

THE UNIVERSITY OF JORDAN



General Safety Guidelines

Chemical Engineering Department

General Safety Committee

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1. Introduction

The purpose of this guide is to promote safety awareness and encourage safe working practices in the laboratory. These brief guidelines should serve as a reminder of tools you can do to work more safely and are applicable to all users of the laboratory.

Laboratory safety is a very important aspect of science. Without it, experimentation would result in a very serious injury. To reduce the risks involved with all types of work such as, running experiments, installing new equipments, handling materials and maintenance, etc., there are certain procedures that we should all follow as individuals and as a member of a group.

This manual describes a minimum level of safe practices that are expected from all Individuals involved in the laboratory operations.

This manual is applicable to all faculty academic staff, administrative staff and students.

2. Responsibility

- *Safety committee*
 - Follow-up of public safety issues in laboratories.
 - Preparing and updating the public safety manual.
 - Training the students of the department on public safety in laboratories.
- *Laboratory Engineers*
 - Knowing all applicable health and safety rules and regulations of Jordan.
 - Identifying hazardous conditions or operations expected in the lab, determining safe procedures and controls, and implementing and enforcing standard safety procedures.
 - Ensuring each student is using appropriate personal protective equipment (PPE) available in the lab. (e.g., lab coats, gloves, eye protection, etc.).
 - Ensuring each student has access to be familiar with the appropriate Laboratory Safety Manual.
 - Post warning signs for unusual hazards such as flammable materials, high voltage, no eating drinking smoking sign etc....
- *Students*
 - Reviewing and following relevant general safety guidelines & to follow all the safety rules, regulations and standard operating procedures.
 - Always wear laboratory coat/apron in the laboratory.
 - Appropriate gloves should be worn as needed.
 - Appropriate shoes should be worn in the laboratory.
 - Wear breathing mask as and when appropriate.
 - Adhering to warning signs.
 - Understanding the hazards of materials and risk of processes in their laboratory.

- Gaining prior approval from the laboratory engineers for the use of restricted chemicals and other materials or conducting any work in the lab.

3. Laboratory design and equipment

- All pilot plant glass apparatuses are equipped with bursting discs.
- Many portable extinguishers are distributed in the lab. It includes water, powder and carbon dioxide. Maintenance for these extinguishers takes place every 6 months.
- Two first aid kits that are usually filled with necessary items.
- A safety shower.
- Two fires hose reels (each, 50 m in length).
- A storage room for all sorts of pipes, fittings, valves, plastics, etc. .
- A storage room for chemicals.
- Fume cupboards in several places.
- Extraction unit in all places.
- A huge crane.
- Smoke detectors.
- Three unobstructed exits.
- Gas cylinders are distributed in different places according to their uses.
- Precautionary signs are posted at different places.

4. Laboratory hazard

Hazards in the laboratory fall into three general categories:

- **Equipment:** A wide variety of equipment is used in the laboratory. Most of the equipment is delicate, sensitive and expensive. Before using any equipment, learning method of its operation and its safety implications must be carried out. All equipments in the laboratory are earthed, and must be disconnected from electricity when the work is finished.
- **Gases:** A variety of compressed gases are used, some of which may be toxic, corrosive, flammable, or explosive. These hazards have been minimized by the use of proper equipment, proper confinement, ventilation, safety valves, etc., and by procedural controls.
- **Chemicals:** Acids, bases, and solvents are commonly used in the laboratory. These are "hands on" hazards which are hard to control by engineering controls only. These chemicals can cause severe burns, tissue damage, organ damage, asphyxiation, and genetic damage if used improperly. Chemical safety instructions must be given before using any chemical.

5. Standard operating procedure

- *Eating, Drinking, and smoking*

Eating, drinking, smoking, gum chewing, applying cosmetics, using long scarfs, and taking medicine in laboratories is strictly prohibited.

- Glassware used for laboratory operations should never be used to prepare or consume food or beverages.
- Laboratory refrigerators, ice chests, cold rooms, ovens, and so forth should not be used for food storage or preparation.
- Laboratory water sources and deionized water should not be used for drinking water.
- Laboratory materials should never be consumed or tasted.

- *Housekeeping and maintenance*

In the laboratory, keeping all items clean and organized can help providing a safer environment.

- Keep drawers and cabinet doors closed and electrical cords off the floor to avoid tripping hazards.
- Keep aisles clear of obstacles such as boxes, chemical containers, and other storage items that might be put there.
- Avoid slipping hazards by cleaning up spilled liquids promptly and by keeping the floor free of loose equipment
- Never block or even partially block the path to an exit or to safety equipment, such as a safety shower or fire extinguishers.
- Use the required procedure for the proper disposal of all wastes
- Clean the work area upon completion of a task and at the end of the day.

- *Glassware safety*

- Handle glass apparatus with care. Glass is easily broken and forms razor-sharp edges.
- Clean up broken glass immediately. It is unsafe to pick up the broken glass with the hands. Instead, you should use a broom and dust pan to collect the broken glass.
- Don't use chipped or broken glassware.
- Do not store glassware near the edge of shelves. Store large or heavier glassware on lower shelves.
- Transport all glass ware or chemical glass containers in bottle carriers.

- *Electrical safety*

- All electrical cords and wires to be in good condition, none have cracked, brittle, or frayed insulation, Electrical equipments to be inspected regularly.

- Do not touch electric circuit when your hands are wet, or bleeding, and don't test circuits with bare fingers.
- All equipments are earthed, and must be disconnected from electricity when the work is finished.
- Avoid using extension cords whenever possible. If you must use one, obtain a heavy-duty one. Extension cords should not go under doors, across aisles, be hung from the ceiling, or plugged into other extension cords.

- *Ovens and hotplates*

Laboratory ovens are used in laboratories for to remove water and other solvents from samples and to dry laboratories glassware. Laboratory furnace used in ash test, carbonate, and pyrolysis etc...

- Never use laboratory ovens for preparation of food for human consumption.
- Don't use Mercury thermometers to monitor the oven temperature
- Use thermal gloves or tongs to remove items from heating unites

- *Dealing with chemical*

- Check chemical labels twice to make sure you have the correct substance. Some chemical formulas and names differ by only a letter or number.
- Never taste laboratory materials.
- Do not pipit solutions by mouth. Use a rubber suction bulb or special pipette filler.
- Do not put flammable liquids near an open flame.
- DO NOT return any excess material to its original container.

- *Fire Prevention*

Aware yourself of ignition sources in the laboratory (open flames, heat, and electrical equipment).

- Purchase chemicals in quantities that will be used in a short period of time.
- Always store flammable liquids in appropriate cabinets.
- Do not store incompatible reagents together (e.g., acids with organic solvents).
- Familiarize yourself with sitting and condition of fire extinguishers.
- Do not use fire extinguishers unless you are trained and feel confident to do so.

6. Personal Protective Equipment

- *Laboratory Coat*

The laboratory coat is designed to protect the clothing and skin from chemicals that may be spilled or splashed. All students must wear laboratory coat in the chemical engineering laboratory at all times.

- *Face Mask*

Always wear face mask where necessary

- *Hand Protection*

Always wear protective gloves in the laboratory specially when handling chemicals. Thermal gloves should be used when handling small hot objects.

- *Foot Protection*

All students must wear sturdy shoes that cover the foot completely. These will provide the best protection. Avoid shoes that expose feet in any way.

- *Ear Protection*

All students must wear ear protection where necessary

7. Laboratory Safety Equipment

- *First Aid kits*

Two first aid kits are available in the chemical engineering laboratories that are usually filled with necessary items.

- *Safety Showers and Eye Wash Stations*

Safety showers and eye wash stations are important. They are used to suppress a fire or more commonly to decontaminate a person who has been exposed to chemicals or fire.

- All laboratory staff should locate the safety showers and eye wash stations, and how they operate before an accident happens.
- The stations must be easily accessible from any location in the laboratory.
- The treatment for any chemicals which spill on the body is to rinse the affected body area for 15 minutes under cold running water after removing of all clothing jewelry, and shoes
- If chemicals spill into your eyes, call out for help. If you cannot see, someone will guide you to the eye wash station, where you should wash out your eyes thoroughly. You should blink continuously and rapidly while washing your eyes to aid the flushing action of the water.

- *Fume Hoods*

The fume hoods are large cabinets which have sliding glass doors in front. Fume hoods are used to protect workers from harmful fumes, gases and odors. The fume hood has an air duct in its ceiling which is attached to a powerful fan. When the fan is turned on, the air in the fume hood is pulled up through the duct, carrying away any harmful fumes or smoke.

- *Fire Alarm, Smoke Detectors & Fire Extinguishers*

- The laboratory is provided with a system of fire alarms and smoke detectors; these are located at different point to cover all the laboratory area.
- Many portable extinguishers are distributed in the lab. It includes water, powder and carbon dioxide. Maintenance for these extinguishers takes place every 6 months.
- Training for laboratory staff on the proper method of using fire extinguishers is scheduled for the first semester 2019-2020.