Guideline for Instructional Laboratory Safety
Computing and Software
McMaster University

Revised: July 19, 2024

1 Introduction and Objectives

This guideline provides a set of minimum standards and practices for the healthy and safe operation of the instructional laboratories of the Department of Computing and Software (CAS). Following the directives set out in the guideline will help meet the requirements of the Occupational Health and Safety Act of Ontario (OHSA) for the purposes of the operation of an instructional laboratory in CAS. This guideline is required reading for all laboratory supervisors, instructors, researchers, staff, and students working in or managing instructional laboratories in CAS. The guideline was developed by CAS in consultation with faculty and staff in the Department and University Health & Safety (UHS). Revisions and updates will be made on a continual basis. Please submit any comments or suggestions you have about the guideline to the Chair of the Department Lab Committee. This guideline is intended to:

- Outline specific policy for laboratory operation;
- Explain basic emergency procedures; and
- Provide information and standards for the healthy and safe operation of a laboratory.

The guideline is not all encompassing. There may be special procedures conducted within CAS laboratories that require unique health and safety precautions.

An instructor for a course that utilizes a CAS instructional laboratory should use this document as a template to produce a guideline for instructional laboratory safety in his or her course. The title block information should be changed to include the number and name of the course and the sections in the Appendix that start with [[and end with]] should be filled in.

2 Definitions

2.1 Instructional Laboratory

An instructional laboratory is a laboratory where a group of students simultaneously receive instruction in and perform experimental procedures associated with a formally approved academic course.

2.2 Supervisor

A supervisor is a person who has charge of a workplace or authority over a worker (OHSA Section 1(1)). At the University, this includes all faculty and staff who supervise an instructional laboratory. Deans, chairs, directors, instructors, and researchers are supervisors.

2.3 Department Laboratory Supervisor

The Chair of the Department Lab Committee is the Department Laboratory Supervisor for the CAS instructional labs. This position is appointed by the Department Chair. The Department Laboratory Supervisor is responsible for all matters of health and safety in the lab.

2.4 Laboratory Worker/User

A laboratory worker or user is anyone, student, staff or faculty, who works as a student or for pay in a laboratory, including those who have supervisory responsibilities.

2.5 Unattended Procedures/Equipment

A procedure or piece of equipment that is left operating when no one is in the lab.

2.6 Hazardous Agent

Any physical, chemical, radioactive, or biological agent that may pose a health or safety hazard to those exposed.

2.7 Critical Injury

As defined by Ontario Regulation 834/90), a *critical injury* is an injury for which one of the following is true:

- Places life in jeopardy.
- Produces unconsciousness.
- Results in substantial loss of blood.
- Involves the fracture of a leg, or arm, but not a finger or toe.
- Involves the amputation of a leg, arm, hand, or foot, but not a finger or toe.
- Consists of burns to a major portion of the body.
- Causes the loss of sight in an eye.

3 Responsibilities of Supervisors

3.1 Responsibilities of Instructors

These are the responsibilities of an instructor of a course that utilizes an instructional laboratory:

1. The instructor has the overall responsibility for the health and safety of his or her students when they are in the laboratory. Prior to any work being performed by a student it is the instructor's responsibility to ensure that the student is aware of safety rules and follows them.

2. The instructor must provide his or her students a guideline for instructional laboratory safety in his or her course. The guideline should be based on this document and should include healthy and safety information specific to the course.

3. The instructor must ensure that the TAs for the course receive training on the procedures and equipment used in laboratory and have completed all health and safety training required by the University.

4. The instructor must ensure that the students in the course are instructed on health and safety issues relevant to using the laboratory including:

   (a) An appropriate safety orientation for students when they are first assigned to a laboratory space.

   (b) Training on special or unusual hazards in the laboratory.

   (c) Training in the use of laboratory-specific emergency equipment and emergency response.

   Each student must pass a quiz on this information before he or she will be allowed to use the laboratory. The records of the quiz results shall be kept by the instructor for a least one year.

5. If the laboratory requires continuous supervision, the instructor or an appointed alternate (e.g., one of the TAs for the course) must be present whenever students are in the laboratory.

6. The instructor must ensure that an incident investigation report is completed for every incident or injury that occurs in the laboratory.

7. All instructors should be familiar with the McMaster Laboratory Safety Handbook and the McMaster Emergency Guidebook.

8. An instructor reports on health and safety issues concerning the CAS instructional laboratories to the Department Laboratory Supervisor.

3.2 Responsibilities of the Department Laboratory Supervisor

These are the responsibilities of the Department Laboratory Supervisor:

1. The Department Laboratory Supervisor must ensure that adequate emergency equipment is readily available and in proper working order for each CAS instructional laboratory.

2. The Department Laboratory Supervisor must periodically review how the instructors of courses using instructional laboratories are performing their duties with respect to health and safety.

3. The Department Laboratory Supervisor must ensure that safety and housekeeping inspections are conducted in each CAS instructional lab once a month and will keep the records pertaining to health and safety for the instructional laboratories. Copies of these records should be kept in the Department office.

4. The Department Laboratory Supervisor reports on health and safety issues to the Department Chair.

3.3 Responsibilities of the Department Chair

These are the responsibilities of the Department Chair:

1. The Department Chair is responsible for the health and safety in the entire Department including the instructional laboratories.

2. The Department Chair must periodically review with the Department Laboratory Supervisor the status of health and safety in the instructional laboratories.

3. The Department Chair reports on health and safety issues to the Dean of Engineering and consults with the Department Health and Safety Committee (HSC) and the UHS.

4 Rights and Responsibilities of Laboratory Workers

All laboratory workers have the following rights:

1. The right to participate in enhancing a safe work place.

2. The right to know about all the hazards in the workplace and how to protect themselves from the identified hazards, and the right to request comprehensive information on the potential hazards in the workplace.

3. The right to refuse unsafe work.

All laboratory workers are responsible for:

1. Following all applicable safety rules and practices as outlined by a supervisor.

2. Reporting all incidents to the Department Laboratory Supervisor.

3. Reporting all unsafe conditions to the Department Laboratory Supervisor.

5 General Health and Safety Principles

Good laboratory practice requires that every laboratory worker and supervisor observe the following:

1. Food and beverages are not permitted in the instructional laboratories.

2. Laboratory equipment should only be used for its designed purpose.

3. The Department Laboratory Supervisor should be informed of any unsafe condition.

4. The location and correct use of all available safety equipment should be known.

5. Potential hazards and appropriate safety precautions should be determined and sufficiency of existing safety equipment should be confirmed before beginning new operations.

6. Proper waste disposal procedures should be followed.

6 Basic Safety Procedures

6.1 Procedures for Unattended Work

1. Unattended procedures should be kept to a minimum.
2. An unattended procedure must be visited periodically and a sign posted. The sign will indicate the date and time the procedure was started, when it is expected to be completed, and when it was last checked.

6.2 Working Alone

1. For safety reasons, working alone should be avoided. Someone should always be within call when a laboratory procedure is being performed.
2. For work with hazardous materials or procedures, the Department Laboratory Supervisor has the right to require that at least one other person be present.

6.3 Housekeeping

1. Work areas must be kept clean and free of obstructions.
2. Stairways and halls must not be used for storage. This applies to both equipment and personal property.
3. Walkways and aisles in laboratories must be kept clear.
4. Access to emergency equipment or exits must never be blocked (Ontario Regulation 851 Section123 (2)).
5. Equipment must be stored properly.
6. Wastes must be placed in appropriate, labeled containers.
7. Materials no longer used must not be allowed to accumulate and must be disposed by following proper procedures.

6.4 Laboratory Equipment Maintenance

Laboratory equipment must be inspected and maintained by a qualified person. The frequency of the inspection depends on the hazard posed by the equipment, the manufacturer's instructions, or as required by regulations. Records of the maintenance must be kept on file by the Department Laboratory Supervisor. Copies of these records should be kept in the Department office.

6.5 Guarding and Shielding

1. All mechanical and electronic equipment must be adequately guarded to prevent access to electrical connections or moving parts.
2. Shielding or equivalent precautions are to be used when working with non-ionizing radiation sources, magnetic, and other fields.
3. Appropriate shielding is required when using equipment with thermal hazards.

6.6 Electrical Safety

All electrical equipment, 50 volts or greater capacity, must be approved by an agency acceptable within Ontario. So effectively CSA, OH, or ULC approval is required for electrical equipment.

1. All electrical apparatus must be properly grounded.
2. Any two-pin device must be CSA approved.
3. Never remove the ground pin of a 3-pronged plug.
4. Minimize the use of extension cords on a permanent basis. Ask Facility Services to install more outlets.
5. Only qualified and trained people should repair or modify electrical or electronic equipment.
6. Extension cords must not be used for permanent installations.
7. Use ground fault circuit interrupters where there is a risk of an operator coming in contact with water and electrical equipment simultaneously.

8. Electrical equipment must have spark protection in areas where there is a danger of fire or explosion.

9. Do not use portable space heaters in proximity of combustible and flammable material.

10. Circuit breaker panels must be easily accessible and clearly marked. Familiarize yourself with their location.

11. Frayed wires or cords must not be used.

12. Do not use electric wires as supports and never pull on live wires.

13. Ensure that all wires are dry before plugging them into circuits.

14. All electrically energized equipment when immersed in liquids must have ground fault interrupters.

15. Do not enter areas or restart equipment that is locked or tagged out. Consult RMM #306: Lockout / Tagout Program.

Common sources of sparks and static electricity are:

1. Decanting of organic liquids from one metal container to another.

2. Plastic aprons.

3. Metal clamps, nipples, or wires used with non-conducting hoses.

4. Gases released quickly from cylinders under high pressure.

5. Switches and thermostats.

6. Electrical contacts (light switches, thermocouples, or refrigerators) may produce sparks.

7 Reporting Hazards, Incidents and Injuries

Every hazardous situation and incident, whether or not it results in injury or is a "near miss" occurrence should be reported to your supervisor or the Department Chair as soon as possible. In case of an injury, the employee must complete a McMaster Incident/Injury Report form. Whether incident

or injury occurred, the supervisor or the Department Chair must then immediately advise UHS of the hazard or accident by completing a McMaster University's Injury/Incident Report form within 24 hours. This information is required for completion, where applicable, by Employee Health Services of a Form 7 to the Workplace Safety and Insurance Board (WSIB). In those circumstances where the employee has no immediate supervisor, or when the supervisor is absent, then the employee must report the details of the hazard or accident to his/her supervisor's supervisor. If this person is not available, the employee must initiate this contact with UHS. Further information can be found in RMM #1000: Reporting and Investigating Injury/Incident/Occupational Disease Program.

Steps in the Resolution of a Health and Safety Concern

1. First Response — the concern should be reported to the relevant supervisor.

2. Second Response — if no satisfactory resolution is achieved with the supervisor, the concern should be brought to the attention of the Department Health and Safety Committee (HSC).

3. Third Response — if no satisfactory resolution is achieved with the supervisor, the concern should be brought to the attention of the Faculty of Engineering Joint Health and Safety Committee (JHSC).

4. Fourth Response — at times the involvement of senior administration may be necessary. University Health & Safety (UHS) Office may be consulted at any time after the problem has been discussed with the supervisor.

5. Last Response — The underlying principle of the Occupational Health and Safety Act of Ontario is that of an internal responsibility system. Therefore, the Ministry of Labour should only be consulted if all other attempts (1, 2, and 3) have failed to bring satisfactory resolution to a health and safety problem.

Supervisors and workers share the responsibility for the "workers" safety. In all cases, if a hazard or unsafe situation is identified, the worker must inform the supervisor as quickly as possible. The preferred method of resolution

is between the supervisor and the worker; however, the issue, if unresolved, may require discussion at the JHSC.

If the concern is relevant to the Department or Faculty, the supervisor should bring this concern to the attention of the particular faculty administration (i.e., Chair or Dean). A worker should raise this type of concern with their JHSC representative if their supervisor has not adequately resolved the concern. Again, it is expected that the Committee will decide if the concern is to be forwarded to the employer.

8 Accidents and Incidents

If there is an accident or injury in the lab, do the following:

1. Inform the laboratory supervisor on duty.
2. If there is no one on duty, inform the Department Laboratory Instructor (Robert Li, ITB 242, x23445).
3. If the lab instructor cannot be found, contact someone in the Department office (ITB 202).
4. Once the injured person has been attended to, fill out an Incident/Injury Report form.
5. If the injury is serious or a critical injury, **Dial 88** from a campus phone or **Dial 905-522-4135** from a cellphone.

9 Specific Emergency Procedures

9.1 Medical Emergency

On McMaster University campus, call Campus Safety Services at extension **88** from a campus phone or **905-522-4135** from a cellphone for assistance or if medical aid is required. Report all incidents to your supervisor and to University Health & Safety (UHS) as quickly as possible. Completed Injury/Incident Reports must be submitted to UHS within 24 hours of its occurrence.

9.2 In Case of a Fire

RMM #1201: Fire Safety Plan provides instruction and direction during a fire emergency for all persons working, studying, or visiting campus buildings.

In Case of a Fire

1. Immediately vacate the building via the nearest Exit Route. *Do not use elevators!*

2. Everyone is responsible for knowing the location of the nearest fire extinguisher, the fire alarm, and the nearest fire escape.

3. The safety of all people in the vicinity of a fire is of foremost importance. But do not endanger yourself!

4. In the event of a fire in your work area shout *"Fire!"* and pull the nearest fire alarm.

5. Do not attempt to extinguish a fire unless you are confident it can be done in a prompt and safe manner utilizing a hand-held fire extinguisher. Use the appropriate fire extinguisher for the specific type of fire. Most labs are equipped with Class A, B, and C extinguishers. Do not attempt to extinguish Class D fires which involve combustible metals such as magnesium, titanium, sodium, potassium, zirconium, lithium, and any other finely divided metals which are oxidizable. Use a fire sand bucket for Class D fires.

6. Do not attempt to fight a major fire on your own.

7. If possible, leave fume hoods on, close fume hood sashes, and make sure the room is evacuated; close but do not lock the door and exit the building using the stairs.

For a fire on the McMaster campus, dial phone 88 on a McMaster phone or dial 905-522-4135 on a cellphone and give location and details. When calling, report a fire, give name, exact location, and building. For all other sites, follow the emergency protocol of the building involved.

9.3 Clothing on Fire

1. Douse with water from safety shower immediately or
2. Roll on floor and scream for help or
3. Wrap with fire blanket to smother flame (a coat or other nonflammable fiber may be used if blanket is unavailable). Do not wrap a standing person; rather, lay the victim down to extinguish the fire. The blanket should be removed once the fire is out to disperse the heat.

Do not use a fire extinguisher on people.

10 Important Information and Contacts

McMaster University Emergency/Campus Safety Services (Security)	Dial 88 on a McMaster phone or dial 905-522-4135 on a cellphone
McMaster University Campus Safety Services (Security): (Inquiries/Non Emergency)	Dial 24281 on a McMaster phone or dial 905-525-9140 ext. 24281 on a cellphone
Location of First Aid Kit	ITB 242
McMaster University: Facility Services (Physical Plant) for Heat; ventilation concerns, Fire Extinguisher and Replacement, Work orders for immediate repairs	Dial 24740 on a McMaster phone or dial 905-525-9140 ext. 24740 on a cellphone
University Health & Safety (UHS): Health & Safety	Dial 24352 on a McMaster phone or dial 905-525-9140 ext. 24352 on a cellphone

11 Appendix for [[name of course]]

11.1 Laboratory Specific Hazards

[[To be fill in by the instructor.]]

11.2 Equipment Standard Operating Procedures

[[To be fill in by the instructor.]]