



प्रयोगशाला सुरक्षा समिति
LABORATORY SAFETY COMMITTEE

LABORATORY SAFETY MANUAL

Indian Institute of Technology Goa
Version 1.0

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1 Emergency Contact Details*

1	Local Emergency Fire or Personal Injuries	101
2	Local Police	100
3	Ambulance	108
4	Ambulance IIT Goa (Driver)	+91 702 0364226
5	Hospital	+91 832 2312114
6	Medical Centre, IIT Goa	+91 832 2490873
7	Security, IIT Goa	+91 832 2490854
8	Laboratory Safety Committee	+91 832 2490861

**All labs should have these contact numbers pasted in the lab door*

2 Introduction

The main objective of this manual is to establish proper procedures to avoid potential risks or hazards associated with the laboratories of all kinds.

Each laboratory handling potentially hazardous materials is required to have a copy of this manual readily available with all the laboratory personnel in charge of it. Majority of the topics covered under this manual are focused on the basic safe operating practices so that investigators, lab technicians, and students may carry out effective teaching and research programs in a safe environment.

3 Guidelines

3.1 General Safety

1. You must have an understanding of what you are doing. You are not required to do anything you feel is unsafe or feel unsure about.
 - (a) Seek information or advice where necessary before carrying out new or unfamiliar work.
 - (b) Do not use any apparatus you have not been trained on. During training
 - i. Watch the operation of the equipment by an experienced operator.
 - ii. Operate the equipment while directly supervised.
 - iii. Self-operate independently only after approval of responsible supervisor.
2. **NO ONE IS ALLOWED TO WORK ALONE IN THE LAB.** If anyone wants to work outside of the usual lab timing i.e. from 8:30 am to 7 pm, She/he needs special permission from the supervisor.
3. No food, drink items are allowed in the laboratory. Consumption of food and drinks inside the lab is strictly prohibited.
4. Keep your working place clean.
5. Maintaining a lab notebook is essential. Observations are key to your success as a researcher. Any observation should be elaborately mentioned in the lab notebook.
6. If you are issued with any item (Chemicals, Equipment, Instruments etc..), you are to make an entry in the borrowing registrar.
7. Turn off all equipment unless instructed when not in use.
8. If you notice that a common lab supply is running low, please let the concerned person know about it.
9. Never work with broken glassware.
10. If you find any equipment is not working, please report it to the concerned person.
11. Respect other experiments, Never remove or change parts from others or own experiments.
12. Initial experiments should not be run by a new student in the absence of the trained student, the lab staff or faculty member.

13. Each student participating in the experimental study must be prepared for emergency shut-down procedures before initiating any experiment.
14. Have a **PRE-PLANNED** emergency shut-down procedures ready.
15. Do not leave an experiment unattended at any time.
16. If you are having problems with an experiment or something unexpected is happening, shut down the experiment.
17. Attending 1) Safety Seminar 2) Fire Training are mandatory for all Ph.D. Students.
18. Abiding all the rules and regulation are essential and mandatory.

3.2 Personal Safety

1. Ensure proper use of all safety devices (Goggles, Ear-plugs etc.) and other personal protective equipment (Gloves, Lab Coats etc.)
2. Appropriate protective clothing and footwear **MUST** be worn at all times and long hair **Must** be tied back.
3. All lifting equipment, including chain blocks, pendant hoist controls, and abney lifting frames are to be used by technical staff only unless training and authorization have been approved.
4. Visitors must be accompanied by a lab member or a trained personnel.
5. Sanitisation/Cleaning of your hands before and after the experiments is important.

3.3 Fire Safety

1. Everyone has to undergo fire fighting training which is organized by the Institute.
2. Knowing of locations of Fire alarms and Fire-extinguishers are mandatory.
3. Everyone has to be aware of Fire exists and Assembly points of the lab.
4. During the fire accidents, keep calm and don't use the elevator, approach the assembly point without fail.

3.4 Gas Safety

1. Pressurized cylinders must be latched all the time.
2. Trolley must be used all time to transport any pressurized cylinders.
3. All gas cylinders must be labelled with its content.
4. All gas Cylinders must have a safety cap.
5. Empty cylinders must also be labelled properly.

3.5 Waste Disposal

1. Designing of an experiment **MUST** include the Waste disposal methods.
2. Waste **MUST** be segregated and labelled properly according to the Institute norms.
3. Regular disposal of the waste must be carried out.
4. Keep in mind **RECYCLE AND REUSE**.
5. Complying to the safety instruction is compulsory.
6. Clean machines after use.
7. Take care when using Compressed Air.

4 Laboratory Specific Safety Guidelines

4.1 Chemistry Laboratories

1. Always wear gloves and safety goggles inside the chemistry lab.
2. Keep the sinks, and eyewashes free of glassware, etc.. Eyewash should be checked every fortnight, and safety shower should be checked every month. A regular maintenance of eyewash and safety shower should be carried out and documented.
3. Make sure samples are capped tightly and labelled properly. Without a label, all your sample does not make any sense.
4. Never wear gloves outside of the lab and don't touch the door handle wearing a glove.
5. When you order new chemicals/consumables, please tell the group leader or in charge to update the chemical inventories.
6. Always close and latch freezer doors (-20°C) completely when not in use.
7. Always close the sash of the chemical fume hood when you are not working inside it.
8. When the chemical hood is not working, no one is allowed to work in the lab.
9. Please check the label before you open a new chemical to ensure proper storage and disposal methods. **IF YOU HAVE DOUBTS, PLEASE ASK.**
10. To set up a higher scale reaction (more than 1 gram), you need a permission from your supervisor
11. Before working with nBuLi or any other organometallic reagents, you need special training, which will be given by authorized personnel.
12. Heating reaction in the night time is not allowed without the safety heating equipment.
13. Any liquids more than 1 lit should not transfer by holding it with your hands. It has to be transferred inside a bucket.
14. Flammable liquids more than 1 lit should not be kept on the working bench for overnight. It should be returned to the designated cabinet.
15. Please don't take out the exact maximum amount of reagent/solvent using a syringe, e.g. don't take out 20 ml solvent using 20 ml syringe.
16. Don't throw anything inside the sink. **IF YOU DON'T KNOW THE WASTE DISPOSAL PROCEDURE THEN ASK SOMEONE.**
17. Silica gel should always be transferred inside the fume hood and use protecting mask to prevent inhalation.
18. If you spill a small amount (less than 1 gm/ml) of chemical, please clean it immediately. If you spill more than please consult with authorized personnel.
19. Before using any toxic/flammable gas you should inform all your colleagues in the lab.
20. All MSDS data-sheet should be available electronically.

4.2 Electrical Laboratories

1. Always keep the workbench clean and clear.
2. No conducting parts should lie near any live electrical connections.
3. Turn-off all the electrical connections and disconnect the plug points from the socket before leaving the lab.
4. Use electrical cords which are under good condition and if necessary. Connecting multiple cords to the same socket is NOT ALLOWED.
5. All electrical equipment should have 3 wire grounding plugs
6. Plugs are MUST to operate any electrical equipment. DON'T connect bare conductors to any electrical sockets.
7. For equipment with a power rating more 1 kW always use 15 A sockets
8. Energizing electrical circuits should be carried out under the supervision of the advisor/lab manager.
9. When using circuits with energy storage elements (inductors and capacitors) make sure that these elements are completely discharged before the disconnection.
10. Live circuits should not be TOUCHED at any point in time.
11. Inspection of MCBs and Fuses is mandatory once in a year to ensure their proper working condition.
12. Once in a year, a comprehensive survey has to be performed to check for any loose socketing, conductor skinning and faults in electrical connections.
13. The grounding resistance has to be measured once in a year and made sure it is less than 5Ω (as recommended by the IEEE).
14. DO NOT install the electrical equipment in any areas where flammable gases, dust, and easily ignitable materials are present.
15. Any hanging jewellery SHOULD BE completely avoided while performing the experiments in electrical labs.
16. All electrical installations should be carried out as per the NATIONAL ELECTRICAL SAFETY CODE.
17. Lab managers of all electrical labs SHOULD display the code of conduct to perform the experiments and SHOULD clearly state any special requirements in particular to their lab.
18. Care should be taken to avoid the direct short-circuit while performing any electrical hardware experiments.
19. Any kind of inappropriate electrical connections/leakages/mishandling of electrical equipment/violation of code of conduct SHOULD be brought into the notice of the LSC Committee.
20. Labs SHOULD BE maintained clean to avoid the insects/reptiles to come in contact with the live conductors leading to the short circuit.
21. All equipment used in the electrical lab SHOULD have passed the specified standards and certified.

4.3 Mechanical Laboratories

1. Ask Workshop Supervisor before operating an equipment.
2. The amount of compressed gas in a bottle is determined by reading the pressure in the regulator. Each cylinder should be tagged.
3. Storage of compressed gas cylinders must be done carefully by completely closing the valve.
4. All cylinders must be chained in position even during use.
5. Close bottles during non-use. Regulator and lines must be de-pressurized.
6. When using a compressed gas, first ensure that appropriate regulators and pressure gauges compatible with the gas are used. Especially, do not use an oiled gage for oxygen.
7. Once proper regulator is chosen, screw in the regulator threads into the female port on the gas bottle. There should be no resistance until it is almost completely on and then tightening with an adjustable wrench.
8. Remember the right hand screw rule!
9. Make sure you are using appropriate material and components are for the expected pressure range.
10. When opening the cylinder, open the valve slightly and then proceed to open gradually.
11. Initially open regulator to a low pressure and check the downstream components for leaks. If no leaks found, then open the regulator until you reach the desired pressure and check one last time for leaks.
12. When shutting down, close the cylinder and allow gas to bleed out of the line fully before closing regulator.

4.4 Physics Laboratories

1. Most instruments in the physics laboratories use an electrical power supply, and some instruments also use the high-voltage power supply, and therefore, general guidelines of electrical safety should be followed.
2. Before switching on any power supply make sure that proper electrical connections to the devices are in place.
3. Before entering any optics laboratory, a user/guest must make sure that they are not disturbing any ongoing experiments. Generally, optical experiments are performed in a dark-room, and therefore any unauthorized entry/sudden switching on of light would disturb/completely ruin the ongoing experiments.
4. Lasers are common light sources that are used in physics laboratories. The laboratory in-charge must make sure the laser-sign is attached to the laboratory main door. It is also advised to furnish the classes (power rating) of lasers used in in the laboratory.
5. Low-power lasers (Class 2 and Class 3A) include laser pointers and alignment lasers; they are safe when used as intended but require some controls.

6. High-power lasers (Class 3B and Class 4) are more frequently used in research laboratory and the primary hazard associated with these lasers' operation is potential eye damage; other potential hazards include skin burns, electrical currents, explosions, fires, toxic material, laser-generated air contaminants, collateral radiation, noise, and ultraviolet light (in case of UV laser).
7. International regulations strongly advised that the doors of the laboratories with higher-class lasers should be assembled with the interlock devices. Sudden entering in the lab would shut down the laser and hence the ongoing experiments. Thus, a prior approval to enter in these labs are required, perhaps by
 - (a) knocking the door and waiting for someone to open the door,
 - (b) ringing the door bell and waiting for someone to open the door.
8. Only the users, who have gone through a proper laser safety tutorials/classes and have signed the laser safety form, can work independently in the lab.

4.5 CoE Laboratories

1. Regulations applicable to all laboratories of the Institute will also be applicable for the labs under CoE.
2. Safety instructions specific to a lab are available with the laboratory in-charge or the faculty in-charge of the individual lab.

4.6 Biological Laboratories

This section will be updated soon