

# GEORGIA INSTITUTE OF TECHNOLOGY

## ESSENTIALS OF

### MSE LABORATORY SAFETY PROGRAM

#### 1. *PURPOSE*

The purpose of this program is to insure compliance with all OSHA and other federal, state, and local regulations and standards that relate to laboratory safety.

#### 2. *LABORATORY SAFETY TRAINING*

Initial training and annual refresher training thereafter is required for all students who work in MSE laboratories. The topics covered in the training include:

- a. Material Safety Data Sheets (MSDS) Requirements
- b. Chemical Spills/Spill Clean Up
- c. Hazardous Waste (Shipment and Disposal)
- d. Bloodborne Pathogens
- e. Reactives and Corrosives
- f. Personal Protective Equipment (PPE)
- g. Compliance with Regulatory Agencies
- h. Environmental Concerns and Impact
- i. Eyewashes and Deluge Showers
- j. Fume Hoods
- k. Housekeeping
- l. Facilities Maintenance

Visual aids in the form of videos and topic appropriate handouts will be utilized in conjunction with training. Sign in sheets for attendance are required and are made available at the time of training.

#### 3. *LABORATORY SURVEYS*

Laboratory safety surveys will be periodically conducted by Environmental Health and Safety (EH&S). Focus of all surveys is to ensure compliance with general safety, fire safety, chemical safety and physical safety. All surveys are documented and follow up accomplished as required.

#### 4. *LABORATORY SAFETY SURVEY CRITERIA*

The following are minimum laboratory essential criteria:

##### *a. Emergency Phone Numbers*

Must be clearly and visibly posted in the main entrance area of each laboratory. In addition, the names and telephone numbers of responsible laboratory personnel must be displayed.

##### *b. Appropriate Warning Signs Posted*

- i. Where applicable, NFPA 704 fire diamond should be posted for use by firefighters in emergency conditions. The green placard that the diamond is mounted on will also have indications of chemical reactivity factors. Laboratories that utilize radioactive materials must also post appropriate radiation warnings.
- ii. Researchers working with or storing biosafety level 2 or higher organisms should also label the laboratory with the universal biohazard warnings.

***c. Food or Drink Rules***

- i. No food or drink is allowed in any laboratory within GT Campus. (*See: OSHA 29 CFR 1910.141(g)(2)*)
- ii. Application of cosmetics in a laboratory is prohibited.
- iii. Smoking is prohibited in laboratories and in all buildings.
- iv. Ice in the ice machines in science/research facilities should not be used for human consumption.

***d. Material Safety Data Sheets (MSDS)***

MSDS must be on hand or on order for all chemicals within the lab. They should be maintained in a single binder or location, and be available to all employees within the lab, and for individuals reviewing lab safety procedures.

***e. Ventilation of Laboratories***

- i. Laboratories must be areas of controlled occupational exposure regarding indoor air quality (IAQ).
- ii. Fume hoods or bio safety cabinets are to be utilized as controlled areas for applicable experimentation.
- iii. Laboratories must be maintained under negative air conditions.

***f. Fire Extinguishers***

- i. Fire extinguishers must be charged and inspected annually
- ii. Fire extinguisher training can be obtained through EH&S.

***g. Paths of Egress***

- i. It is imperative that all laboratories have unobstructed means of egress.

***h. Electrical/Gas Safety Issues***

***i. Electrical***

1. Electrical cords must be of good condition. Repair with electricians' tape is not acceptable.

2. Cheater plugs are not authorized.
3. Access to electrical sources must be kept clear of obstructions.
4. There must be no visible overloading of electrical circuits. (Multi outlet adapters are discouraged)
5. All electrical equipment must be appropriately grounded. (*See 29 CFR 1910.303*)

**ii. Gas**

1. Bunsen burners and burner tubing must be routinely inspected and must be free of defects.
2. Access to gas shut offs must be kept free of obstructions.

**i. Compressed Gas Cylinders**

Compressed Gas Cylinders must be appropriately secured. All compressed gas cylinders inclusive of lecture bottles, EMPTY CYLINDERS, and cylinders in transit, must be secured. Cylinders are appropriately secured by a number of means including clamps and straps, chains, straps, stands, racks, and any acceptable means that eliminates the possibility of tipping over of a tank.

**j. Personal Protective Equipment (PPE)**

- i. The individual responsible for the laboratory is also responsible for insuring that adequate PPE is on hand and in good condition for use by lab workers. (*Note: Although safety standards are not mandated by OSHA for students in teaching laboratories, it is both common sense and appropriate procedure that safety rules regarding personal protective equipment and clothing will also apply to students in a laboratory setting. Accordingly, it will be the responsibility of the laboratory supervisor, P.I., or the TA in charge to insure that PPE safety standards are enforced.*)
- ii. PPE will include at minimum, but not be limited to:
  1. Gloves appropriate for type of research conducted
  2. Lab coats/aprons (as required)
  3. Safety glasses/goggles and face shields as required
  4. Long sleeved clothing and long trousers/slacks to cover as much skin as possible is encouraged.
  5. Short pants/short skirts are prohibited.
  6. Open toed shoes/sandals are prohibited. Solid rubber soled shoes are encouraged.

***l. Machine Guarding***

Machines and equipment with rotating gears, belts, and or functions that may allow entrapment of fingers, hair, clothing, etc. must be guarded.

***m. Proper Labeling of Chemicals***

All chemicals in laboratories must be labeled with hazard information inclusive of chemical nomenclature, physical and health hazard information and manufacturer. (NOTE: Chemical symbols by themselves do not satisfy OSHA standards, and the common nomenclature must appear on the container regardless of chemical symbol).

***n. Segregation of Chemicals***

Stored chemicals must be separated and stored based upon compatibility and reactivity. (i.e. separate acids from bases, flammables from oxidizers, and reactives from air or water).

***o. Refrigerator Storage***

- i. Do not store flammables in refrigerators.
- ii. Explosion proof and flammable refrigerators and/or freezers are to be utilized only for the intended purpose stated by the manufacturer.

***p. Physical Storage of Chemicals***

- i. Do not store chemicals on shelves above eye level.
- ii. Do not store chemicals in fume hoods as bulk storage in hoods impedes airflow.
- iii. Store flammables in flammable storage cabinets.
- iv. Do not store chemicals or chemical waste on floors unless they are in secondary containment.
- v. Avoid storing chemicals in direct exposure to sunlight, excessive heat, or excessive cold.
- vi. Review MSDS for storage specifics.

***q. Chemical Waste***

- i. Ensure that all chemical waste containers are kept closed, appropriately marked and labeled to include start date of collection.
- ii. Outdated, expired, and/or unknown chemicals must be disposed of as waste through coordination with the Chemical Coordinator, EH&S.
- iii. Chemicals that may no longer be used, or of questionable purity, or that are past expiration date should be removed from the labs.

***r. Biological Waste***

Common methods for appropriate disposal include disinfecting, autoclaving, and for liquid disposal in the sanitary sewer. Be sure that the container is properly labeled, and decontaminated before disposal. Note the method of disposal for each liquid and solid waste. Observe that biohazard waste is stored in secondary containment.

***s. Sharps Disposal***

Contaminated sharps include needles, syringes, scalpels, exposed dental wires, broken glass if contaminated with human blood, and other potentially infectious material(s). These items must be collected in a sharps container or other puncture resistant container that is color coded or labeled with the universal biohazard symbol. (29 CFR 1910.1030 (b), (d), (2)(viii)).

**5. INVENTORY AND INVENTORY CONTROL**

An inventory of chemicals stored and used in laboratories or storage areas must be completed annually. Copies of the inventory must be forwarded to the Chemical Coordinator, EH&S. New chemicals received should be marked on the label with the date of receipt. Quantities of chemicals received should be reviewed against the shipping documents. (It is important to minimize quantities ordered for amounts necessary only for given projected time frames in order to avoid over-ordering, excess chemical inventory, and problems with orphaned chemicals.)

**6. LABORATORY SELF AUDITS**

Safety self-audits of laboratories are to be completed by primary investigators or their designated laboratory personnel annually.

**7. OTHER SIGNIFICANT SAFETY FACTORS**

It must be understood that this program, like any and all safety programs, must be a continual work in progress. Accordingly constructive criticism, recommended changes, and the requirement for periodic update are welcome and encouraged. To make recommendations for change and or review, contact Krishna Parachuru at 404-894-0029, [krishna.parachuru@mse.gatech.edu](mailto:krishna.parachuru@mse.gatech.edu), or Frank Moss at 404-894-6763, [Frank.Moss@mse.gatech.edu](mailto:Frank.Moss@mse.gatech.edu).

**8. CONCLUSION**

The safety of students, faculty, and staff who work in or take classes in laboratories must be a priority of all individuals who have access to the laboratories. Lab safety must be a constant and ongoing awareness issue. It is the responsibility of individuals who work in laboratories to remain safety conscious at all times. Mistakes in laboratories can result in loss of facilities, loss of research, and most importantly injury to employees and/or students with the possibility of loss of life.