



**DALHOUSIE
UNIVERSITY**
Inspiring Minds

Research Laboratory Safety Policy Manual

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Research Laboratory Safety Policy Manual

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RESEARCH LABORATORY SAFETY POLICY MANUAL

Introduction

Dalhousie University is a world class research and teaching institution in which laboratory-based programs are a vital component. On a daily basis, staff, faculty and students engage in experimental work that involves hazardous chemicals and equipment. Providing a safe and healthful environment in the University's research laboratories is a shared responsibility of all those involved in laboratory programs, including the University, departmental chairs, laboratory supervisors, staff and students.

Departmental chairs and laboratory supervisors have special responsibilities for the health and safety of those they supervise. To help clarify these responsibilities and to guide departmental chairs and research laboratory supervisors, Dalhousie has adopted the laboratory safety policies set out in this Manual. Although they were designed with the needs of the research laboratories in mind, supervisors of undergraduate laboratories may find features of this policy manual helpful in teaching laboratories.

There are many areas of laboratory safety not addressed in these policies. Dalhousie University expects that those involved with research laboratory programs, will make every reasonable effort to create safe and healthful laboratory environments by exercising sound, professional judgement and by following the policies. By acting in this fashion, the University believes that all involved will meet the expectations of people both within and outside the University.

These policies were developed by a committee of staff and faculty who are active members of Dalhousie's laboratory research community and who were appointed by their respective deans to represent the concerns of all those who work and study in our laboratories. In this work, the Committee was aided by the Dalhousie Environmental Health and Safety Office.

This policy manual, together with a safety training program and laboratory safety manuals designed for use by laboratory staff and students, comprise Dalhousie University's Research Laboratory Safety Plan.

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SUPERVISORY RESPONSIBILITY

Policy

Laboratory supervisors are responsible for ensuring that activities undertaken in their laboratories are consistent with the Dalhousie University policy of providing a safe and healthful environment for laboratory staff and students and for those who provide services to the laboratory.

Procedure

To discharge their responsibilities, supervisors must periodically assess the risks posed by laboratory activities and respond, in a prudent fashion, to minimize the likelihood that anyone will suffer harm in the laboratory.

- a) Chairs or heads of departments shall require laboratory supervisors annually, to forward to the local health and safety committee, a written assessment of hazards present in their laboratory.
- b) When this assessment identifies the potential for a serious injury, that the laboratory supervisor shall provide both the local safety committee and laboratory staff and students, with a written procedure designed to minimize the risk of harm.
- c) Laboratory supervisors shall train staff and students in how to carry-out these procedures, provide and ensure that the staff and students use required safety equipment and take precautions that the supervisor deems necessary and limit laboratory activities to those which can be safely undertaken given the facilities and equipment available and the knowledge and experience of laboratory staff and students.

Although the supervisor may not always be present in the laboratory when staff or students are working, the supervisor must provide the supervision required to ensure that laboratory staff follow safe practices and use the equipment that the supervisor has determined to be necessary for safe operations. In unusual cases, the supervisor may need to seek the assistance of the Dalhousie Environmental Health and Safety Office or others to conduct medical or environmental testing.

Responsibility

The University is responsible for maintaining buildings and building services in all University buildings which house research laboratories.

Departmental chairs are responsible for ensuring that laboratory supervisors are aware of and adequately discharge their responsibilities for laboratory safety and for providing support and assistance that supervisors require.

Laboratory supervisors are responsible for ensuring that staff and students are appropriately trained and supervised so that day-to-day laboratory activities do not put staff, students, other building occupants or service personnel at unreasonable risk.

CHILDREN IN LABORATORIES, WORKSHOPS AND OTHER HAZARDOUS AREAS

Policy

Because of their small body mass, high metabolic rates, developing immune and neurological systems, and inexperience in recognizing hazards, children might be at particular risk from the many physical, chemical, biological and radiological health hazards that are present in Dalhousie University clinics, laboratories and workshops. To protect such children from harm, Dalhousie does not permit children under the age of 14 to enter workshops, clinics or laboratories where toxic or reactive chemicals are present.

Procedure

1. Children under the age of 14 are not permitted in workshops or laboratories that have been assigned red or yellow codes under the University's "Hazard Identification" program. This restriction also applies to offices and other support areas if access to these areas is only through a restricted area. The policy does not apply to children receiving treatment or participating as subjects in approved research programs in a Dalhousie clinic or laboratory.
2. Exceptions may be made to allow children between five and fourteen, to enter such hazardous areas:
 - in connection with University-sponsored events such as school tours or other outreach programs, or
 - with prior written permission of the Dean

When children are present in laboratories, workshops or clinics under such circumstances, they must at all times, be supervised by someone who is thoroughly knowledgeable about the hazard present.

Note

Hallways and rooms adjacent to these areas are not considered hazardous. However, adult supervision of children is required because of the potential fire emergencies associated with laboratory work.

Other areas of University buildings are generally free of hazards, although security considerations may also create situations where children should not be present.

LABORATORY SECURITY

Policy

Dalhousie University requires that supervisors, laboratory staff and students, cooperate to reduce, to the extent practical, unauthorized removal of hazardous materials from their laboratories.

Procedure

1. No hazardous material shall be removed from any laboratory except with the permission of the laboratory supervisor.
2. Hazardous materials may not be left unattended or unsecured at any time. When vacant, laboratories shall be locked to prevent unauthorized entry.
3. Freezers, refrigerators, cold rooms and storage cabinets where hazardous materials are stored or used, shall be locked or otherwise secured at all times except when they are in the direct view of the supervisor of a laboratory, staff member or student.

Responsibility

The laboratory supervisor is responsible for ensuring the security of all hazardous materials stored or used by laboratory staff or students. The laboratory supervisor shall immediately report the unaccounted-for loss of any hazardous material.

The Director of Environmental Health and Safety, in co-operation with the Chief of Security, is responsible for periodically auditing the security of University stocks of hazardous materials.

CHEMICAL INVENTORIES

Policy

To comply with Provincial legislation and to aid the Fire Department and other emergency responders, the University maintains a current inventory of hazardous chemicals. The Dalhousie Environmental Health and Safety Office compiles the inventory by gathering together inventories of hazardous chemicals stored by laboratory supervisors and managers of support units that use chemicals.

Procedure

1. Laboratory supervisors and managers of support units that use chemicals shall create and maintain up to date inventories of chemicals present in their laboratories or work areas. Ideally, the inventory should contain:
 - the name of the chemical
 - the supplier
 - container size
 - storage location (room number)
 - date of purchase
2. The inventory shall be readily available to staff and students who work with or in the vicinity of the chemicals.
3. At least annually, the laboratory supervisor or unit manager shall provide an updated inventory to Environmental Health and Safety Office for inclusion in the Dalhousie Hazardous Chemical Inventory. In laboratories where the chemical holdings change rapidly, the supervisor should provide updated inventories more frequently.

Responsibility

Laboratory supervisors and managers of units which use chemicals are responsible for maintaining current inventories and for co-operating with the Environmental Health and Safety Office in preparing the Dalhousie Hazardous Chemical Inventory.

The Director of Environmental Health and Safety is responsible for maintaining the Dalhousie Hazardous Chemicals Inventory and for ensuring that it is available as required by emergency responders and others with a need to use this information.

The Environmental Health and Safety Office encourages laboratory supervisor to maintain inventory systems which are compatible with the electronic University Hazardous Chemical Inventory now being developed.

STORAGE OF CHEMICALS WITHIN THE LABORATORY

Policy

Storage of chemicals and chemical wastes in Dalhousie laboratories is guided by the National Fire Code of Canada and the National Fire Protection Association's.

- a) Flammable and Combustible Liquids Code, and
- b) Standard 45 - Fire Protection for Laboratories Using Chemicals

When not in actual use, chemicals in Dalhousie laboratories shall be stored in accord with the following procedure.

Procedure

A. General Storage Procedures:

1. Chemicals shall be stored securely, in the minimum practical quantities, and protected from exposure to excessive heat, cold or damage.
2. Upon receipt, chemicals shall be entered into the laboratory chemical inventory. For chemicals which degrade over time, the date of receipt should be noted on the label.
3. Chemicals shall not be stored on the floor or on shelves with open back which could allow the chemical to fall off the back of the shelf.

Note: It is dangerous to store chemicals, particularly chemicals in large containers, on shelves above shoulder height. In trying to place chemicals on high shelves, people sometimes strike the shelf, breaking the bottle and causing a spill.

B. Separation of Incompatible Chemicals:

1. Chemicals shall be stored in a fashion that minimizes the likelihood of incompatible chemicals coming into contact. One means of achieving this is to separate incompatible chemicals. Classes of incompatible chemicals include:
 - oxidizers
 - acids & bases *
 - dangerously reactive chemicals
 - solvents
- C Where separate storage is impractical, acids and bases may be stored together. A secondary container to control a spill is highly recommended and care is needed when removing or replacing bottles.

C. Flammable and Combustible Liquids:

The National Building Code of Canada classifies liquids according to their fire hazards.

flammable liquids - liquids with flash points below 37.8 C and which have vapour pressures less than 275.8 kPa, and

combustible liquids - liquids with flash points greater than 37.8 C but less than 93.3 C.

CI. Solvents**

1. Solvents shall be stored in approved safety cans, or the supplier's original container or equivalent.

2. Maximum solvent container sizes shall be:
glass - 5L safety can - 20L

except that diethyl ether may not be stored in containers exceeding 1L capacity.

3. Solvents shall not be stored in any laboratory in quantities above the following:

Total Solvent Volume (L. per sq. m.)	
Excluding quantities in safety cans or safety cabinets	Including quantities in safety cans or safety cabinets
0.8	2.5

** Includes non-combustible (largely halogenated) solvents.

The Table lists commonly used flammable and toxic solvents to which storage limitations apply. (***)

Ethers : Diethyl ether, Tetrahydrofuran, 1,2-Dimethoxyethane, p-Dioxane

Aliphatic Hydrocarbons : Pentanes, Hexanes, Petroleum ether, Ligroin, Cyclopentane, Cyclohexane

Aromatic Hydrocarbons : Benzene, Toluene, Xylene

Ketones	:	Acetone, Methyl ethyl ketone
Alcohols	:	Methanol, Ethanol, Propanols, Butanols
Esters	:	Ethyl acetate, Butyl acetates, Amyl acetates
Chlorinated Solvents	:	Carbon tetrachloride, Chloroform, 1,2-Dichloroethane, Methylene chloride, Tetrachloroethylene, 1,1,1-Trichlorethane
Other Solvents	:	Pyridine

*** Specialty solvents with low flash points must also be kept in limited quantities. For advice, consult the Safety Office.

4. Refluxing, and particularly refluxing over reactive materials, shall not be used for the ongoing preparation of solvents. When solvent preparation is required on an ongoing basis, commercial, low temperature units shall be used.

CII. Flammable and Combustible Liquids

Many laboratories use flammable and combustible liquids as reagents rather than solvents. Although these materials are generally used and stored in relatively small volumes, never-the-less, they present a fire risk.

1. Flammable and combustible liquid reagents shall be stored with regard for their flammability, reactivity and toxicological properties.
2. When flammable liquids are stored in refrigerators or freezers, the unit must be designed for or have been appropriately modified to safely store such materials.

D. Compressed Gases

1. Cylinders of compressed gases shall be secured at all times in a fashion as to prevent the cylinder from toppling over.
2. Compressed gases shall be stored with due regard for the flammability, reactivity and toxicological properties of the gas.

Responsibility

Laboratory supervisors are responsible for the safe storage of chemicals in laboratories under their supervision.

LABORATORY ACTIVITIES

Policy

Dalhousie University requires that supervisors and laboratory staff and students will co-operate to reduce, to the extent practicable, the risk of injury, illness or environmental damage related to activities in their laboratories.

Procedure

1. Laboratory supervisors will supervise all laboratory activities providing information, advice and training as required. Only activities authorized by laboratory supervisors are permitted in University laboratories.
2. The storage or consumption of food is not permitted in any laboratory where there is danger of contamination by chemical or biological hazards.
3. The supervisor shall ensure that all equipment is maintained in a safe operating condition. Laboratory staff and students shall only operate equipment as directed by the supervisor and shall not operate any piece of equipment that is missing guards, interlocks or other safety devices.
4. Laboratory staff and students will observe the precautions instituted by the supervisor to minimize the dangers posed by:
 - radioisotopes or other sources of radiation;
 - infectious materials (immunization against blood borne pathogens or zoonotic diseases may be prudent);
 - equipment that operates at pressures above or below atmospheric;
 - toxic, flammable or dangerously reactive chemicals.
5. Laboratory staff and students shall:
 - use appropriate eye protection at all times when in a hazardous environment;
 - wear other protective equipment as directed by the supervisor. Appropriate protective equipment may include gloves, and laboratory coats or aprons. It may be inappropriate to wear open-toed shoes, shorts, or to wear long hair hanging loosely.
6. Personal protective equipment may not be worn outside of the laboratory if there is a risk that it has been contaminated with hazardous chemicals or biohazardous materials.

7. In so far as is possible, all containers of chemicals shall carry the original supplier's label or a laboratory label showing:
- the chemical name (not abbreviated), and
 - safe handling information

When containers are too small to be labelled in this fashion, the supervisor shall develop a system that, as is far as practical, meets these objectives.

Responsibility

The Laboratory supervisor is responsible for ensuring that laboratory staff are trained, properly equipped and supervised in the laboratory. Laboratory staff and students are responsible for working safely, for following the supervisor's directions and seeking help before undertaking laboratory activities with which they are not fully familiar and which might pose a hazard to themselves or others.

UNATTENDED OPERATIONS

Policy

Whenever possible, laboratory activities will only be carried out while staff or students are present in the laboratory or adjacent offices and are able to respond to accidents, service disruptions or emergencies.

Procedure

When experiments must be conducted while the laboratory is vacant, laboratory staff and students shall:

1. in consultation with the supervisor, consider the possible consequences of:
 - interruptions in power, water, propane, refrigeration, compressed air, or inert gas;
 - breakage or obstructions in hoses or gas lines;
 - failure of stirrers, thermostats, level indicators or equipment which regulates temperature or pressure; and
 - take steps to minimize the consequences of such a failure.

Note: In some cases, it may be safer to use a Variac instead of a thermostat to control a heater.

2. post a notice outside the laboratory door indicating that an unattended experiment is in progress, the nature of the experiment and the equipment involved and the names and telephone numbers of people who should be contacted in an emergency.

When particularly dangerous activities must take place in unattended laboratories, fail-safe controls or interlocks are required.

Responsibility

Laboratory supervisors are responsible for ensuring that unattended experiments are only conducted when necessary and that all such unattended experiments are carried out in a manner that minimizes the likelihood and consequences of an emergency.

In purchasing equipment, supervisors should take into account the possibility that it will be used in unattended experiments and choose equipment that incorporates fail-safe design features.

HANDLING OF LABORATORY WASTE

Policy

Dalhousie University is committed to dealing with hazardous laboratory waste in a fashion that does not endanger health, safety or the environment.

Procedure

1. All waste that poses a risk of infection for people or animals shall be collected and stored in a manner that minimizes the infection risk and shall be rendered non-infectious before being discarded. Treatment may involve chemical treatment, autoclaving or incineration.
2. Broken glass or sharp equipment that is not contaminated with hazardous chemicals shall be sealed in a robust, puncture-resistant package prior to being discarded along with regular trash. Contaminated sharps must be cleaned of contamination before being discarded as above.
3. Waste animal tissue shall be sealed in leak-proof, robust packaging and disposed of as directed by the University Director of Animal Care. Properly packaged waste and tissue shall be kept in refrigerated storage pending disposal. Where a delay between packaging and disposal is expected, waste animal tissue shall be stored frozen.
4. Containers that have contained hazardous chemicals shall be cleaned to remove chemical residues and labels shall be removed or defaced. Containers may then be disposed of with regular trash or recycled.
5. Waste or surplus hazardous chemicals shall be disposed of only through Dalhousie's Waste Chemical Disposal Program.
6. Non-hazardous, solid chemicals may be disposed of along with regular trash in sealed containers. Containers shall be clearly marked with a label showing the date, the name of the generator of the waste and indicating that the package contains "waste non-hazardous materials".

Non-hazardous liquid waste may be flushed down a sanitary drain. Non-hazardous liquids wastes may not be disposed of with regular trash.

When in doubt about the suitability of any disposal method, supervisors should seek advice from the Dalhousie Safety Office.

7. Radioactive waste may only be disposed of in accord with the directives of the Canadian Nuclear Safety Commission.

Responsibility

Laboratory supervisors are responsible for ensuring that their laboratory activities generate the least possible amount of waste and that all hazardous waste is disposed of in accord with legal requirements and University policies.

EMERGENCY RESPONSE

Policy

To minimize the impact of laboratory accidents, Dalhousie University requires that laboratory staff and students shall be trained and able to respond effectively to accidents that are reasonably foreseeable.

Procedure

1. Where the laboratory activities warrant, staff and students shall have ready access to and be trained in the use of:
 - : fire extinguishers
 - : eye wash fountains
 - : chemical spill kits
 - : first aid supplies
 - : emergency showers
 - : other emergency equipment

2. Laboratory entrances shall be marked with:
 - : the name and telephone number of emergency contacts;
 - : a floor plan indicating the nature and location of hazards and control devices within the laboratory;
 - : a colour-coded notice to service personnel describing the routine, non-emergency entry limitations; and
 - : biohazard, radiation or other signs as required.

Responsibility

Departmental chairs are responsible for ensuring the department develops and maintains an appropriate emergency response plan.

Laboratory supervisors are responsible for ensuring that their laboratories are appropriately equipped and the staff and students are able to respond to the types of accidents that might be reasonably anticipated within their laboratories.

LABORATORY INSPECTIONS

Policy

At least annually, laboratories shall be inspected to identify and correct situations which could lead to an accident or environmental damage.

Procedure

1. At least annually, laboratory supervisors shall formally inspect their laboratories taking into account the significant hazards present and previous accidents. In carrying out the inspection, the supervisor should document health or safety problems observed and the steps taken to correct these problems.

Supervisors may find it helpful to involve staff and students who work in the laboratory and to use inspection forms available from the Dalhousie Environmental Health and Safety Office.

2. Copies of the inspection report shall be provided to the departmental chair and to the Dalhousie Environmental Health and Safety Office.

Responsibility

Departmental chairs are responsible for ensuring, perhaps through a departmental health and safety committee, that the department operates an effective laboratory inspection program.

Laboratory supervisors are responsible for conducting annual inspections in laboratories under their supervision and for resolving health and safety problems identified during these inspections.

AUDIT

Policy

Laboratory safety programs shall be audited to assure supervisors, departments and the University that the health and safety of staff, faculty and students in Dalhousie laboratories is being adequately protected.

Procedure

1. On an unscheduled basis, the Dalhousie Safety Office shall audit the safety program in randomly selected University laboratories.
2. The written results of audits shall be reported to the laboratory supervisor and the departmental chair.

Responsibility

The Director of Environmental Health and Safety is responsible for ensuring that safety audits of a representative number of laboratories in Dentistry, Health Professions, Medicine, and Science are carried out annually.

VACATING LABORATORIES

Policy

When staff or students vacate a laboratory permanently or for a prolonged period, the laboratory must be left in a state that does not pose a health or safety risk to service staff or subsequent occupants.

Procedure

1. When a laboratory is permanently vacated, the laboratory shall be cleaned up and all hazardous materials removed and proper storage or disposal arranged. The laboratory shall be left in a condition such that service people can work safely in the laboratory or the laboratory can be safely re-occupied.
2. When a laboratory is vacated for periods of more than a few weeks, the laboratory shall be cleaned up, all hazardous wastes shall be removed and all chemicals and equipment left in a secure and safe fashion.

Responsibility

The Departmental chair is responsible for ensuring that vacated laboratories are left in a safe fashion. Where proper clean-up is not carried out, the clean-up shall be carried out by the Environmental Health and Safety Office. The Department will bear the costs of the clean-up.

TRANSPORTING DANGEROUS MATERIALS

Policy

All shipment of chemicals to and from Dalhousie property shall be in accord with the requirements of the Transportation of Dangerous Goods Act. People shipping or receiving chemicals must be trained as required by the TDG Regulations and are responsible for ensuring that dangerous goods are packaged and labelled and vehicles placarded as specified in the regulations.

All movement of chemicals on Dalhousie property or through common areas of Dalhousie buildings shall be as described in the following procedures.

Procedure

1. Chemicals shall be moved carefully in a fashion that minimizes the chance of a spill or leak. Although it may be safe to move small containers of low hazard chemicals by hand, larger quantities and more dangerous materials shall normally be moved on a cart.
2. While being moved, liquids shall be packaged in the original supplier's shipping package or in:
 - safety carriers (for corrosive liquids)
 - a secondary containment vessel to contain a leak or spill (for non-corrosive liquids)
3. Compressed gas cylinders larger than lecture bottles shall be moved
 - on carts with the cylinder securely strapped to the cart and
 - with the regulator removed and the cylinder cap in place.

Responsibility

Departmental chairs are responsible for ensuring, perhaps through departmental safety committees, the safe movement of dangerous goods transported in connection with departmental activities.

Laboratory supervisors are responsible for ensuring that staff and students under their supervision move dangerous goods in compliance with legislation and University policies.