

LABORATORY SAFETY GUIDE

Discipline of Metallurgy Engineering and Materials Science

Indian Institute of Technology (IIT) Indore

Your safety in laboratory is our prime concern. This document will guide you to works safely in the laboratory. As we know, the motto of IIT Indore safety departments is, **“SAFETY IS FIRST AND MUST FOR ALL”**.

Thus, all laboratory users are expected to adhere to safety guidelines and maintain safety standard expected in the Institute facility.

1. Guidelines for Laboratories:

- a) Every laboratory should have its own safety manual and declaration form. All users must read and understand the manual and then sign the declaration form.
- b) It is advised to do risk assessment for all process and equipments. If any high risk process is involved, we suggest to eliminate such process if possible, otherwise additional risk control must be practiced.
- c) It is suggested to prepare a standard Work Procedure (SWP) for commonly used equipments.
- d) Log-book for all laboratory equipments should be maintained.
- e) New users must be trained before granting access of equipments.

2. Guidelines for Laboratory Users:

- a) Every user must read and understand the safety manual of laboratory, then sign the declaration form.
- b) Do risk analysis for your laboratory process. If any high or medium risk process is involved, user must have to discuss with laboratory in-charge.
- c) Read and understand all aspects of safety before using any equipment.
- d) Be alert to unsafe conditions of the equipment, procedures and actions, and call attention to them, so that corrections can be made as soon as possible.
- e) Use proper personnel protective equipments (PPEs) in laboratory work.

- f) Wash hand before leaving laboratory, **FOOD and DRINKS** are not allowed in laboratory.
- g) The headphone should not be used in laboratory.
- h) Always inform to the laboratory in-charge for any unfavourable event.
- i) Should be familiarised with the location, use and limitations of the safety devices such as *First Aid Kit, Fire Alarm, Fire Extinguisher, Eye Wash Station etc.*

3. General Hazards and Safety:

(i) Chemicals:

(Follow the Safety Guidelines of Department of Chemistry)

- a) Acids, bases, solvents and etching solutions are commonly used in materials growth and device fabrication. Improper use of solvents can result in a major fire. The chemicals even they look ordinary, are definitely not hazard free. These chemicals can cause severe burns, tissue damage, organ damage, asphyxiation, and genetic damage if used improperly.
- b) **One must carefully read and follow MSDS for each and every chemical to ensure its safe use.**
- c) Risk assessment must be completed by the person carrying out the work and signed by the supervisor who will determine the course of action appropriate to the experiment before work proceeds
- d) Label all storage areas, appropriately, and keep all chemicals in properly labelled containers.
- e) Familiarise yourself with the appropriate protective measures when exposed to the following classes of hazardous materials: Flammable, Corrosive, Toxic, Carcinogen, Compressed Gases, Poisonous.
- f) Pour more concentrated solutions into less concentrated solutions to avoid violent reactions (i.e.add acid to water, not water to acid).
- g) Do not store incompatible reagents together (e.g., acids with organic solvents).

- h) Always use extracted wet benches for chemical work, always wear safety glasses or goggles, wear laboratory coat/apron, appropriate shoes, breathing mask and gloves during all laboratory works.
- i) Never mouth suck anything in a pipette, keep exposed skin covered and wash hands before leaving the laboratory.
- j) Always keep bench tops, extracted wet benches, floors and aisles clear of unnecessary material.
- k) If experiments must be left unattended, place a note next to experimental apparatus indicating the chemicals involved and possible hazards and your name and a number where you can be reached in case of an emergency.
- l) Handle and store glassware carefully so as not to damage it or yourself.

(ii) Heating Equipments:

- a) Equipments such as Hotplates, Tube & Box Furnaces, Heating Mantles, Hot-Air Guns, Oil Baths and Ovens are used to supply heat in laboratories. Improper use of any one of these could result in fire or burns to the user.
- b) Apparatus should be maintained as required by the manufacturer.
- c) Check to see if the unit has an automatic safety shutoff in case of overheating.
- d) Note the condition of electrical cords and have them replaced as required.
- e) Check earthing voltage at the industrial plugs before switching on the furnaces and Ovens.
- f) Never open any furnace above 100°C. While using bulk furnace, all the samples must be covered.
- g) Furnace room exhaust fan and the ceiling fan should always be kept ON when any of the furnaces is working to maintain air circulation.
- h) Never go beyond the maximum temperature limit of the furnaces.
- i) Flammable or combustible solvents should not be used in a heated bath or placed near the bath. Oil baths must always be housed in a chemical fume hood.

(iii) Vacuum Systems and Gases:

- a) Familiarise yourself with the operations of the vacuum system in use. (If you are not familiar with the functions of *Rotary, Diaphragm, Diffusion or Turbo Pumps*.)
- b) Improper use can lead to accidents, serious damage to pump, substantial cost in repair or replacement of the pump and of course delay in project work.
- c) Make sure the service cord and switches are free of observable defects and accessible in case of emergency.
- d) Always use a trap on the suction line to prevent liquids from being drawn into the pump. If gases or vapours are being drawn through the pump, a cold trap should be used in the suction line to prevent contamination of the pump oil.
- e) Place a tray under the pump to catch any oil drips.
- f) A variety of compressed gases are used in laboratory, some of which may be toxic, corrosive, flammable, or explosive. These hazards have been minimised by the use of proper equipment, proper confinement, ventilation, safety valves, etc., and by procedural controls. You must learn about the safe handling of gases before embarking on their use.

(iv) Computational Facility:

- a) Follow the basic safety guidelines to prevent cuts, burns, electrical shock, and damage to eyesight.
- b) Do not spill water or any other liquid on the machine. It can cause short circuit fire as well as damage the machine.
- c) Do not touch areas in printers that are hot or that use high voltage. Remember that some components retain a high voltage even after the printer is turned off.
- d) Do not open a power supply or a CRT monitor. They contain high voltages.
- e) Beware that Electrostatic discharge (ESD), harsh climates, and poor-quality sources of electricity can cause damage to computer equipment. Use equipment that stabilizes power to prevent equipment damage and data loss.
- f) Poorly placed or unsecured cables can cause tripping hazards in a Computing lab. If there are many cables, they should be installed in conduit or cable trays to avoid clutter and prevent hazards.

- g) To avoid eye fatigue and Computer vision syndrome, blink your eyes often/ relax eyes by closing them for few minutes at regular intervals or perform eye exercises. Look away from the screen once in a while to give your eyes a rest. Use quality display screen and avoid glare.
- h) Sit straight and in comfortable posture to avoid neck and back pains. Spread fingers apart or rotate wrists at regular intervals to avoid Carpal tunnel syndrome.

4. Emergency and Fire Safety:

- a) Inform other users and evacuate the laboratory immediately. Report the incidence to laboratory In-charge and security personnel as soon as possible.
- b) In case of chemical spillage, follow the instruction as mentioned in chemical safety.
- c) Familiarise yourself about the location of Fire Alarms. Fire Extinguishers are located near exits in the laboratory. Only use a fire extinguisher if the fire is controllable and you know how to use the extinguisher safely. If you can't put out the fire, leave immediately and trigger a fire alarm. If fire alarm is activated inform immediately to **Security personnel**.

Contact details of Safety Department:

Security Help Desk Simrol 0731-2438917, 7509062839(M)

Security Help Desk (Silver Spring) 7509062835

Chief Security Officer (CSO) 0731-2438986, 7581055527(M)

Security Help Desk: securityhelpdesk@iiti.ac.in

Chief Security Officer (CSO) : cso@iiti.ac.in

Discipline of MEMS Committees:

Dr. Ajay Kumar Kushwaha (Convener)

Dr. Shaikh M. Mobin

Dr. Parasharam Shirage

Dr. Sunil Kumar

On Violations of safety rules:

Safety committee have right to monitor the adherence of safety rules by all the personnel's in the laboratory and in case of violations, to impose disciplinary action against a personnel irrespective of the faculty in charge of that personnel. Violation

of rules by any personnel working in the laboratory should lead to restricted entry of that personnel provided the violator agrees to comply with good laboratory practice. If the violator doesn't follow safety rules and regulations successively, he/she should be prohibited from entering any laboratory with the recommendation of safety committee for a certain period of time.

