Carleton University

Laboratory Health and Safety Manual

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Appendices

Laboratory Health and Safety Manual

Section 1: Introduction and Objectives

This manual provides a set of minimum standards and practices for the safe and healthy operation of a laboratory. Following the requirements set out in the manual will help meet the requirements of the Occupational Health and Safety Act of Ontario (OHSA) for the purposes of the operation of a laboratory. It is required reading for all laboratory supervisors, researchers, staff, and students working in research and teaching laboratories at Carleton University.

The manual was developed by Environmental Health and Safety Services (EHSS) based on the Laboratory Health and Safety Manual from the University of Western Ontario, and in consultation with faculty and staff in the Faculties of Science and Engineering, the Department of Physical Plant, and the Joint Occupational Health and Safety Committee. Revisions and updates will continue to be made. Please contact EHSS with any comments or suggestions you have about the manual.

This manual is intended to:

- Define health and safety responsibilities within the University community;
- Outline specific policy application for laboratory operation;
- Explain basic emergency procedures; and
- Provide information and standards for the healthy and safe operation of a laboratory.

The manual is not all encompassing. There are many special procedures conducted within our laboratories, which require unique health and safety precautions.

Departments will have additional procedures that apply to their own situations and work. In all cases the laboratory supervisor is ultimately responsible for teaching safe work practices and must insist upon the use of proper procedures to eliminate unnecessary hazards.

If you have any questions about how to safely undertake a task or project, ask your supervisor before you begin.

The objectives of this manual are to:

1. Define who is a supervisor and who is a laboratory worker;

2. Define the responsibilities of the supervisor and the laboratory worker for the safe operation of a laboratory;

3. Highlight sections of the OHSA which affect the operation of a laboratory;

4. Provide a standard of good laboratory safety practices which also allows the University to meet the requirements of Section 25(2)h of the OHSA, *An employer shall take every precaution reasonable in the circumstances for the protection of a worker*.

5. Provide the general guidelines and basic rules considered the minimum for the safe operation of a laboratory at Carleton University;

6. Protect all laboratory users from health and safety hazards;

Our goal is a healthy and safe environment for everyone.

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Section 2: Definitions

2.1 Teaching Laboratory

A laboratory where a group of students simultaneously receive instruction in, and perform, experimental procedures associated with a formally approved Carleton University academic course.

2.2 Research Laboratory

A laboratory set up primarily to conduct research.

2.3 Supervisor

A supervisor is a person who has charge of a workplace or authority over a worker. (OHSA Section1(1)) At the University, this includes all faculty and staff who supervise a laboratory. Deans, Directors, Chairs and other department heads and researchers are supervisors. The department head will appoint a supervisor for each lab. This supervisor is responsible for all matters of health and safety in the lab and will keep the records pertaining to health and safety for the lab. The department head will ensure that on appointment each supervisor attends a Health and Safety for Supervisors training session provided by EHSS.

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.

Section 3: Responsibilities of Supervisors

The supervisor of a laboratory has overall responsibility for safety.

Prior to any work being performed by a new laboratory worker it is the supervisor's responsibility to ensure that workers are aware of safety rules and follow them and that the following training has been provided:

a) An appropriate safety orientation when individuals are first assigned to a laboratory space;

b) Generic WHMIS training, which may be provided by the Department WHMIS Coordinator, and specific WHMIS training provided by the supervisor;

c) Radiation Safety Training, provided by the Radiation Safety Officer, if applicable;

d) Training on special or unusual hazards in the lab;

e) Training in the use of laboratory specific emergency equipment and emergency response;

Records of the training must be kept on file in the department and a copy sent to EHSS. (See Appendix 1, Record of Training)

In addition the supervisor is responsible for the following:

a) That adequate emergency equipment in proper working order is readily available;

b) That an incident investigation report is completed for every incident or injury that occurs in his/her lab. (See Appendix 2, Incident/Injury Report Form) Examples include incidents requiring first aid or other medical attention and incidents resulting in property damage, such as, spills, fires, explosions as well as near misses in either category. Incidents resulting in personal injury to a worker require completion of a Workplace Safety Insurance Board, Form 7. The WSIB forms are available from Human Resources.

c) That every two weeks safety and housekeeping inspections of the lab are conducted with a record of the inspection kept on file in the lab.

d) That an appropriate alternate is appointed as supervisor when the laboratory supervisor is absent. In a teaching lab where safety is a concern, the supervisor or alternate will always be present. In a research lab, an alternate will be appointed when the supervisor is away from the campus.

Section 4: Responsibilities of Laboratory Workers

All laboratory workers are responsible for:

a) following all applicable safety rules and practices as outlined in this manual and by the supervisor;

b) using and wearing personal protective equipment according to instructions;

c) reporting all incidents to the laboratory supervisor;

d) reporting all unsafe conditions to the laboratory supervisor;

e) completion of recommended occupational health screening programs when applicable; and

f) attending all training courses as directed by the supervisor.

Section 5: General Health and Safety Principles

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

a) Food and beverages are not permitted in the lab. Consume food and beverages only in properly designated areas. (Ontario Regulation 851 Section 131)

b) Use appropriate personal protective equipment at all times. (OHSA Section 28(1))

c) Use laboratory equipment for its designed purpose.

d) Confine long hair and loose clothing. (Ontario Regulation 851 Section 83)

e) Use a proper pipeting device. Absolutely no pipeting by mouth.

f) Avoid exposure to gases, vapours, aerosols and particulates by using a properly functioning laboratory fumehood.

g) Wash hands upon completion of laboratory procedures and remove all protective equipment including gloves and lab coats.

h) Ensure that the laboratory supervisor is informed of any unsafe condition. (OHSA Section 28 (1)(d))

i) Know the location and correct use of all available safety equipment.

j) Determine potential hazards and appropriate safety precautions before beginning new operations and confirm that existing safety equipment is sufficient for this new procedure. (See Appendix 3, Laboratory Risk Assessment)

k) Avoid disturbing or distracting other workers while they are performing laboratory tasks.

l) Ensure visitors to the laboratory are equipped with appropriate safety equipment.

m) Be certain all hazardous agents are stored correctly and labelled correctly according to Workplace Hazardous Materials Information Systems (WHMIS) requirements. (Ontario Regulation 860)

n) Consult the material safety data sheet prior to using an unfamiliar chemical and follow the proper procedures when handling or manipulating all hazardous agents.

o) Follow proper waste disposal procedures. (See Appendix 4, Disposal of Hazardous Waste)

Section 6: Basic Safety Procedures

6.1 Procedures for Unattended Work

a) Unattended procedures should be kept to a minimum.

b) An unattended procedure must be visited periodically and a sign posted on the door of the lab outlining the procedure with the name and phone number of a contact person. 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. (See Appendix 13)

c) Unattended procedures using cooling water must have the hoses securely attached and the water adjusted to the minimum flow necessary. Ensure plumbing drains are clear before leaving the procedure.

6.2 Working Alone

a) For safety reasons working alone should be avoided. Someone should always be within call when a laboratory procedure is being performed.

b) For work with hazardous materials or procedures the supervisor has the right to require that at least one other person be present.

6.3 Housekeeping

a) Work areas must be kept clean and free of obstructions.

b) Stairways and halls must not be used for storage. This applies to both equipment and personal property. Bicycles are not allowed in buildings.

c) Walkways and aisles in laboratories must be kept clear.

d) Access to emergency equipment or exits must never be blocked. (Ontario Regulation 851 Section123 (2))

e) Equipment and chemicals must be stored properly.

f) Spilled chemicals must be dealt with immediately and if safe cleaned up by the chemical user. (See Section 11.4 of this manual) Spills must be reported to the supervisor.

g) Wastes must be placed in appropriate, labelled containers.

h) Materials no longer used must not be allowed to accumulate and must be disposed of following proper procedures. (See Appendix 4, Disposal of Hazardous Waste)

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 laboratory supervisor and be available at all times.

6.5 Guarding

a) All mechanical equipment must be adequately guarded to prevent access to electrical connections or moving parts. (Ontario Regulation 851 Section 25)

b) All centrifuges must be fitted with an interlock so that they cannot be accessed while moving or started while open. (Ontario Regulation 851 Section 31)

6.6 Shielding

a) Appropriate shielding must be used whenever an operation involves chemicals with the potential for explosion or severe splashing. Examples include:
   - when a reaction is attempted for the first time;
   - when a familiar reaction is carried out on a larger scale than usual;
   - whenever operations are carried out under non-ambient conditions; or
   - whenever a severe splashing potential exists for corrosive materials. (Ontario Regulation 851 Section 89)

b) Shielding or equivalent precautions are to be used when working with non-ionizing radiation sources, magnetic and other fields. Examples include:
   - Lasers
   - Infrared radiation
   - Ultraviolet radiation
   - Microwave radiation

Refer to the Radiation Safety Manual (available from EHSS) for shielding of ionizing radiation sources.

c) Appropriate shielding is required when using equipment with thermal hazards.

6.7 Glassware

a) Repair or dispose of any damaged glassware. Follow proper disposal procedures for damaged glassware. (See Appendix 4)
b) Ensure adequate hand protection is used when working with glass tubing.
c) Tape permanent vacuum glassware which presents an implosion risk with either electrical or duct tape or use appropriate shielding. (Ontario Regulation 851 Section 84 (b & f))
d) Wear appropriate hand protection when picking up broken glass.

e) Ensure proper instruction is given for the use of specialized glassware.
f) Specific procedures may apply for contaminated glassware.

6.8 Flammable and Combustible Material Hazards

a) Use an open flame only as long as necessary and extinguish it when done.
b) Do not use an open flame to heat flammable or combustible materials. It is generally not recommended to perform a distillation at reduced pressure using an open flame due to the possibility of local superheating.
c) Remove all flammable and combustible materials from the work area before lighting a flame.
d) Notify all others in the lab and note any procedure using flammable and combustible gases and liquids before lighting a flame.
e) Store all flammable and combustible materials properly as required by the Ontario Fire Code. (See Appendix 5, Storage and Handling of Flammable and Combustible Liquids)
f) Avoid open flames, use non-sparking equipment and adequate ventilation if a flammable atmosphere may be generated, for example when dispensing flammable or combustible solvents. (Ontario Regulation 851 Section 63)

6.9 Cryogenic Materials and Cold Traps

a) Wear proper gloves and a face shield when preparing or using a cold trap below –70 degrees C or cryogenic liquids.
b) Never use liquid nitrogen or liquid air as a cold trap to collect a flammable or combustible material mixed with air. Oxygen may condense from the air and lead to an explosion hazard.
c) Always ensure the flammable or combustible material is collected under vacuum. Use a Dewar vessel designed for cryogenic liquids not a regular domestic vacuum flask.
d) When returning the cooled material back to atmospheric pressure, ensure the cryogenic coolant has been removed to prevent liquid air condensation.
e) Use appropriate gloves when handling cryogenic materials, e.g. dry ice, etc.
f) Dry ice/solvent cooling baths should be prepared carefully by the slow addition of small amounts of the solid dry ice to the solvent to avoid excessive frothing and overflow of the solvent.
g) Never lower your head into a dry ice chest since a high level of CO_2 may accumulate there posing an asphyxiation hazard.

6.10 Systems under Pressure

a) Never heat or carry out a reaction in a closed vessel unless it is designed or tested to withstand the expected pressure of the reaction.
b) Pressurized equipment must have an appropriate pressure release valve.
c) Pressurized equipment must be shielded, guarded, or designed to protect the operator against potential explosions.

6.11 Back Flow Preventers

a) All water faucets to which a hose is attached in a laboratory must be equipped with an appropriate backflow preventer. (Ontario Building Code) This prevents the contamination of the drinking water system. Contact the Manager, Maintenance Services at extension 8821 for an evaluation.

6.12 Electrical Equipment and Apparatus

a) All electrical installations must conform to the provisions of the Power Commission Act of Ontario.
b) All electrical equipment must be CSA approved or inspected by Ontario Hydro.
c) Extension cords must not be used for permanent installations. Contact Physical Plant at 3668 to install or relocate outlets in close proximity to the equipment.
d) Use ground fault circuit interrupters where there is a risk of an operator coming in contact with water and electrical equipment simultaneously.
e) Only trained, qualified personnel may repair or modify electrical or electronic equipment.
f) Power bars should not be located beneath work benches where chemicals are handled.

6.13 Compressed Gas Cylinders

All compressed gases have potential health and safety hazards related to the chemical properties of the gas, as well as pressure hazards. Take precautions to protect personnel from these potential hazards

a) All gas cylinders, empty or full, must be properly secured so they cannot be knocked over. Cylinders with safety caps in place may be secured together. All others must be secured separately. (Ontario Regulation 851 Section 49)
b) Compressed gas cylinders should be transported capped and chained on appropriate carts.
c) Always wear eye protection when working with compressed gases.
d) Always use the appropriate regulator for the gas being used. The regulator should be inspected each time before use, as recommended by the manufacturer.
   Note: Failure of either the diaphragm or the regulator can occur unexpectedly. Be prepared. When opening the main valve of a compressed gas cylinder do not stand over the main valve or behind or in front of the pressure gauge(s). These are the most probable locations for failure.
e) Ensure the tubing and the apparatus downstream from the regulator are designed to withstand the pressures intended to be delivered. The tubing and other components should also be chemically resistant to the gas being used.
f) Never use PTFE (Teflon) tape, other lubricants or sealant when installing a regulator. The recommendation of commercial gas suppliers is that regulator fittings in good condition do not require additional sealants.

g) Ensure all installations are designed to prevent the hazardous combination of gases except as required by the use.
h) Take appropriate precautions to prevent exposure of yourself or others to the other hazardous properties of the gas used. Consult the safety data sheet.
i) Compressed gas cylinders have a finite shelf life. Ensure cylinders are regularly inspected. Any cylinder that is corroded or has damaged valve components should be returned to the supplier. All cylinders older than ten years should be returned to the manufacturer. Manufacturers of corrosive gases recommend that cylinders of corrosives be replaced every six months to guard against valve failure.

See Appendix 9, Compressed Gas Cylinder Storage and Handling for additional information.

Section 7: Chemical Storage, Transportation and Disposal

7.1 Chemical Storage

a) All chemicals must be labelled properly (Ontario Regulation 860) and shall be stored according to compatibility groups. (See Appendix 6, The Essentials of Chemical Compatibility for Storage and Segregation)

b) Chemical storage shelves must be designed for the anticipated load and should be made of materials resistant to the chemicals used. Chemically resistant plastic trays can be placed under stored materials which have special chemical properties.

c) It is advisable that all shelves have a lip or equivalent to prevent materials from being knocked off. New shelving for chemical storage must include this feature.

d) Hazardous chemicals in breakable containers such as highly toxic materials (cyanides, neurotoxins); flammables (diethyl ether, acetone); liquid corrosives (mineral acids); or shock sensitive materials (perchlorate salts) should be stored in such a manner that the risk of breakage is minimized. It is advisable that all chemicals in glass containers or those weighing more than 500g not be stored higher than 2 metres from the floor.

e) Laboratories are encouraged to purchase only limited quantities of chemicals they need for immediate use. Long term storage of chemicals is not advised.

f) Laboratories must maintain an up to date chemical inventory. The condition of stored chemicals must be checked annually. Those chemicals which are no longer needed should be disposed of as soon as possible following appropriate procedures.

g) Chemicals should not be stored in direct sunlight or near heat sources.

h) In general the storage of flammables in any refrigerator is not advised and should be kept to a minimum. Regular domestic refrigerators must not be used for the storage of flammable solvents. This type of refrigerator contains ignition sources such as the door light switch and the thermostat. Refrigerators specially designed or properly modified to exclude ignition sources inside the cabinet should be used for the storage of flammable solvents when cold solvents are needed.

7.2 Transportation of Chemicals

See Appendix 11, Transportation of Dangerous Goods for transportation of chemicals both on and off campus.

7.3 Disposal of Chemicals

See Appendix 4, Disposal of Hazardous Waste.

Section 8: Fumehoods

Laboratory fumehoods serve to contain and exhaust toxic, offensive, or flammable vapours from the laboratory. With the hood sash lowered, a fumehood provides a physical barrier between the laboratory worker and the chemical reaction. Apparatus used in hoods should be fitted with condensers, traps or scrubbers to contain or collect to the extent possible waste solvents or toxic vapours. The hood is not a means of disposing of chemicals or a place for storing chemicals.

Note: Laboratory fumehoods are not intended as protection from explosion. If the risk of explosion exists additional measures must be taken for protection.

Fumehood Use

Each fumehood or group of fumehoods on campus must have a designated individual who is knowledgeable about the operation of the fumehood and the materials being used in it. The user department will designate this individual.

A label with the name of the department and the room numbers and telephone numbers of the designated person and the alternate must be attached to each fume hood by the user department. These labels will be standardised throughout the University. It will be the responsibility of the user department to maintain current information on these labels. Labels are available from the EHSS.

a) Laboratory fumehoods must be evaluated by the user before each use (minimum of monthly) to ensure that they are working properly. Some form of continuous monitoring device for adequate flow should be present and checked before use. The airflow across the face of the hood should be 100 fpm +/- 20 %. If there are any questions about the proper operation of the fumehood or the air flow in the fume hood contact Physical Plant at 3668 and have the flow evaluated. Report to the supervisor if chemical contaminants have escaped into the lab area or if health and safety is a concern.

b) Except when adjusting equipment and carrying out manipulations inside the hood, the sash should be kept closed. When making these adjustments, the sash should be raised between 30 and 45 cm (12 to 18 inches).

c) Equipment and apparatus should be placed at least 15 cm (6 inches) inside the front face of the fume hood. This reduces turbulence along the face and thus prevents the loss of contaminants into the laboratory. The set up of equipment and apparatus must not interfere with the ability to completely close the sash.

d) Laboratory fumehoods are not intended for chemical storage. This may interfere with the airflow and adds additional hazard in the event of an uncontrolled reaction. Chemical bottles and waste containers should only be present in the hood when

they are being used. In special circumstances with approval of the department head, hoods may be used for short-term storage. In these cases, the fumehood must be clearly posted identifying the materials stored and the storage duration. In all other cases, chemicals must be stored elsewhere.

e) Fumehoods that are in use must be running at all times.

f) It is highly recommended and best practice that all operations involving the following WHMIS hazard classes are performed in a functioning fumehood.

- Class B, Flammable and Combustible Material
- Class C, Oxidizing Material
- Class D, Poisonous and Infectious Material
- Class E, Corrosive Material
- Class F, Dangerously Reactive Material

If there are questions about the presence of airborne contaminants from laboratory operations report them directly to the laboratory supervisor. The supervisor will review the situation and determine the necessary action. For concerns relating to fumehood operation and maintenance that are not an emergency, contact Physical Plant at 3668. In case of an emergency, contact University Safety at 4444.

Fumehood Classification*

Class A (Radioisotope)
Any fumehood used for radioisotope work will fall into this category. (Anyone working with radioisotopes must work under a permit issued by the Radiation Safety Officer.)

Class B (Standard)
Fumehoods in this classification are used for all other materials and operations in the laboratory, with the exception of perchloric acid.

Class C (Perchloric)
A properly designed perchloric acid fumehood is required when using perchloric acid. This fumehood incorporates a wash down system in the ductwork to prevent the build up of perchloric acid salts. If work with perchloric acid is required, contact the Director of the Department of Physical Plant at extension 4475.

* Adapted from CSA-Z316.5 Laboratory Fume Hoods. The CSA Standard does not include perchloric acid fume hoods.

Fumehood Testing

All fumehoods will be tested annually by EHSS and Physical Plant for minimum control functions and face velocity.

Testing will also be done following new installations and when modifications are made to fumehoods and exhaust systems. This will be in addition to testing and acceptance of new installations and modifications by the Department of Physical Plant.

Fumehood Maintenance

Physical Plant will coordinate the maintenance of all fumehoods, biohazard hoods and associated local exhaust ventilation systems. In this document, the term "fumehood" is used to mean any of these systems.

a) Before beginning any maintenance work or repairs, the worker who is to perform the work will contact the designated person to inform them about the nature of the work and to receive any special instructions, such as safety precautions.

b) Prior to and during the maintenance work the designated person is responsible for ensuring that the fumehood is free from hazard. EHSS will become involved when there are unresolved health and safety issues.

c) Before beginning work, the worker will attach a sign to the hood in a prominent place indicating the hood is out of order. Such signs are available from the Department of Physical Plant. Whenever possible, the sign will state the estimated time required for repairs. This will also include all other fumehoods interconnected to the fumehood being worked on.

d) The worker will lockout the hood before beginning work. This will also include all other fumehoods interconnected to the fumehood being worked on.

e) The worker will wear an appropriate respirator and the appropriate disposable gloves and other protective equipment required for the work being done. These must be specified by the designated person identified by the fumehood user department. If assistance is required contact the EHSS.

Fumehood Identification and Labelling

All fumehoods are required to have three labels attached to the front. These are an identification label, a user label and a testing label. The labels are available from EHSS.

Section 9: Personal Protective Equipment

Personal protective equipment (PPE) is designed to protect many parts of the body. It should act as a primary barrier between the hazard and the worker. It does not reduce the hazard. Personal protective equipment appropriate to the hazards must be worn. (Ontario Regulation 851 Sections 79-86)

All personnel in a laboratory should consult with their supervisor regarding protective equipment appropriate to the individual laboratory. (Ontario Regulation 851 Section 79) It is the responsibility of the supervisor to select the PPE appropriate to the work being done. The Canadian Standards Association publishes standards with information that may assist the supervisor with the selection. In some cases the department will pay for the PPE, in other cases PPE may be provided from research grant funds, or students may be required to purchase their own PPE.

It is the responsibility of anyone working in the lab to use the PPE that is required.

Personal protective equipment must not be considered the primary means of protecting the laboratory worker. Research procedures and engineering controls, such as fumehoods, must be considered first.

All the personnel in the lab should wear personal protective equipment, not just those actively working. Appropriate clothing should be worn at all times.

a) Gloves

There are many different types of protective gloves available and they should be chosen to offer the best protection for specific procedures and chemicals. Glove materials have different chemical resistances and should be checked with the manufacturer prior to selecting a specific type of glove.

Always check the integrity of the glove before starting work.

Use the correct technique to remove gloves before leaving the laboratory. Consider gloves to be contaminated after use and dispose of appropriately.

b) Eye Protection

An individual exposed to possible eye injury shall wear eye protection appropriate to the circumstances. Approved safety glasses with side shields are the minimum protection required in a laboratory. Goggles and face shields may also be required for certain procedures, as determined by the supervisor.

In those cases where prescription safety glasses are required, the individual will provide them. Such glasses must meet all the requirements for safety glasses as specified by the CSA Standard for Eye and Face Protectors (CSA-Z94.3-99).

c) Skin Protection

Clothing should provide maximum coverage of skin in accordance with the risk of exposure. The supervisor should determine the specific requirements in each lab.

When lab coats are used they should be
- removed and hung up prior to personnel leaving the lab,
- laundered separately from other clothing,
- buttoned closed when worn.

Rubber aprons should be worn when handling highly corrosive or reactive materials.

d) Respiratory Protection

Under normal circumstances respirators should not be required for laboratory situations. Use of fumehoods should generally eliminate respiratory hazards. If a respirator is required, the selection should be based on the CSA Standard, Selection, Use and Care of Respirators CSA – Z94.4-93. It is essential the wearer be properly instructed for fit and safe use of a respirator.

e) Hearing Protection

Hearing protection is required for noise levels above 90 dBA. (Ontario Regulation 851 Section 139) The supervisor will determine the appropriate type of hearing protection to be worn. (Hearing Protectors CSA-Z94.2-M1984) Measuring can be done by EHSS.

f) Foot Protection

Safety footwear is designed to protect feet against a variety of injuries. Impact, compression, chemical splashes and puncture are the most common types of injuries. Footwear should be chosen according to the hazard and should be properly rated. (Protective Footwear CSA-Z195-M92)

g) Head Protection

Head protection is required when working where there is a risk of injury from moving, falling, or flying objects or when working near high-voltage equipment. Hard hats are designed to protect from the impact and penetration caused by objects hitting the head or from limited electrical shock or burns.

Section 10: Procedures for Handling Highly Acute and Highly Chronic Toxins

a) Prior to using these materials users must consult the MSDS and their supervisor for appropriate precautionary measures. Below are general principles for handling these types of materials. Additional precautions may be necessary for some materials and use situations.

b) Protect hands and forearms by wearing gloves and a laboratory coat.

c) Procedures that could result in the generation of aerosols (dusts, mists or fumes) must be conducted in a glove box that is under slight negative pressure and protected by High Efficiency Particulate Aerosol (HEPA) filters or in a fumehood. A respirator equipped with HEPA filters must be worn if exposure to particulates or aerosols is possible.

d) Surfaces that may be contaminated must be covered with a suitable disposable bench covering.

e) Wash your hands and arms immediately with soap and water unless stated otherwise on the MSDS, after working with these materials.

f) Materials contaminated with these substances must be properly labelled and disposed of appropriately. (See Appendix 4)

g) All work surfaces where these materials are used must be thoroughly cleaned on a regular basis.

h) Highly acute toxins have an LD50 of less than 10 mg/kg (this value is usually found on the MSDS).

Section 11: Emergency Equipment and Procedures

The supervisor must ensure all laboratory personnel are familiar with the emergency procedures that pertain to the building or facility. In addition, individual laboratories are encouraged to develop procedures for specific significant hazards. Consult the standard emergency procedure placard posted in the lab.

11.1 Emergency Phone Numbers

The Department of University Safety should be contacted at extension 4444 in the event of any type of emergency. Explain the situation and they will contact the appropriate emergency service (police, fire and ambulance). Contacting DUS will allow them to direct the outside service to the proper campus location.

11.2 Emergency Equipment

An eyewash and safety shower must be accessible at all times to all laboratories where chemicals dangerous to the skin and eye are used. (Ontario Regulation 851 Sections124 & 125)

All laboratories must be equipped with sufficient fire extinguishers of the correct type for the materials being used or produced. (Ontario Regulation 851 Section 123) Contact the Fire Safety Officer at extension 3611 for further information.

All emergency equipment must be checked periodically. The lab users should flush eyewash stations weekly. Safety showers will be tested annually by Physical Plant. The fire extinguishers will be inspected regularly by the Fire Safety Officer. A record of the check will be recorded on a tag attached to the equipment.

11.3 First Aid

It is the responsibility of the laboratory supervisor to ensure that all lab personnel are aware of the location of the closest first aid kit; that the names of those in the building with First Aid Certificates are posted; that first aid kits are inspected at least quarterly by the Certified First Aider and supplies provided by the department; and that records of any treatment given are kept.

For emergency care and ambulance contact University Safety at extension 4444. For care of non-serious occupational injuries contact Health Services at extension 6674 in the CTTC.

When first aid is given a First Aid Report should be completed along with an Injury/Incident Form (Appendix 2). Contact EHSS for additional information.

a) Skin Exposure

- Wash all exposed areas for 15 to 20 minutes with running water.
- Do not use soap or detergent unless stated on the MSDS.
- Obtain further medical treatment if irritation persists, damage is apparent or if the MSDS states that further treatment is required. Take a current copy of the MSDS along with you. Attach MSDS to persons clothing if an ambulance is required.
- Large splashes require the use of a safety shower. Safety showers are most effective when all clothing is removed.

b) Eye Exposure

- Flush the eyes for 15 to 20 minutes with running water. Hold the eye open while flushing.
- Always seek further medical attention in the case of eye exposures to hazardous materials. Take a current copy of the MSDS along with you.

11.4 Chemical Spills

The user of the hazardous material is responsible for cleaning up a spill. Spill kits should be available in all labs. When a chemical is spilled contact the lab supervisor immediately. If the spill is beyond the resources or abilities of the users to cleanup, contact the Department of University Safety at 4444. This duty must not be delegated to other staff such as caretakers.

In cleaning up a spill the following guide should be followed:

a) Determine what was spilled and if the area is safe. If there is any doubt about the safety of an area or the nature of the spilled material evacuate the area using the fire pull station. If the pull station is used, meet emergency personnel to explain the situation.

b) Administer first aid where needed.

c) Secure the area to prevent others from entering.

d) Gather required information such as MSDS's. Consult your supervisor and/or EHSS. Carefully evaluate the situation and form an action plan.

e) Put on all required personal protective equipment.

f) Using appropriate cleanup agents, cleanup spill.

g) Dispose of residue according to the Procedure for the Disposal of Hazardous Materials (Appendix 4) or contact EHSS for advice.

h) Fill out an Injury/Incident Report (Appendix 2).

Refer to Appendix 8 for a recommendation on a spill cleanup kit.

11.5 Mercury Handling and Spill Clean Up

Health Effects

Mercury vapors are odorless, colorless, and tasteless. Mercury poisoning from exposure by chronic inhalation can cause emotional disturbances, unsteadiness, inflammation of the mouth and gums, general fatigue, memory loss, and headaches. In most cases of exposure by chronic inhalation, the symptoms of poisoning gradually disappear when the source of exposure is removed. Improvement, however, may be slow and complete recovery may take years.

Storage and Handling

Because of the health effects of mercury and the extremely difficult and time-consuming procedures required to properly clean spills, every effort should be taken to prevent accidents involving mercury. Always store mercury in unbreakable containers in a well-ventilated area. When breakage of instruments or apparatus containing mercury is a possibility, the equipment should be placed in an enameled or plastic tray or pan that can be cleaned easily and is large enough to contain the mercury. Transfers of mercury from one container to another should be carried out in a hood, over a tray or pan to confine any spills. If possible, the use of mercury thermometers should be avoided. If a mercury thermometer is required, many are now available with Teflon coating that will prevent shattering. Always wash hands after handling mercury to prevent skin absorption or irritation.

Air Monitoring

Any mercury spill has the potential to generate airborne concentrations in excess of regulated levels. Contact EHSS for air monitoring of the spill area before cleanup to determine the airborne concentration. Large spills or spills with elevated vapor levels may require cleanup by a qualified contractor.

Protective Clothing

For small spills, a laboratory coat, safety glasses, and gloves should be used. Gloves made of the following have been rated as excellent for protection against elemental mercury:

- Chlorinated polyethylene (CPE)
- Polyvinyl Chloride (PVC)
- Polyurethane
- Nitrile Rubber, (also known by several brand names)

- Viton ® (Viton ® is a registered trademark of DuPont Dow Elastomers)
- Butyl Rubber
- Neoprene

If mercury has been spilled on the floor, those involved in cleanup and decontamination should wear plastic shoe covers. If a spill is extensive enough to require workers to kneel or sit where mercury has been spilled Tyvek or similar impermeable clothing will be required

Spill Kits

Special spill kits are available from a variety of sources. If a spill kit is purchased, follow the manufacturer's directions. Alternatively, a kit can be assembled with the following components:

- protective gloves,
- mercury suction pump or disposable pipettes to recover small droplets,
- elemental zinc powder (or commercial amalgam material),
- dilute sulfuric acid (5-10%) in spray bottle,
- sponge or tool to work amalgam,
- plastic trash bag,
- plastic container (for amalgam), and
- plastic sealed vial for recovered mercury.

Clean Up Procedures

- Wearing protective clothing, pools and droplets of metallic mercury can be pushed together and then collected by a suction pump.
- After the gross contamination has been removed, sprinkle the entire area with zinc powder. Spray the zinc with the dilute sulfuric acid.
- Using the sponge, work the zinc powder/sulfuric acid into a paste consistency while scrubbing the contaminated surface and cracks or crevices.
- To minimize contamination of housekeeping items, stiff paper may be used to assist in cleaning up the amalgam.
- After the paste has dried, it can be swept up and placed into the plastic container for disposal.
- Rags, shoe covers, sponges, and anything used for the cleanup should be placed in the trash bag to be disposed of as contaminated material.

Follow the procedures for Hazardous Waste Disposal (Appendix 4).

11.6 Laboratory Fires

Before using any chemicals you should make yourself familiar with all the potential fire hazards associated with the chemical. This information will be found on the MSDS in the fire and explosion and reactivity sections. The information will include the decomposition products, critical temperatures, and the most applicable type of fire fighting equipment to be used should a fire get started.

a) If a small fire does start in a lab and is contained in a beaker, flask or other small container, you **may** attempt to extinguish the fire with the proper fire extinguisher or by smothering it. Call for help from others in the area while doing this so they are aware of the fire and ready to take action if your attempt is not successful. After the fire is out, immediately report the fire and your action to University Safety at 4444.

b) If the fire is not limited to a small area, if volatile or toxic materials are involved, or if you have failed in your attempt to extinguish a small "beaker fire", or do not wish to try, you should:

- Pull the fire alarm.
- Inform everyone in your immediate area that there is a serious fire.
- If possible close all doors that will isolate the fire from the rest of the building.
- Evacuate the building using the stairs. Do not use the elevators.
- Meet the emergency service personnel at the entrance of the building and explain the nature of the fire, and the identity of all possible associated hazards such as toxic fumes, explosive potential, fire extinguishing media, etc.

c) Fill out an Injury/Incident report. (Appendix 2)

Classes of Fire

A Class - ordinary combustibles such as wood, paper, cloth, plastic, etc.
B Class - flammable and combustible liquids
C Class - charged electrical fires
D Class - combustible metals

Types of Extinguishers

ABC Dry Powder/Multipurpose extinguishers will extinguish class A, B and C fires.

Pressurized water extinguishers will only work on A Class fires. Do not use this type of extinguisher on a charged electrical fire since electrical shock may result. When used on a flammable liquid it will cause the fire to spread.

None of these extinguishers will work on a combustible metal fire (D Class). If you are using combustible metals consult with the Fire Safety Officer at extension 3611 for the proper extinguisher.

Appendix 1

Carleton UNIVERSITY

Record of Training

Please complete and keep one copy for your files and send one copy to the Department of University Safety, Room 203 Robertson Hall.

NAME OF COURSE	
DATE OF COURSE	
DEPARTMENT & LOCATION	
NAME OF PERSON/COMPANY GIVING COURSE	
DESCRIPTION OF COURSE (method of training, video title, sample of hand-outs, method used to ensure understanding by participants, etc.)	

Testing Conducted: Yes ☐ No ☐
Record Retained By: _____
Location of Record: _____
Certificate Issued: Yes ☐ No ☐ Expiry Date: _____

LIST OF ATTENDEES

NAME	DEPARTMENT	SIGNATURE
		`

Completed by: _____ Date: _____

Appendix 2

Carleton University
Incident/Injury Report Form

(To be completed by the supervisor, or individual reporting the incident)

Department: Date of Incident:

Names of those Involved: Supervisor:

Location: Phone:

Briefly describe the events leading to the incident or injury, what was being done at the time, describe the injury and what actually happened, include a description of any equipment or machinery involved.

(Include names of witnesses, if any.)

Briefly describe the action taken to investigate the incident and the steps taken to prevent a recurrence.

....

Signature of Supervisor ***Date***

Distribute copies to: University Safety (EHSS)
Department Head

Appendix 3

Procedure for a Laboratory Risk Assessment

A risk assessment is required in advance of all laboratory operations to identify and resolve any risk to health, safety and the environment. This procedure provides for a consistent approach throughout the University. Prior to commencing new laboratory operations supervisors are responsible for conducting a risk assessment. The assessment must include those responsible for the process, the reporting structure and the line of supervision.

The following guideline should be checked and action taken to conduct a laboratory process risk assessment. Changes to this list to suit the specific requirements of the proposed laboratory operation are the responsibility of the supervisor.

1. Planning

- Prepare a detailed description of the process and work plan.
- Check hazard types: toxic, flammable, reactive, and/or explosive materials.
- Check chemical lists and amounts to be used.
- Check if less hazardous chemicals can be used.
- Check where the process can be conducted (open lab, enclosure or fume hood).
- Check required engineering controls (existing or new required).
- Check material storage requirements (special cabinets and refrigerators).
- Check if new or unknown substances will be produced as a result of the process.
- Check if any staff and students involved are pregnant or are likely to become pregnant.
- Check if staff and students have sensitivities to proposed chemicals.
- Check working procedures required, level of supervision and lab partners.
- Check supervision of the process required.
- Check running time for the process, continuously or for short periods.
- Check the need for an alarm system to notify of an accident.
- Communicate the plan to all staff and students involved.

2. Information Review

- Consult the current MSDS and manufacturer chemical data.
- Obtain detailed information regarding the use of proposed substances with a significant or unusual hazard potential.
- Determine the type of toxicity with each proposed chemical.
- Check if chemicals are acutely toxic, corrosive, irritants or are sensitizers.
- Check if any carcinogens or suspected carcinogens have been proposed for use.
- Check if any proposed chemicals are suspected to be reproductive or developmental toxins or neuro toxins.
- Check requirement for external professional expertise in developing the risk assessment

3. Exposure

- Check potential routes of exposure for each proposed chemical.
- Check the LD 50 for each chemical via the relevant routes of exposure.
- Check the acute toxicity level for each substance.
- Review TLV-TWA, STEL and PEL values regarding inhalation hazards.
- Check Personal Protective Equipment (PPE) requirements.
- Review handling and transport requirements on campus and within buildings.
- Check potential affects on building occupants in the event of a spill.
- Establish decontamination procedures.
- Check provisions to secure laboratory area.
- Check signage requirements advising of potential hazards.
- Advise University Safety and Maintenance Services of all hazards and access restrictions.

4. Emergency Plan

- Develop an emergency plan specifically related to this operation.
- Provide spill kits and emergency responder information.
- Check training requirements for emergency responders.
- Check requirements for a contracted emergency response HAZMAT company.
- Provide copies of the emergency plan to University Safety and Physical Plant.

5. Waste Management

- Check hazardous waste disposal requirements (see Appendix 4, Procedure for Disposal of Hazardous Waste).
- Check with EHSS that the Ministry of Environment has issued a Certificate of Approval for fume hood discharges associated with this process.

6. Approvals

- Obtain departmental approval prior to proceeding with work.
- Obtain Building Authority approval of the emergency plan and the work prior to proceeding.

  If assistance is required in developing the plan, contact Environmental Health and Safety Services.

Appendix 4

Procedure for Disposal of Hazardous Waste

The Ministry of Environment (MOE) regulates the disposal of all hazardous waste material at Carleton University. Any questions about these procedures should be referred to the Department of University Safety, Environmental Health and Safety Services (EHSS).

1. Responsibilities

The disposal of hazardous waste at Carleton University is regulated by the MOE through Waste Management Regulation 347 of the Environmental Protection Act. The MOE has issued a Generator Registration Number to the University covering a specific list of hazardous waste. All waste must be disposed of under this number. Waste not shown on this list may not be disposed of without an additional application to the MOE. This application must be done through EHSS with the signature of the appropriate officer of the University.

The Regional Municipality of Ottawa-Carleton (RMOC) also regulates waste disposal through the Sewer Use Control by-law.

The department heads in the areas that generate hazardous waste are responsible for ensuring that the legal requirements are followed. Department heads generally appoint a contact person to coordinate the disposal of hazardous waste. A list of contacts is available from EHSS and is on the University Safety web site. EHSS provides information regarding hazardous waste disposal to the university community and maintains contact with the MOE.

2. General Disposal Procedures

The following steps are required to prepare for disposal of hazardous waste:

- Contact EHSS to verify if the waste is included under the registration number so that an application can be made if it is not,
- Prepare an inventory of the waste, including the identity, condition and amount,
- If the waste is unknown, include that information,
- Contact Purchasing for a list of companies certified by the MOE to provide hazardous waste disposal services,
- Ensure all waste containers are clearly labeled.

The MOE requires a manifest for disposal of all hazardous waste for tracking purposes. The carrier of the waste provides the manifest at the time of pick-up.

The manifest must be completed as follows:

- The department disposing of the waste (the consignor) completes and signs Part A of the manifest, including the University generator registration number, which is available from EHSS.
- The carrier completes Part B of the manifest.
- The consignor (department) separates the manifest and mails Copy 1 (white) to the MOE as directed on the back of the manifest and copy 2 (green) to John Algie in EHSS.
- The carrier takes copies 3, 4, 5 and 6 with the shipment.
- The receiver sends copy 6 to John Algie in EHSS after the shipment has been received. (If the department receives this copy, it should be forwarded to John Algie.) EHSS retains the green and brown copies on file for periodic inspection by the MOE.

3. Control, Handling and Storage of Waste

In each department where hazardous waste is generated, the department head is responsible for establishing procedures for the control, handling and storage of hazardous waste in preparation for disposal. The waste must be kept in a secure storage area.

The following are not permitted:

- Storage of waste in public access areas,
- Reducing liquid waste by evaporation in fume hoods or other areas,
- Handling by custodial staff. This restriction includes hazardous biological or medical waste, including needles; laboratory glassware; and chemical containers either empty or with contents.

The waste disposal contractor can provide assistance as to the size and type of containers for collection, and procedures for packing and storing waste.

The MOE limits storage of hazardous waste to three (3) months. If there is a requirement to store hazardous waste longer than three months, the University must submit a request to the MOE within five (5) days after the three-month period. The report must include the name and waste number, quantity involved, manner in which it is stored, reasons for storing and anticipated time and manner of disposal. Please contact John Algie in EHSS (ext. 8548) to submit this report.

Empty containers that originally held hazardous materials are subject to the following disposal restrictions:

- Empty containers may not be placed in hallways, recycling bins or garbage bins.

- Empty containers that held organic waste, solvents or acids may be placed in the building garbage bin by department staff if they have been cleaned using the following procedure. This cleaning requires triple rinsing with a rinse agent and flushing with water. Ethanol or acetone may be used as a rinse agent for organic waste and solvent containers, use sodium bicarbonate for acid containers. All rinsing liquid must be collected in an appropriate container and disposed of as hazardous waste. Containers may then be rinsed with water, which can be put down the drain.
- Empty containers that held other chemicals or waste must be disposed of as hazardous waste. Do not rinse or put the contents of these containers down the drain.

Empty containers may be used for the collection of hazardous waste using the following guidelines:

- Containers must have airtight seals and be undamaged.
- Previous container material must be compatible with the waste material.
- Original labels must be removed and containers must be clearly labeled with the chemical name, concentration and volume (no abbreviations) of the waste.

4. Specific Waste Types

Pathological Waste and Sharps

The department head is responsible for establishing specific procedures for the control, handling, storage and disposal of pathological waste or biological or medical waste, including needles used in the department. This type of waste is not permitted in regular garbage containers and custodial staff are not permitted to handle it.

Compressed Gas Cylinders, Tanks and Aerosol Cans

Containers under pressure must be secured in laboratories and workshops and not left unattended in public access areas. The department head is responsible for establishing specific procedures for the control, handling, storage and disposal of compressed gas cylinders, tanks and aerosols.

Empty compressed gas cylinders and tanks are not permitted in the regular garbage. Disposal procedures should be checked with the supplier as the supplier may refill or recycle these containers. If not, these containers must be disposed of as hazardous waste.

Aerosol cans that are empty can be recycled. Waste aerosol cans that are not empty must be disposed of as hazardous waste. Contact John Algie in EHSS at extension 8548 for information concerning recycling

Additional information regarding compressed gas cylinders can be found in Appendix 9.

Radioactive Waste

The Atomic Energy Control Board (AECB) regulates the use and disposal of radioisotopes. The university disposes of radioactive waste to Atomic Energy of Canada (AECL) according to their procedures. Any questions regarding the disposal of radioactive waste should be directed to the Radiation Safety Officer, Norm Barton at 798-8353 or through EHSS.

5. Decommissioning a Laboratory

Prior to leaving the University all faculty, staff and students must complete a review of the hazardous materials they have been working with in the laboratory. This review will include identification of all hazardous materials and disposal of those materials no longer needed through the proper procedures. The review must be done with the department head or department contact.

6. Waste Minimization

All individuals working in laboratories or other areas where hazardous materials are used can have a direct effect on the total volume of hazardous waste generated by the department. Considering the following points before beginning new projects could result in a safer area and reduce the amount of waste disposal and the costs associated with it:

- The use of a non-hazardous or less hazardous material,
- Micro scale experiments,
- Buy only what is needed, disposal costs negate the savings of bulk purchasing,
- Check with the College of Natural Sciences Central Stores before purchasing to see if the product is already available in the stores,
- Advise the College of Natural Sciences Central Stores of products available for others to use,
- Label all products; costs to verify unknowns are very high,
- Arrange the return of test materials in advance,
- Only accept donations of hazardous materials if there is an immediate use.

Appendix 5

Storage and Handling of Flammable and Combustible Liquids

The storage and handling of flammable and combustible liquids is regulated under the Ontario Fire Code (OFC), Part 4 - Flammable and Combustible Liquids. The OFC is available at the following address http://www.gov.on.ca/OFM/legreg/index.html of the Ontario Fire Marshall.

Supervisors are responsible to ensure those operations in their section involving the use, storage and handling of flammable and combustible liquids are conducted in accordance with the OFC. Questions regarding the requirements of the Ontario Fire Code should be referred to the Fire Safety Officer at extension 3611.

1. Definitions

The following definitions are taken from the Ontario Fire Code:

Closed container - a container so sealed by means of a lid or other device that neither liquid nor vapour will escape from it at ordinary temperatures.
Combustible liquid - any liquid having a flash point at or above 37.8 degrees Celsius and below 93.3 degrees Celsius.
Dispensing – transfer of flammable or combustible liquids from one container to another.
Flammable liquid - a liquid having a flash point below 37.8 degrees Celsius and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8 degrees Celsius as determined by ASTM D323, "Vapour Pressure Petroleum Products (Reid Method)".
Flash Point - the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.
Fuel dispensing station - any premises at which flammable or combustible liquids are dispensed from fixed equipment into the fuel tank of a motor vehicle or watercraft.
Lower explosive limit - the minimum concentration of vapour in air at which the propagation of flame occurs on contact with a source of ignition.
Safety Containers – individual containers with a capacity of more than 5 litres of flammable and combustible liquids used for storage in a building shall conform to ULC/ORD-C30, “Safety Containers”. Containers exceeding 25 litres shall not be used.
Storage Cabinets – a cabinet that conforms to ULC-C1275, Storage Cabinets for Flammable Liquid Containers”.
Unstable liquid - a liquid, including flammable and combustible liquids, which is chemically reactive to the extent that it will vigorously react or decompose at or near normal temperatures and pressure conditions or which is chemically unstable when subject to impact.

2. Classification

Flammable and combustible liquids are classified by their flash point. Prior to the use, storage and handling of a flammable and combustible liquid its flash point must be verified. Classification and the requirements of Part 4 (OFC) may then be determined. The product Material Safety Data Sheet (MSDS) will identify the flash point of the liquid, its properties and other safety requirements. A partial list of flammable and combustible liquids (including; liquid name, flash point & liquid class) is available at the Ontario Fire Marshals web site: http://www.gov.on.ca/OFM/guidetec/part4/4commenlist.htm

The following classifications are taken from the Ontario Fire Code:

Flammable liquids shall be Class I liquids, and shall be subdivided into

(a) Class IA liquids, which include those having a flash point below 22.8 degrees Celsius and a boiling point below 37.8 degrees Celsius.

(b) Class IB liquids, which include those having a flash point below 22.8 degrees Celsius and a boiling point at or above 37.8 degrees Celsius.

(c) Class IC liquids, which include those having a flash point at or above 22.8 degrees Celsius and below 37.8 degrees Celsius.

Combustible liquids shall be Class II or IIIA liquids, and shall be subdivided into

(a) Class II liquids, which include those having a flash point at or above 37.8 degrees Celsius and below 60 degrees Celsius, and

(b) Class IIIA liquids, which include those having a flash point at or above 60 degrees Celsius and below 93.3 degrees Celsius.

Heated Liquids - when a liquid having a flash point at or above 37.8 degrees Celsius is being processed, stored, handled or used at a temperature at or above its flash point, it will be treated as a Class I liquid.

Mixed Liquids - when Class I or II liquids are added to used oils the resulting mixture shall be classified by tests conforming to Subsection 4.1.3 of the OFC.

3. Determining Storage and Handling Requirements

Once a flammable and combustible liquid has been classified, the use, storage and handling requirements may be determined. It should be noted that requirements vary depending on the use and the occupancy of the work area. A review of the following sections of Part 4: Flammable and Combustible Liquids will identify the requirements for your area:

Section 4.1 Application
Section 4.2 Container Storage and Handling

Section 4.3 Tank Storage
Section 4.4 Piping And Transfer Systems
Section 4.5 Fuel Dispensing Stations
Section 4.10 Withdrawal Of Storage Tanks From Service
Section 4.11 Tank Vehicles
Section 4.12 Laboratories

Key considerations in reviewing the requirements for your work area include the following items:

- Classification
- Storage
- Storage Rooms
- Containers
- Labeling
- Maximum Quantities
- Dispensing
- Spill Control
- Unauthorized Access

4. Storage, Quantity and Containers

a) Flammable and combustible liquids, including waste liquids, shall be stored in closed containers, safety containers and approved flammable and combustible liquid storage cabinets.

b) Rooms used for the storage of flammable and combustible liquids must meet the requirements of building and fire codes.

c) The storage and use of fuels for internal combustion engines must also comply with the requirements of the Gasoline Handling Act and Regulations.

d) Fume hoods are not approved for the storage of flammable and combustible liquids.

e) Containers of flammable and combustible liquids shall be kept closed at all times.

f) A container of not more than 1 litre capacity for Class I liquids and 5 litres capacity for Class II and IIIA liquids need not conform to the requirements listed in section 4.2.3.1(1) of the Fire Code.

g) Glass and plastic containers are only permitted for use where the use of metal safety containers would create purity problems or the liquid will cause excessive corrosion of the metal container. Glass and plastic container sizes must comply with the following table. For the requirements of containers exceeding these sizes, contact the Fire Safety Officer at extension 3611.

Classification	Container Size
Class I	1 litre maximum
Class II	5 litres maximum
Class IIIA	5 litres maximum

h) The maximum quantity of flammable and combustible liquids permitted to be stored in the open area of a laboratory will comply with the following table. Provided the laboratory is separated from other parts of the building by a fire separation having a rating of not less that 1 hour.

Location	Flammable Classification	Combustible Classification	Maximum Quantity	Container Size
Laboratory	X	_	50 litres	5 litres maximum
Laboratory	_	X	250 litres **(1)**	5 litres maximum
Total Combined	X	X	300 litres	5 litres maximum

Note: 1. Combustible liquid quantity may increase as the quantity of flammable liquid is reduced.
2. Requirements for occupancies other than laboratories are identified in the Fire Code.

i) The maximum quantity of flammable and combustible liquids stored in a cabinet shall be 500 litres.

5. Handling and Dispensing

a) Eliminate all ignition sources prior to dispensing flammable or combustible liquids.

b) During dispensing operations, procedures for the "Control of static electric charge" must conform to the requirements of the Ontario Fire Code.

c) Dispensing of flammable and combustible liquids up to a size of 5 litres must be done in a laboratory fume hood or other properly ventilated area.

d) Dispensing of flammable liquids from containers larger than 5 litres must be done in accordance with and in a room conforming to the requirements of the Ontario Fire Code.

e) Glass bottles containing flammable and combustible liquids must be placed in approved solvent safety carriers for transport through public areas.

Appendix 6

The Essentials of Chemical Compatibility for Storage and Segregation

The following groups of chemicals must be stored separately from chemicals in other groups and away from the general chemical storage.

Mineral Acids
Examples: hydrochloric acid, hydrofluoric acid, nitric acid, sulfuric acid, phosphoric acid, chlorosulfonic acid, perchloric acid*

* Perchloric acid should be stored with mineral acids. However, it should be kept on a tray separate from the other acids. If sulfuric acid is spilled on a wooden shelf and then perchloric is spilled in the same spot an immediate fire will result.

Flammable Solvents See Appendix 5 for detailed information
Examples: acetone, alcohol, pet ether, diethyl ether, benzene, acetonitrile, formamide, toluene, xylene

Examples of non-flammable solvents include chloroform, methylene chloride, and carbon tetrachloride. These do not need to be kept in a flammable storage cabinet.

Organic acids such as acetic, butyric, and formic acids are combustible materials and should be stored in a flammable storage cabinet. In fact any organic acid can be stored with the flammable solvents.

Inorganic Oxidizers
Examples: nitrates, nitrites, chlorates, perchlorates, periodates, permanganates, persulfates

Bases (Alkaline Materials)
Examples: sodium hydroxide, potassium hydroxide, ammonium hydroxide, organic amines

Cyanide Containing Materials
Examples: sodium cyanide, cyanogen bromide, potassium ferricyanide, potassium ferrocyanide, sodium thiocyanate

Materials Requiring Special Storage Considerations

Picric Acid
Inspect monthly (record inspections) and keep wet with distilled water. Dry only the amount required for immediate use. Dry picric acid is shock sensitive.

Peroxide Formers
Peroxide forming materials should be dated when opened and disposed of when the recommended time limit has expired.

After 3 months - isopropyl ether, divinyl acetylene, vinylidene chloride, butadiene, chloroprene, tetrafluoroethylene

After 12 months - ethyl ether, tetrahydrofuran, dioxane, acetal, vinyl ether, diacetylene, methyl acetylene, cumene, cyclohexene.

Most of these materials are flammable materials and should be stored in a flammable storage cabinet.

Other Shock Sensitive Materials
Examples: Nitro compounds, organic nitrates, acetylides, azides, diazomethane, fulminates
Purchase these materials in small quantities and dispose of when the research project is finished.

Organic Peroxides
Examples: benzoyl peroxide, peracetic acid
Purchase in small quantities, keep refrigerated, dispose 12 months after opening.

Water Reactives
Examples: sodium and potassium metal, phosphorus pentoxide, aluminum chloride, titanium trichloride

Air Reactives (Pyprophorics)
Examples: alkyl lithium compounds, Grignard reagents, white phosphorus

All other chemicals including inorganic salts, and organic liquids and solids may be stored together.

Appendix 7

Fumehood Labels

Fumehood Identification

The fumehood identification label below is completed and attached to the fumehood by the Department of Physical Plant.

FUMEHOOD IDENTIFICATION	
Class:	**Number:**
Building:	**Room:**
Fan Number:	**Fan Location:**
Fan Switch Location:	
For maintenance and repairs contact Physical Plant at 3668	

Fumehood User Identification

The fumehood user identification label below is completed and attached to the fumehood by the Department Head, or designate. Prior to attaching a new label, any outdated user labels should be removed.

FUMEHOOD USER IDENTIFICATION	
Building:	**Room:**
Department:	**Date:**
Supervisor	**Alternate**
Name:	Name:
Room:	Room:
Office Tel:	Office Tel:
Home Tel:	Home Tel:

Fumehood Testing

The fumehood testing label below is completed and attached to the fumehood by the department of Physical Plant.

FUMEHOOD TESTING	
WARNING **Unsafe conditions could result if the following operation requirements are not adhered to.** **Operation Requirements** Fumehood may only be operated at a maximum sash opening height of 30 cm. Fumehood may only be operated with laboratory doors and windows in a closed position. Equipment must not obstruct fume hood operation. Modification of fumehoods is not permitted. Chemical storage in fumehoods is not permitted.	
Class:	**Number:**
Building:	**Room:**
Face Velocity: _____ At a sash operating height of 30 cm.	
Tested by: **Physical Plant and EHSS** **Date:** _____	

Appendix 8

Spill Kits

A typical spill control kit would include the following items:

Personal Protective Equipment

- splash goggles
- face shield
- lab coats/coveralls
- gloves (nitrile and neoprene)
- rubber boots
- chemical cartridge respirator with multiple cartridges
- chemical resistant apron

Cleanup Equipment

- bucket with mop and floor sponge
- spill control pillows
- plastic dust pan
- heavy plastic garbage bags

Cleanup Agents

- 5 kg sodium bicarbonate to neutralize common acids
- 2 kg sodium dihydrogen phosphate (a weak acid) to neutralize common bases
- 10 kg of a mixture of soda ash, kitty litter, and sand (1:1:1) this works for acids (with the exception of HF) and solvents and can be used to contain other materials.

A mercury spill requires special care. If you are working with mercury, refer to the section on mercury handling and spill cleanup.

Appendix 9

Compressed Gas Cylinder Storage and Handling

Compressed gases present a number of health and safety hazards. These include pressure, volume and those hazards related to the chemical properties of the gas. Gases may be flammable or combustible, explosive, corrosive, poisonous, inert or include a combination of hazards. Only trained personnel are permitted to handle and use compressed gases and cylinders.

The Ontario Fire Code (OFC) includes requirements for the storage and handling of compressed gases. These requirements must be followed when using compressed gases. The Ontario Fire Code (OFC) is available at the following web site: http://www.gov.on.ca/OFM/legreg/index.html Sections 5.6 Compressed Gases and Section 5.17 Cutting and Welding. Questions concerning the requirements of the Ontario Fire Code should be referred to the Fire Safety and Crime Prevention Officer, University Safety at extension 3611.

1. Identification

The contents of any compressed gas cylinder must be clearly identified. The identification should be stenciled or stamped on the cylinder or a label. Gas cylinders that are not clearly identified should not be accepted for use. If a label on a gas cylinder is unclear and the contents cannot be confirmed it should be labeled "contents unknown", removed from circulation and returned directly to the supplier.

2. Monitoring

Requirements for gas monitoring and alarm systems apply to the use of highly toxic, toxic, flammable and/or pyrophoric gases. A risk assessment must be conducted to determine monitoring and alarm system requirements prior to the use of these gases. (See Appendix 3 Laboratory Risk Assessment)

3. Smoking

Smoking is not permitted in any area where gas cylinders are stored or handled. This includes exterior locations.

4. Gas Cylinder Delivery, Return and Disposal

Departments must have a procedure that is provided to suppliers outlining cylinder delivery, return and disposal requirements. These procedures should include:

- Transportation of Dangerous Goods requirements (see Appendix 11).
- Names of receiver, shipper and supplier 24-hour emergency contact number.
- Cylinder inspection checklist (condition, identification, valve protection caps etc.)

- Cylinder delivery to a secure area.
- Identification of empty cylinders for return (tag stating they are empty).
- Cylinder inspection prior to return (condition, identification valve protection caps).
- Confirm waste cylinder disposal requirements (see Appendix 4 Disposal of Hazardous Waste).

5. Transportation

- Ensure valve cylinder caps are secured in place prior to transport.
- Always use a properly designed cylinder cart for moving and transporting cylinders. Never drag or roll a cylinder along the floor
- Cylinders must be chained or strapped to the cart during transport.
- Transport only one cylinder at a time.
- If transporting cylinders by elevator restrict public access during transport.
- Do not transport compressed gas cylinders through the tunnel system.

6. Storage

- Store cylinders in secure designated areas only.
- Never store cylinders at an exit.
- Never remove cylinder identity labels.
- Store and use cylinders on a "first in - first out" basis.
- Identify empty cylinders with a tag stating they are "EMPTY".
- Store empty and full cylinders separately.
- Reference the Ontario Fire Code, Part 5, Section 5.6 Compressed Gas Cylinders, for specific compressed gas cylinder storage requirements.

7. Use and Handling

- Wear safety equipment appropriate for the hazard potential.
- Inspect all gas cylinders upon receipt.
- Do not accept gas cylinders without proper caps, identification or if they are leaking.
- Secure cylinders at all times to prevent tipping.
- Secure cylinders in an upright position to a wall, cylinder rack, post or bench top using purpose made chains and straps.
- Leak test around valves and valve outlet connections.
- Use gases only in well-ventilated areas.
- Never use a gas cylinder unless the contents are clearly identified.
- Do not rely on the colour of the gas cylinder to identify the gas inside.
- Never ground a cylinder or place it near an electrical conductor, including plumbing.
- Do not transfill gas from one cylinder to another.
- Replace cylinder caps when cylinders are not in use and when being moved.

8. Valves and Regulators

- Only use the type of regulator specifically designed for the pressure level and type of gas in the cylinder. Use of the wrong regulator may result in a hazardous reaction between the gas and the materials inside the regulator.
- Always verify the correct regulator for your application.
- Always inspect regulator condition and type prior to attachment to the cylinder. The wrong regulator or a regulator with damaged threads can cause a gas leak.
- Obtain and follow manufacturer specifications for regulator attachment and maintenance procedures.
- If a valve will not open by hand, contact the supplier. Never hammer, force or pry a stuck or frozen cylinder valve to loosen it, and never use a wrench.
- Never attempt to repair a cylinder or valve.
- Do not allow grease, oil or combustibles to come in contact with valve threads.
- This is particularly important when dealing with oxidizing gases.

9. Gas Cylinders and Piping Systems

Prior to installation and use, piping systems used to deliver gas to equipment and processes require review. The following items should be incorporated into the review:

- Verify gas and piping material compatibility.
- Confirm compatibility of the gas pressure and piping system rating.
- Do not use plastic piping for any portion of a high-pressure system.
- Do not conceal gas-piping systems.
- Clearly label all piping lines and outlets as to the gas contained.
- Ensure that piping systems are designed to include valves that will prevent gas flow reversal.
- Identify the function of all valves and controls forming part of the gas delivery piping system.
- Inspect piping systems for leaks on a regular basis. This should include fittings and connections that may develop cracks.

10. Emergency Situations

In the event of an emergency in your area involving a compressed gas cylinder take the following action:

- Evacuate the area.
- Contact University Safety at 4444.
- Advise your supervisor immediately.

Appendix 10

Workplace Hazardous Materials Information System (WHMIS)

What is WHMIS:

The Workplace Hazardous Materials Information System (WHMIS) is a comprehensive national communication system for safe management and use of hazardous materials that is legislated by both the federal and provincial jurisdictions.

The WHMIS legislation requires that workers must be informed about the hazardous materials in the workplace and receive appropriate training to enable them to work safely. To accomplish this, WHMIS requires all suppliers of hazardous materials to label and prepare Material Safety Data Sheets (MSDS's) for products they make, import, package, or process that meet the hazard criteria set out in the Controlled Products Regulations under the federal Hazardous Products Act. The buyers of these controlled products must make sure that these products are correctly labelled and that MSDS's are available to those using the products. Employers must set up worker education programs to instruct workers about the WHMIS legislation, the contents and significance of labels and MSDS's, and how to work safely with hazardous materials.

In summary, WHMIS delivers the necessary information by the following means:

1. labels on containers of controlled products,
2. MSDS's for each controlled product,
3. worker training programs.

The ultimate goal of the WHMIS program is to create a safer workplace by providing workers with the knowledge and tools to enable them to work safely.

Assignment of Responsibilities:

Supplier: The supplier of the controlled product must classify the product according to the type of hazard, label it according to the regulation and provide a Material Safety Data Sheet (MSDS).

Employer: The Employer is defined under the Occupational Health and Safety Act as a person who employs one or more workers. This definition includes individual faculty as employers when they employ students under a grant. It is the responsibility of the employer to ensure the WHMIS program is implemented.

Supervisor: At the University, the employer delegates the implementation of the WHMIS program to supervisors. A supervisor is defined by the Act as a person who has charge of a workplace or authority over a worker.

It is the supervisor's responsibility to ensure the WHMIS program is implemented in the department. This includes the following:

- Identify products used in the department/lab that are controlled under WHMIS;
- Ensure that these products are correctly labelled;
- Ensure that MSDS's are available in the workplace for these products;
- Provide training to those working with these products as to the use, storage and handling of them;
- Ensure that this information is understood by the worker;
- Keep a record of this training of the worker.

WHMIS Coordinator: The WHMIS Coordinator is appointed by the Department Head to assist in implementing the WHMIS program within the department.

Worker: The Worker is defined by the Act as a person who is paid for work or services. It is the worker's responsibility to participate in the WHMIS education program, to follow the procedures and use the equipment provided, to review MSDS's and labels, and to bring items of concern to the attention of the supervisor.

JOHSC: The Act requires the Employer to develop and implement the WHMIS program in consultation with the JOHSC and to review it annually.

EHSS: Environmental Health and Safety Services provides information to those involved with the WHMIS program to assist them in meeting the requirements of the legislation.

The Three Components:

Labels: The label is the first indication to the users that the product may be hazardous. There are two types of labels, supplier labels and workplace labels. There are other means of identification when labels are not appropriate. Laboratory samples may also have different labels. Detailed information about labels is part of the WHMIS education program.

Supplier labels must appear on containers of controlled products coming into the workplace. The supplier has a legal requirement to produce and attach these labels. It is the supervisor's responsibility to ensure products coming into the workplace have a supplier label.

Workplace labels are required when controlled products are decanted into another container in the workplace. They may also be used to replace labels that have become worn or damaged.

Material Safety Data Sheets (MSDS's): The material safety data sheet is an important source of information for the worker and supervisor. The MSDS must be available in the workplace and the supervisor and worker must review the hazards of the product before work begins to ensure that proper precautions are taken.

The MSDS must include the following nine categories:

- Product Identifier and related information
- Hazardous Ingredients
- Physical Data
- Fire and Explosion Data
- Reactivity Data
- Toxicological Data
- Preventive Measures
- First Aid Measures
- Preparation Information

The information provided is expected to be comprehensive and must include what is reasonably expected to be known about the material and the hazards it may present. MSDS's from different companies may not look the same but they must contain the same basic information. Each section of a MSDS must be filled in, even if it only states: "not determined" or "not applicable".

Detailed information about the MSDS is available in the WHMIS Pocket Dictionary. This publication is available from the WHMIS Coordinator in your department or from EHSS. EHSS subscribes to the MSDS database at the Canadian Centre for Occupational Health and Safety (CCOHS) and it is accessible to anyone at the University through Communications and Computing Services.

WHMIS Training Program:

The legislation states that the WHMIS training program must include the following:

- The contents required on a supplier label and workplace label, and the purpose and significance of the information contained on the labels;
- The contents required on a material safety data sheet and the purpose and significance of the information contained on the MSDS
- Procedures for the safe use, storage, handling and disposal of a controlled product;
- Procedures to be followed when fugitive emissions are present; and
- Procedures to be followed in case of an emergency involving a controlled product.

At Carleton different types of programs are used to provide the basic training. A videotape and related handout information is available from EHSS for the supervisor to use. A computer based training program is also available from EHSS. There is a cost to the department for this program.

In addition to the basic program, the supervisor must provide specific information to the worker about the materials being used. The training program must be provided to the worker before that worker begins to work with any hazardous materials. A refresher-training program should be provided at least every 3 years. Records of this training must be kept on the Record of Training form with copies kept on file in the department and sent to EHSS.

Additional information is available from EHSS Services.

References: Occupational Health and Safety Act
WHMIS Regulation
WHMIS, A Guide to the Legislation (Ontario Ministry of Labour)

Appendix 11

Procedure for the Transportation of Dangerous Goods

The Transportation of Dangerous Goods (TDG) Act regulates the transportation of dangerous goods to and from Carleton University. Transportation of dangerous goods within the campus is not regulated by the TDG, except for explosives and radioactive material. This document outlines procedures for transportation of dangerous goods on campus and highlights the TDG requirements.

It is the responsibility of department heads and faculty whose staff or students are involved in the transporting of dangerous goods to ensure safe practices are followed on campus and the requirements of the TDG Act are met for off-campus shipments.

For additional information about these procedures, the TDG Act, or training, contact John Algie in University Safety (Environmental Health and Safety Services) at extension 8548.

1. Transportation within the Carleton University Campus

Prior to transporting dangerous goods across campus, general planning by the supervisor is required to ensure the safety of those moving the materials and others in the vicinity of the move.

General Planning

- Schedule the transport to avoid peak activity periods, special events and occupied areas.
- Review the material safety data sheets for special handling and packaging requirements.
- Provide appropriate personal protective equipment.
- Provide appropriate spill kits.
- Check the condition of the material containers.
- Use containers that can be sealed. Open top containers or containers covered with foil or plastic wrap should not be used.
- Use chemical bottle safety carriers.
- Package materials to prevent an accidental release.
- Carry only what can be safety handled.
- Use trolleys with containment edges.

Corridors and Loading Docks

Dangerous goods should not be left in corridors or at loading docks. Delivery should be to the laboratory or work area.

Elevators

Only those involved in the transportation of a dangerous good should be in an elevator during the transport. The individual in control of the material should advise others at the elevator of this restriction and notify colleagues of the plan, in case there is a spill in the elevator.

Tunnels

The use of the tunnel system to carry dangerous goods between buildings is not recommended because of the risk of fire, smoke or fumes and the effect on pedestrians in the tunnel. If other means of transportation are not suitable, the tunnels may be used provided the following precautions are strictly adhered to:

- Materials are transported at times of minimum pedestrian traffic in the tunnel;
- Only minimal quantities are transported this way;
- Spill clean-up materials accompany the transportation;
- University Safety at extension 3612 is notified in advance of the transportation.

Vehicles

Only university vehicles should be used to transport dangerous goods between buildings. Individually owned vehicles should not be used for insurance reasons.

If you are planning the transportation of explosives or radioactive material please contact John Algie at extension 8548 or the Radiation Safety Officer at 798-8353.

2. Transportation To and From the University Campus

The TDG Act applies to all shipments of dangerous goods to and from the University.

Only a carrier certified by Transport Canada may carry dangerous goods.

Only individuals who have taken training and received a certificate from University Safety may ship or receive dangerous goods.

It is the responsibility of the person requesting the transportation of dangerous goods to provide the certified individual with the necessary information required to complete the shipping documents.

When arranging a shipment of dangerous goods verify in advance that the carrier is authorized to ship the material and clarify who will provide the packaging, labels and vehicle placards.

The University has certified staff in the following departments/schools:

Architecture
Athletics
Biology
Chemistry
Civil and Environmental Engineering
Electronics Engineering
Geography
Life Science Research Centre
Mechanical and Aerospace Engineering
Physical Plant
Science Technology Centre
University Safety

Carleton University

Dangerous Goods Shipment Checklist

Check the appropriate boxes
Y = Yes; N = No; N/A = Not Applicable

If any checks are entered in the **NO** box make all necessary corrections before allowing shipment to be released.

Item	Shipping Document Questions	Y	N	N/A
1.	Is the Shipping Date entered? (4.4.(1)(a))			
2.	Is the Shipping Document Number entered? (4.4(1)(a))			
3.	Is the full name and address of the Consignor entered? (4.8(1)(a))			
4.	Is the full name and Address of the Consignee entered? (4.8(1)(b))			
5.	Is the Name of the Initial Carrier entered? (4.8(1)(c))			
6.	Is the Unit Number of the Railway Vehicle entered? Rail Only 4.8(1)(d))			
7.	For shipments including Dangerous and Non Dangerous Goods, are the Dangerous Goods correctly highlighted? (Under a separate Heading of Dangerous Goods, Highlighted in a different colour or an X in a DG/MG column opposite the shipping name) (4.6(b))			
8.	Is each item of dangerous goods entered in the following order? a) The full Shipping Name. (4.8(1)(e)(i))			
	b) The primary classification (4.8(1)(e)(ii))			
	c) For class 1 only the compatibility group (4.8(1)(e)(iii))			
	d) Every susidiary class in parentheses (4.8(1)(e)(iv))			
	e) The product identification number (4.8(1)(e)(v)			
	f) The letter "E" if applicable (4.8(1)(e)(vi))			
	g) The packing group (4.8(1)(e)(vii))			
9.	Are the words "SPECIAL COMMODITY" used if by rail and special provision 102 applied? (4.8(1)(f)			
10.	Is the flash point for all class three items entered, if by ship? (4.8(1)(g))			
11.	If subject to Schedule XII requirements do the words "Summary Emergency Response Plan" or "ERP", the plan reference Number and the plan telephone number appear? (4.8(1)(h))			
12.	Does the number of packages and containers for each item appear? (4.8(1)(i))			
13.	Is the total gross mass or volume of each item listed? (4.8(1)(i))			

Item	Shipping Document Questions	Y	N	N/A
14.	Is the net explosive quantity listed? (class1only) (4.8(1)(j)			
15.	Are all special instructions for the safe handling, storage and transportation listed, including; a) Control and Emergency Temperatures (4.8(1)(k)(i))			
	b) Requirements for chemical stability (4.8(1)(k)(ii))			
16.	Is the 24 hour emergency phone number entered? (4.8(1)(l))			
17.	Is the type and number of placards entered? (4.8(1)(m))			
18.	Do any Directions, Permits for Exemption or Permits for equivalent Level of safety apply and are the numbers listed? (4.8(1)(n)(o)(p))			
19.	Are all additional required documents attached? (4.4(1)(c))			
20.	Is the Consignors mark or signature entered? (4.4(1)(b))			
21.	Have two copies of the shipping document been provided to the initial Carrier? One for carrier and one for Consignee. (4.26(a))			
	Packing and Labeling Questions			
22.	Are the following legibly, durably and visibly displayed on each package or small container? a) The full shipping Name (5.37(1)(a))			
	b) The Product Identification Number (5.37(1)(c))			
	c) The Control and Emergency Temperatures if required (5.37(1)(b))			
	d) If by ship, the flash point for class 3 items (5.37(1)(d))			
	e) The upright arrows for packages with internal liquid containers (5.37(1)(e))			
	f) The label for the Primary Class (5.7)(1)(a))			
	g) Labels for the Primary Class (5.7)(1)(a))			
	h) If "E" is part of the classification the explosive label without words or numbers.			
	i) For PCB's the PCB Label			
	j) Any other markings as required			
	k) If the package, container or overpack is greater than 2m cubed do the markings and labels appear on two opposite sides (5.10(b))			
23.	Is each package, small container and overpack in sound condition? (TDG ACT P.4 & P.5)			
24.	Have the correct number and type of placards been given to the initial carrier? (5.5(1)(b))			
25.	Have the placards been installed prior to loading the vehicle? (5.16)			

Date:	**Checked By:**	**Signature:**

Carleton University

Shipping Document

Shipping Document Reference #: _____ (Department Code / Year-Month-Day)	**Railway Vehicle Unit #:** _____
CONSIGNOR **Name:** Carleton University **Address:** 1125 Colonel By Drive, Ottawa **Province:** Ontario **Postal Code:** K1S 5B6	**CONSIGNEE** **Name:** **Address:** **Province** **Postal Code:**

Consignor Information:

_____ name _____ signature _____ date _____ telephone

Name of Initial Carrier: _____

Dangerous Goods

Shipping Name (Technical Name) if applicable	Class Primary (Subsidiary)	Product ID Number	E if applicable	Packing Group	Number of Packages	Mass or Volume
					TOTAL	

SPECIAL INSTRUCTIONS

Marine: Class 3 Flash Point _____ **Division :** _____

4 Placards / Panels Class: _____

Emergency Telephone Number: (613) 520 - 3612 Carleton University Police & Security Services

( ) Residue Last Contained: _____

WHERE DANGEROUS GOODS ARE LISTED IN SCHEDULE XII

Summary of Emergency Response Plan. Reference Number E.R.P. _____

Telephone Number to have plan activated: _____

Reference # of permit for equivalent level of safety (If applicable): _____

NAME: _____ DEPARTMENT _____

SIGNATURE: _____ DATE: _____

Appendix 12

Designated Substances Compliance Program

Program:

Designated Substances are those substances designated as hazardous by the Ministry of Labour under the Occupational Health and Safety Act, Section 70 (2) 23. The Act defines a designated substance as:

> *a biological, chemical or physical agent or combination thereof prescribed as a designated substance to which the exposure of a worker is prohibited, regulated, restricted, limited or controlled.*

A regulation specifies procedures for control of the substance. The following substances have been designated:

Acrylonitrile (1984)
Arsenic (1986)
Asbestos (1982)
Asbestos - Construction, Building & Repair (1985)
Benzene (1984)
Coke Oven Emissions (1982)
Ethylene Oxide (1987)
Isocyanates (1983)
Lead (1981)
Mercury (1982)
Silica (1983)
Vinyl Chloride (1982)

When a designated substance is present in the workplace, the Occupational Health and Safety Act requires the employer to review the work methods and assess the likelihood of worker exposure. When there is likelihood of worker exposure, a control program must be instituted that includes engineering controls, work practices, hygiene practices, record keeping and medical surveillance, if applicable.

The Joint Occupational Health and Safety Committee (JOHSC) must be consulted with regard to both the assessment and the control program.

Environmental Health and Safety Services (EHSS) in the Department of University Safety coordinates the Designated Substances Compliance Program.

Implementation:

When a designated substance is present in the workplace, the supervisor must complete an assessment of the use of the substance. This assessment is to determine if a health hazard exists for workers and whether or not a control program is required. The assessment will include the following:

- information regarding the use, handling, storage and disposal of the designated substance,
- actual and potential exposure of workers to the substance, and
- methods and procedures required to control that exposure.

Assessment forms and copies of the Regulations for each substance are available from EHSS.

The completed document will be sent to EHSS for consultation with the JOHSC.

In some cases, further evaluation of the assessment and establishment of a control program may be required. The supervisor and department head will develop the control program. The control program includes action taken to protect workers from exposure to the designated substance and procedures to monitor exposure. Documentation of the control program will be provided to EHSS.

Appendix 13

WARNING

UNATTENDED PROCEDURE IN OPERATION

Contact(s)	Office Phone Number	Home Phone Number

EMERGENCY
CALL UNIVERSITY SAFETY AT 4444

Procedure Description

List of Hazardous Materials In Use (flammable, combustible, toxic)

Procedure Schedule	Date	Time	Signature
Start			
Completion			
Inspection Intervals			