that should be replaced, have deteriorated, or show container deterioration. Unneeded items should be returned to the storeroom/stockroom and compromised items should be discarded as chemical waste. Indications for disposal include:

- Cloudiness in liquids
- Color change
- Evidence of liquids in solids, or solids in liquids
- Buildup of material around outside of containers
- Pressure build-up within containers
- Deterioration of containers

Access to hazardous chemicals, including toxic and corrosive substances, should be restricted at all times. These materials must be stored in laboratories or storerooms that are kept locked when laboratory personnel are not present.

Chemical Labeling

Every chemical found in the laboratory must be properly labeled. Most chemicals come with a manufacturer's label that contains the necessary information, so care should be taken to not damage or remove these labels. Each chemical bottle, including diluted chemical solutions, must be labeled with its contents and the hazards associated with this chemical. It is recommended that each bottle also be dated when received and when opened to assist in determining which chemicals are expired and require disposal. When new chemicals and compounds are generated by laboratory operations, these new chemical bottles must be labeled with the name, date, and hazard information; the generator or other party responsible for this chemical should be named on the container so that they may be contacted if questions arise about the container's contents.

Chemical Storage & Segregation

Establish and follow safe chemical storage & segregation procedures for your laboratory. Always wear appropriate personal protective equipment (e.g., laboratory coat, safety glasses, gloves, safety goggles, apron) when handling hazardous chemicals. Be aware of the locations of the safety showers and emergency eyewash stations. Each laboratory is required to provide appropriate laboratory-specific training on how to use this equipment **prior** to working with hazardous chemicals.
Most chemicals have multiple hazards and therefore storage areas should be appropriate for each specific chemical. The following are guidelines for storage:

- **Distance**: Incompatible hazardous materials should be stored in different storage areas or widely separated within an area.
- **Containerization**: Corrosive and reactive materials should be isolated by placing them into secondary containment units.
- **Flammability:** Flammable materials should be stored in a flammable cabinet.
- **Corrosivity:** Corrosive materials should be stored in impervious (non-reactive) containers, and in a ventilated area away from incompatible material.
- **Toxicity:** Toxic chemicals should be isolated within a storage area and locked in a flammable storage cabinet to protect against accidental release.

General Recommendations for Safe Storage of Chemicals

Each chemical in the laboratory must be stored in a specific location and returned there after each use. Acceptable chemical storage locations may include corrosive cabinets, flammable cabinets, laboratory shelves, or appropriate refrigerators or freezers. Fume hoods should not be used as general storage areas for chemicals, as this may seriously impair the ventilating capacity of the hood.

Chemicals should not be routinely stored on bench tops or stored on the floor. Additionally, bulk quantities of chemicals (i.e., larger than one-gallon) should be stored in a separate storage area, such as a stockroom or supply room.

Laboratory shelves should have a raised lip along the outer edge to prevent containers from falling. Hazardous liquids or corrosive chemicals should not be stored on shelves above eyelevel and chemicals which are highly toxic or corrosive should be in unbreakable secondary containers.

Chemicals must be stored at an appropriate temperature and humidity level and should **never** be stored in direct sunlight or near heat sources, such as laboratory ovens. Incompatible materials should be stored in separate cabinets, whenever possible. All stored containers must be appropriately labeled and capped to prevent vapor interactions. Laboratory refrigerators and freezers must be labeled appropriately with “No Food/Drink” and must **never** be used for the storage of consumables.

Flammable and Combustible Liquids

Large quantities of flammable or combustible materials (more than 200 liters) should not be stored in the laboratory.

Only the amounts needed for the current procedure should be kept on bench tops and the remainder should be kept in flammable storage cabinets, explosion proof refrigerators/freezers that are approved for the storage of flammable substances, or approved safety cans or drums that are grounded. Always segregate flammable or combustible liquids from oxidizing acids and oxidizers. Flammable materials must **never** be stored in domestic-type refrigerators/freezers, and must not be stored on the floor or in any exit access.

Oxidizers

Oxidizers (e.g., hydrogen peroxide, ferric chloride, potassium dichromate, sodium nitrate) should be stored in a cool, dry place and kept away from flammable and combustible materials,

such as wood, paper, Styrofoam, plastics, flammable organic chemicals, and away from reducing agents, such as zinc, alkaline metals, and formic acid.

Peroxide Forming Chemicals

Peroxide forming chemicals (e.g., ethyl ether, diethyl ether, cyclohexene) should be stored in airtight containers in a dark, cool, and dry place and must be segregated from other chemicals that could create a serious hazard (e.g., acids, bases, oxidizers). The containers should be labeled with the date received and the date opened.

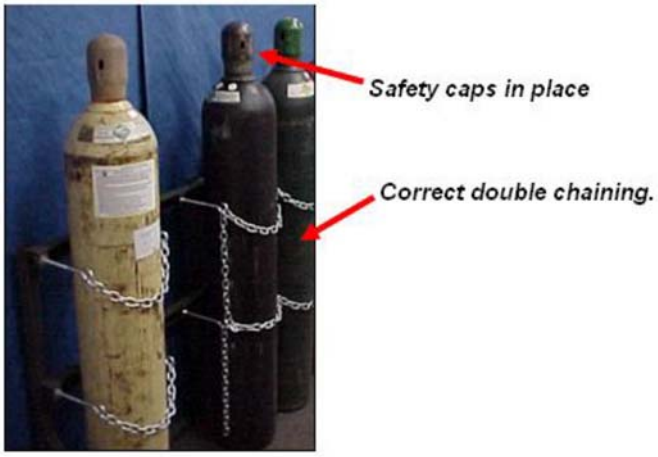
Never return unused quantities back to the original container and clean all spills immediately.

Corrosives

Store corrosive chemicals (i.e., acids, bases) below eye level and in secondary containers that are large enough to contain at least 10% of the total volume of liquid stored or the volume of the largest container, whichever is greater. Acids must always be segregated from bases and from active metals (e.g., sodium, potassium, magnesium) at all times and must also be segregated from chemicals which could generate toxic gases upon contact (e.g., sodium cyanide, iron sulfide).

Special Storage Requirements

Compressed Gas Cylinders



Compressed gas cylinders must be stored with the safety cap in place when not in use. Cylinders must be stored either chained to the wall or chained within a cylinder storage rack. The cylinders must be restrained by two chains; one chain must be placed at one third from the top of the cylinder, and the other placed at one third from the bottom of the cylinder. For wall storage, no more than three cylinders may be chained together in the laboratory. Bolted “clam shells” may be used in instances where gas cylinders must be stored or used away from the wall. Store liquefied fuel-gas cylinders securely in the upright position. Cylinders containing certain gases are prohibited from being stored in a horizontal position, including those which contain a water volume of more than 5 liters. Do not

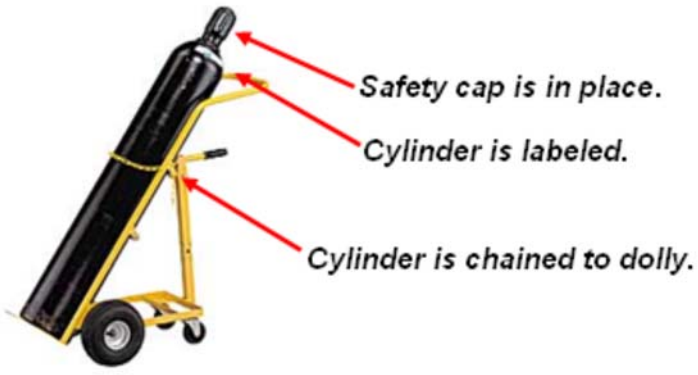
expose cylinders to excessive dampness, corrosive chemicals or fumes. Certain gas cylinders require additional precautions. Flammable gas cylinders must use only flame-resistant gas lines and hoses which carry flammable or toxic gases from cylinders and must have all connections wired. Compressed oxygen gas cylinders must be stored at least 20 feet away from combustible materials and flammable gases. Gas cylinder connections must be inspected frequently for deterioration and must never be used without a regulator. Never use a leaking, corroded or damaged cylinder and never refill compressed gas cylinders. When stopping a leak between cylinder and regulator, always close the valve before tightening the union nut. The regulator should be replaced with a safety cap when the cylinder is not in use. Move gas cylinders with the safety cap in place using carts designed for this purpose.

Liquid Nitrogen

Because liquid nitrogen containers are at low pressure and have protective rings mounted around the regulator, they are not required to be affixed to a permanent fixture such as a wall. However, additional protection considerations should be addressed when storing liquid nitrogen in a laboratory. The primary risk to laboratory personnel from liquid nitrogen is skin or eye thermal damage caused by contact with the material.

On-Campus Distribution of Hazardous Chemicals

Precautions must be taken when transporting hazardous substances. Chemicals must be transported in break-resistant, secondary containers such as commercially available bottle carriers made of rubber, metal, or plastic, that include carrying handle(s) and which are large enough to hold the contents of the chemical container in the event of breakage. When transporting cylinders of compressed gases, always secure the cylinder with straps or chains onto a suitable hand truck and protect the valve with a cover cap. ***Do NOT*** drag, slide, or roll cylinders.



CHAPTER 7: TRAINING

Regulatory Requirements

Implementation of the necessary training procedures, and policies outlined in this chapter follow the guidelines set by Royal Decree (42) of 2009 concerning the Environment, Health and Safety Management System (EHSMS)

Introduction

Effective training is critical to facilitate a safe and healthy work environment and prevent laboratory accidents. All Department Heads must facilitate formal safety training and ensure that all their employees have appropriate safety training before working in a laboratory.

Types of Training

All laboratory personnel must complete general safety training before:

- Beginning work in the laboratory;
- Prior to new exposure situations; and
- As work conditions change.

Annual refresher training is also required for all laboratory personnel.

General Laboratory Safety Training

Anyone working in a laboratory is required to complete General Laboratory Safety training, which includes:

- **Laboratory Safety Fundamental Concepts** – for all persons working in a laboratory
- **Laboratory Safety for Laboratory Supervisors** – for Laboratory Supervisors responsible for implementing a laboratory safety plan
- Review of laboratory rules and regulations, including the Chemical Hygiene Plan
- Use of engineering controls, administrative controls and personal protective equipment to prevent hazards
- Review of reference materials (e.g., SDS) on hazards, handling, storage and disposal of hazardous chemicals
- Fire safety and emergency procedures
- Recognition of laboratory hazards

Additionally, all personnel are required to participate in an annual General Laboratory Safety re-training.

Laboratory-Specific Training

Laboratory Supervisors must also provide laboratory-specific training. Topics that require specific training include:

- Location and use of the Chemical Hygiene Plan, IIPP, SDS(s) and other regulatory information
- Review of IIPP and Emergency Management Plan, including location of emergency equipment and exit routes
- Use of Specialized equipment
- Overview of Standard Operating Procedures and specialized procedures and protocols including emergency procedures

Documentation of Training

Accurate recordkeeping is a critical component of health and safety training. Departments are responsible for documenting health and safety training, including safety meetings, one-on-one training, and classroom and online training. Documentation should be maintained in the laboratory safety manual.

CHAPTER 8: INSPECTIONS AND COMPLIANCE

Regulatory Requirements

Implementation of the necessary inspections and compliance outlined in this chapter follow the guidelines set by Royal Decree (42) of 2009 concerning the Environment, Health and Safety Management System (EHSMS)

Chemical Safety Inspections

EH&S has a comprehensive compliance program to assist laboratories and other facilities to maintain a safe work environment. This program helps to ensure compliance with regulations and protect the health and safety of the campus community.

As part of this program, EH&S conducts annual inspections of laboratories and other facilities to ensure the laboratory is operating in a safe manner and to ensure compliance with all federal and university safety requirements. The primary goal of inspection is to identify both existing and potential hazards that can be corrected **before** an accident occurs.

The inspection includes the following categories:

- Documentation and Training
- Hazard Communication (including review of SOPs)
- Emergency and Safety Information
- Fire Safety
- General Safety
- Use of personal protective equipment (PPE)
- Chemical Storage, Disposal and Transport
- Fume Hoods
- Mechanical and Electrical Safety

Once the inspection is completed, EH&S issues a Laboratory Inspection Report. The report identifies deficiencies in the laboratory, both serious and non-serious. Serious deficiencies are those that have the potential to lead to serious injuries or be of critical importance in the event of an emergency. These deficiencies must be immediately corrected. Non-serious deficiencies must be corrected within 30-days. Any deficiency that requires a “Facilities Service Request” (FSR) for completion must be communicated to the FSR department so that it can be expedited

by Facilities Management. A copy of the most recent *Laboratory Inspection Checklist* and *Inspection Report* should be maintained as part of the records inside the Laboratory Manual.

Notification and Accountability

The compliance program requires that Department Heads, Laboratory Supervisors and other responsible parties take appropriate and effective corrective action upon receipt of written notification of inspection findings. Failure to take corrective actions within the required timeframe will result in a repeat deficiency finding and an escalation of the notification to the Director. Depending on the severity of the deficiency, the Director may temporarily suspend research activities until the finding is corrected.

Recordkeeping Requirements

Accurate recordkeeping demonstrates a commitment to safety and health. EH&S is responsible for maintaining records of inspections and accident investigations. Departments or laboratories are responsible for documenting health and safety training, including safety meetings, one-on-one training, and classroom training.

CHAPTER 9: HAZARDOUS CHEMICAL WASTE MANAGEMENT

Proper Hazardous Waste Management

Training

All personnel who are responsible for handling, managing or disposing of hazardous waste must attend training **prior** to working with these materials.

Waste Identification

All the chemical constituents in each hazardous waste stream must be accurately identified by knowledgeable laboratory personnel. Mixing of incompatible waste streams has the potential to create violent reactions and is a common cause of laboratory accidents.

Storage: The hazardous waste storage area in each laboratory must remain under the control of the persons producing the waste, should be located in an area that is supervised and not accessible to the public.

Segregation: All hazardous materials must be managed in a manner that prevents spills and uncontrolled reactions. Stored chemicals and waste should be separated.

Administrative Controls: In order to reduce the amount of chemicals that become waste, administrative and operational waste minimization controls should be implemented. Usage of chemicals in the laboratory areas should be reviewed to identify practices which can be modified to reduce the amount of hazardous waste generated. When ordering chemicals, be aware of any properties that may preclude long term storage, and order only exact volumes to be used. Using suppliers who can provide quick delivery of small quantities can assist with reducing surplus chemical inventory. Consider establishing a centralized purchasing program to monitor chemical purchases and avoid duplicate orders.

Inventory Control: Rotate chemical stock to keep chemicals from becoming outdated. Locate surplus/unused chemicals and attempt to return unused chemicals to the vendor.

Drain Disposal: ADPOLY does not permit drain disposal of chemical wastes.

CHAPTER 10: ACCIDENTS

Overview

Laboratory emergencies may result from a variety of factors, including serious injuries, fires and explosions, spills and exposures, and natural disasters. All laboratory employees should be familiar with and aware of the location of their laboratory's emergency response plans and safety manuals. **Before beginning any laboratory task**, know what to do in the event of an emergency situation. Identify the location of safety equipment, including first aid kits, eye washes, safety showers, fire extinguishers, fire alarm pull stations, and spill kits. Plan ahead and know the location of the closest fire alarms, exits, and telephones in your laboratory.

Accidents

Department Heads and Laboratory Supervisors are responsible for ensuring that their employees receive appropriate medical attention in the event of an occupational injury or illness. All accidents must be reported to EH&S and an investigation will be conducted to develop recommendations and corrective actions to prevent future accidents. At a minimum, each laboratory must have the following preparations in place:

- **First aid kit**
- **Posting of emergency telephone numbers**
- **Training of staff in basic CPR and First Aid**

Fire-Related Emergencies

In the event of a fire immediately follow these instructions:

1. Pull the fire alarm pull station and **CALL 999** to notify the Fire Department
2. Evacuate and isolate the area. Close Doors
    - ***If Safe To Do So:***
        - Use portable fire extinguishers to facilitate evacuation and/or control a small fire (i.e., size of a small trash can)
        - Shut off equipment before leaving
3. Remain safely outside the affected area to provide details to emergency responders; and
4. Evacuate the building when the alarm sounds. It is against state law to remain in the **building when the alarm is sounding.** If the alarm sounds due to a false alarm or drill, you will be allowed to re-enter the building as soon as the Fire Department determines

that it is safe to do so. **Do not go back in the building until the alarm stops and you are cleared to reenter.**

If your clothing catches on fire, go to the nearest emergency shower immediately. If a shower is not immediately available, then **STOP, DROP,** and **ROLL.** A fire extinguisher may be used to extinguish a fire on someone's person. Report any burn injuries immediately and seek medical treatment.

Chemical Spills

Chemical spills can result in chemical exposures and contaminations. Chemical spills become emergencies when:

- The spill results in a release to the environment (e.g., sink or floor drain)
- The material or its hazards are unknown
- Laboratory staff cannot safely manage the hazard because the material is too hazardous or the quantity is too large

Effective emergency response to these situations is imperative to minimize adverse reactions when chemical incidents occur. In the event of a significant chemical exposure or contamination, immediately try to remove or isolate the chemical if safe to do so. When skin or eye exposures occur, remove contaminated clothing and flush the affected area using an eye wash or shower for at least 15 minutes. If a chemical is ingested, drink plenty of water. Obtain medical assistance as indicated. Remember to wear appropriate PPE before helping others. Laboratory Supervisors must review all exposure situations, make sure affected employees receive appropriate medical treatment and/or assessment, and arrange for containment and clean-up of the chemical as appropriate.

Small chemical spills can be cleaned up by laboratory personnel who have been trained in spill clean-up and with the appropriate materials. A small spill is generally defined as < 1 liter of chemical that is not highly toxic, does not present a significant fire or environmental hazard, and is not in a public area such as a common hallway. **Large chemical spills** include spills of larger quantities, spills of any quantity of highly toxic chemicals, or chemicals in public areas or adjacent to drains. Large spills require emergency response. **CALL 999 *immediately***.

Site Safety Checklist

Lab Personnel (Learner) Name	
ADP ID#	
ADP Email	
Lab Supervisor Name	
Lab Supervisor Signature	
Date	

Laboratory Site Safety Orientation

Initial Next To Each Item To Confirm That You Have Received the Site Specific Training

Item	Training	Initial
Emergency Procedures		
Fire Alarm Pull Station	Location and Usage	
Eye Wash/Safety Showers	Location and Usage	
Fire Extinguisher	Location and Usage	
First Aid Kit	Location and Contents/Usage	
Chemical Spill Kit	Location and Usage	
Phone	Location and Emergency Dialing Instructions	
Emergency Procedures Guide	Location Of Posters And Discussion Of Scenarios	
Shelter-in-Place	Procedures For Securing The Lab For Shelter-In-Place Orders	
Emergency assembly area	Location and pathways to Emergency Assembly Points; Review of evacuation procedures	

Engineering Controls (where applicable)		
Chemical fume hoods	Location and Usage	
Chemical storage	Location and Segregation Rules	
Biological safety cabinets	Location and Usage	
Other engineering controls (glove boxes, gas cabinets)	Demonstration of proper use and instruction on adjustable controls	
Administrative Controls (where applicable)		
Laboratory Safety Manual (including Chemical Hygiene Plan) or Shop Safety Manual	Location and Content Description	
Demonstrate electronic access to Safety Data Sheet (SDS) repository		
Laboratory Standard Operating Procedures (SOPs)	Location and Content Description	
Personal Protective Equipment (where applicable)		
Lab coat	Location, Usage and Type: ☐FR ☐Non- FR (FR – Flame Resistant)	
Eye protection	Location, Usage and Type: Chemical Splash Goggles, Corrective Prescription,	
Gloves	Location and Usage (properly wear, remove and dispose)	
Waste Disposal and Hazardous Waste Accumulation Area	Demonstrate location, proper labeling, proper storage requirements, and process to request pick-up.	
	Understands safety procedures for specific operations (safe use of specialized equipment, high voltage equipment, confined space, etc.).	
Additional Hazard-Specific Safety Training Courses		

Training History Record

The Training History document is used to maintain a history of completed safety training ***for each laboratory employee***. This includes site-specific training, EH&S training and any off-campus training. Refer to the Laboratory Safety Manual and consult with the Department Head for direction on the required training topics. This documentation is to be maintained in the Laboratory Safety Manual.

Employee Name: _____ Supervisor: _____

Assigned Laboratories: _____

Each laboratory employee must be made aware of the location and content of the ***Laboratory Safety Manual***. By your signature below, you acknowledge that you have read and understood the contents of the manual, and know how to access it in the laboratory.

Employee Signature: _____ Date: _____

Title or Description of Training	*Provider*	*Date*

Training Record (Site-Specific)

The Training Record document is used to record any site-specific training sessions.
Place a copy in the ***Laboratory Safety Manual***

Training Topic: _____

Location: _____ Date: _____ Duration: _____

Name	*Signature*	*ADP ID#*