



DEPARTMENT OF MECHANICAL AND MATERIALS ENGINEERING

SAFETY STANDARDS MANUAL

(Updated July 2016)

**For: All employees
All students
All researchers
All professors
All post-doctoral fellows
All technicians
All technologists
All administrative staff
All contractors
All visitors**

**IN CASE OF EMERGENCY
(FIRE/AMBULANCE/THEFT/SAFETY/FUMES)**

ON CAMPUS 36111

OFF CAMPUS 613-533-6111

1.0 DO's and DO NOT's while working in the LABORATORY and SHOP areas:

DO:

- READ MSDS' BEFORE WORKING IN THE LAB OR SHOP
- WEAR APPROVED SAFETY GLASSES WITH SIDE SHIELDS
- WEAR THE APPROPRIATE PROTECTIVE CLOTHING FOR THE TASK:
 - Ensure you are protected against chemical splashes, burns or cuts to exposed skin by wearing protective clothing, such as: long pants, long sleeves, socks, etc.
 - The supervisor and worker must determine what is considered appropriate protective clothing in their work area.
- WASH HANDS THOROUGHLY WITH SOAP AND WATER BEFORE LEAVING THE SHOP OR LABORATORY

DO NOT:

- SMOKE
- EAT or DRINK
- STORE FOOD or DRINKS
- WEAR: CONTACT LENSES
SANDALS , OPEN TOED SHOES or HIGH HEELED SHOES
ITEMS THAT COULD BECOME ENTANGLED IN MOVING EQUIPMENT
(ie. unconfined long hair, loose jewellery, ties or loose clothing)
- ENGAGE IN PRACTICAL JOKES / ROUGH HOUSING / PRANKS

2.0 SAFETY OFFICERS

QUEEN'S ENVIRONMENTAL HEALTH AND SAFETY:

| | | |
|--------------------------|--------------|-------|
| Director | Dan Langham | 74980 |
| Fire Safety Co-ordinator | James Dick | 74977 |
| Hazardous Materials | Tom Martinek | 74976 |
| Safety & Hygiene | Dan Langham | 74980 |
| Radiation | John Bullock | 32951 |

Department of Mechanical and Materials Engineering:

Department Head **Kevin Deluzio** - Phone # 32578

Safety officers: **Onno Oosten** – McLaughlin Hall and Jackson Hall - Phone # 78380

Charlie Cooney –Nicol Hall, and Basement, Jackson Hall, with the exception of the Physics area - Phone # 32752

Department Manager **Gabrielle Whan** - Phone # 32585

Engineering Safety Committee:

Ms. Kelly Sedore, Co-Chair
Ms. Lynn O'Malley, Co-Chair
Ms. Jacquie Brown
Mr. Christopher Cochrane
Mr. Larry Steele
Ms. Alexandria Tsimiklis
Ms. Maxine Wilson
Ms. Catherine Guernsey, Secretary
Ms. Wanda Badger
Mr. Stephen Hunt
Ms. Sarah Kauffman
Mr. Simon Smith

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Nicol Hall (1st Floor – 4th Floor)

3.0 INTRODUCTION

The purpose of this manual is to outline procedures, rules and cautions to be observed by "everyone" in the Department of Mechanical and Materials Engineering. "Everyone" includes; researchers, graduate students, undergraduate students, administrative staff, professors, technicians, technologists, post-doctoral fellows, employees, contractors, and visitors. We must all work together to ensure that the Department of Mechanical and Materials Engineering at Queen's is a safe place to work and study.

This manual is directed towards the most common activities pursued in the department. Extra precautions may be necessary in some areas because of the specific nature of local hazards. It is the responsibility of the supervisor to establish these procedures and ensure they are followed.

Safety includes: good laboratory practice; good housekeeping; environmental safety; and ensuring that equipment, buildings, and surroundings are free from hazards.

Personal safety depends on sincere safety-mindedness and good judgement on the part of each individual as an integral part of their daily activity. Most health and safety problems in a laboratory or workshop environment can be avoided by practising common sense based on informed knowledge of the hazards.

Safety audits are performed, once per year, by members of the Engineering Safety Committee to look for unsafe acts and conditions which exist in the department and to help researchers improve their health and safety practices. Equipment inspections may also be performed to ensure that safety equipment will perform properly when it is needed.

Safety audits by the fire marshal and Government inspectors can occur at any time without forewarning.

If you have any questions or concerns please contact a Departmental Safety Officer (see page ii).

4.0 EXPECTATIONS

Everyone must read this manual before commencing work in the department.

A **signed declaration**, Student/Worker Orientation Checklist, is required by each person before they begin work or study (i.e. undergraduate/graduate students doing research projects, etc.) in the department (see Form 2, pages 43-45).

Safety of **visitors** is the responsibility of the person in Mechanical and Materials Engineering who is hosting them or bringing them into the department. If a visitor will only be in Mechanical and Materials Engineering for one day or less, AND will not be performing any laboratory duties, they should be accompanied at all times so we ensure they are kept safe. If the visitor will be staying for longer than one day AND/OR they will be working in a laboratory, they should read this safety manual and sign the Department of Mechanical and Materials Engineering Safety Expectations (page 3). Under OSHA, visitor safety is our responsibility.

Anyone in Mechanical and Materials Engineering who brings in an independent **contractor** or **service person** shall ensure that:

- a) relevant safety standards are communicated to the person or company.
- b) the contractor or service person follows the Mechanical and Materials Engineering safety standards, OSHA Regulations and OSHA Industrial Regulations.

Following these safety standards and regulations is a condition of doing work in the Department of Mechanical and Materials Engineering. All contractors who enter this department must be cleared with the Safety Officer. Under OSHA, contractor's safety is our responsibility and we (Department/University) are liable for any accidents. The Safety Officer will decide if a signed declaration is necessary.

**QUEEN'S UNIVERSITY
DEPARTMENT OF MECHANICAL AND MATERIALS ENGINEERING
SAFETY EXPECTATIONS**

The safety regulations under the Occupational Health and Safety Act (OHSA) apply to all **employees, students, administrative staff, professors, researchers, contractors, technicians, technologists, post-doctoral fellows and visitors** at Queen's University. Everyone in the work place has legal duties and rights regarding OHSA.

Safety includes: good laboratory practice; good housekeeping; environmental safety; and ensuring that equipment, buildings, and surroundings are free from hazards.

Everyone is legally required and responsible for working safely, and bringing safety problems and concerns to the attention of the Department Safety Officer. We must all work together to ensure the Department of Mechanical and Materials Engineering is a safe place to work and study.

In addition to working safely themselves, **supervisors** are responsible for ensuring that individuals who report to them have a safe environment to work in, know and follow the safety rules, have available the use of proper safety equipment.

The **Department Head** has the responsibility and the authority for health and safety in the department and must provide safety standards, procedures, training, and audits to ensure compliance with OHSA.

Supervisors of any students or staff are responsible for arranging instruction and training so that the student/staff may carry out their work safely. It is required that the supervisor and student/staff fill out the Student/Worker Safety Orientation Checklist (see Form 2, pages 43-45).

5.0 QUEEN'S UNIVERSITY POLICY STATEMENT ON HEALTH AND SAFETY

Queen's University is committed to the prevention of illness and injury through the provision and maintenance of a healthy and safe campus. The University endeavours to meet its responsibilities for the health and safety of the members of its community by complying with relevant health and safety standards and legislative requirements, and by assigning general and specific responsibilities for workplace health and safety.

The University takes all reasonable steps to acquaint its employees with their rights and duties in the workplace and applicable regulations and procedures for protecting their health and safety. Where appropriate, the University establishes special arrangements and programs to assist in maintaining safe conditions and work practices and facilitating employee participation in health and safety activities, including health and safety committees.

All individuals shall protect their own health and safety by complying with prevailing regulations and standards and with safe practices and procedures established by the University. Employees must report any health hazards and unsafe conditions or practices to supervisory staff for corrective action.

It is a primary duty of all faculty and staff who are supervisors, as defined under the Occupational Health and Safety Act, to ensure that any persons under their direction are made aware of and comply with all applicable health and safety policies and procedures. They are responsible for ensuring that all aspects of the workplace, including teaching and research sites, are safe and that any risks, hazards, and safety violations drawn to their attention are investigated and corrected promptly.

This policy statement was accepted by the Board of Trustees at its regular meeting held on May 8, 2015.

QUEEN'S UNIVERSITY

POLICY STATEMENT ON ENVIRONMENTAL MANAGEMENT

Queen's University is committed to the protection of the environment through the implementation of an effective environmental management program. At a minimum, the University will comply with all applicable environmental legislation and will make every reasonable effort to exceed its formal obligations for protecting the environment, out of a sense of responsibility for the safety of the environment as a shared resource. Members of the University community shall be aware of the manner in which their activities must be conducted in order to have the least possible impact on the environment.

All departments and persons utilizing University premises shall comply with, and if reasonably possible, exceed all environmental statutes and regulations as well as Ministry of Environment policies and guidelines and internal University policies and procedures. Furthermore, it is the duty of all employees or students who are defined as a person responsible under the Environmental Protection Act to ensure that any person under their direction are made aware of and comply with all applicable environmental statutes and legislation. They shall be responsible for ensuring that all aspects of Queen's premises, including teaching and research sites, pose minimal environmental impact and that any environmental risks and/or hazards are investigated and corrected promptly.

The University shall take all reasonable steps to acquaint its employees with their duties and obligations to prevent, contain and clean up the release of pollutants generated at Queen's or as the result of Queen's activities and with the applicable regulations and procedures for protecting the environment. Where appropriate, the University shall establish special procedures and programs to assist in preventing releases of pollutants, the containment of pollutants, cleaning up spills, recycling materials and reusing them. The University shall facilitate and encourage participation in activities to protect and preserve the environment.

This policy statement was approved by the Board of Trustees at its regular meeting held on May 6th, 2016.

6.0 OCCUPATIONAL HEALTH & SAFETY ACT

In Ontario, the Occupational Health and Safety Act, has established safety regulations and laws. Items below in *italics* are direct quotations from the Act.

SUPERVISORS AND THEIR DUTIES

6.1 Definition of a Supervisor

- A "supervisor" is defined in the Occupational Health and Safety Act as *a person who has charge of a workplace or authority over a worker. A supervisor: is qualified because of knowledge, training, and experience to organize work and its performance, is familiar with the Act and the regulations that apply to the work, and has knowledge of any potential or actual danger to health or safety in the workplace* (OHSA Section 1).
- The person supervised is an employee of the supervisor or their institution or firm. This means that:

The professor directing the research of a graduate student is the direct supervisor of that student if the student is paid a salary for the research work; i.e., the student is an employee.

If graduate students do not receive a salary for their research work, being supported entirely through other funds (scholarships, savings, etc.), then they are not an employee and the professor is not their supervisor in the present sense of the Act. The Queen's University Department of Mechanical and Materials Engineering nevertheless operates on the basis that the professor in this case IS the direct supervisor of the students and morally has the same responsibilities towards them in the work place as they do towards an employee doing the same work.

6.2 Duties of Supervisor

- The duties of a supervisor (OHSA Section 27) are:
 - (1) *A supervisor shall ensure that a worker,*
 - (a) *works in the manner and with the protective devices, measures and procedures required by this Act and the regulations; and*
 - (b) *uses or wears the equipment, protective devices or clothing that their employer requires to be used or worn.*

- (2) *Without limiting the duty imposed by subsection (1), a supervisor shall*
 - (a) *advise a worker of the existence of any potential or actual danger to the health or safety of the worker of which the supervisor is aware;*
 - (b) *where so prescribed, provide a worker with written instructions as to the measures and procedures to be taken for protection of the worker; and*
 - (c) *take every precaution reasonable in the circumstances for the protection of a worker.*
- A supervisor also has special responsibilities, indicated in Section 12 of this manual, in dealing with accidents involving personal injury or death.

WORKERS AND THEIR DUTIES

6.3 Definition of a Worker/Employee

A "worker" (employee) *means a person who performs work or supplies services for monetary compensation, i.e. staff, faculty, teaching assistants, lab demonstrators, paid research assistants, post-doctoral fellows, technicians, technologist . . . but NOT undergraduate students or members of the visiting public.*

6.4 Duties of Workers

- The duties of a worker (OHS Act Section 28) are:
 - (1) *A worker shall,*
 - (a) *work in compliance with the provisions of this Act and the regulations;*
 - (b) *use or wear the equipment, protective devices or clothing that their employer requires to be used or worn;*
 - (c) *report to their employer or supervisor the absence of or defect in any equipment or protective device of which they are aware and which may endanger themselves or another worker; and*
 - (d) *report to their employer or supervisor any contravention of this Act or the regulations or the existence of any hazard of which they know.*

- (2) *No worker shall,*
- (a) *remove or make ineffective any protective device required by the regulations or by their employer, without providing an adequate temporary protective device and when the need for removing or making ineffective the protective device has ceased, the protective device shall be replaced immediately;*
 - (b) *use or operate any equipment, machine, device or thing or work in a manner that may endanger himself/herself or any other worker; or*
 - (c) *engage in any prank, contest, feat of strength, unnecessary running or rough and boisterous conduct.*

6.5 Students

Undergraduate students taking laboratory courses in the department or unpaid graduate students are not employees under OSHA. Nevertheless, it is the policy of the Department of Mechanical and Materials Engineering that instructors in these courses shall act as direct supervisors. They shall assume the same responsibilities towards the students doing laboratory work under their direction as if the students were employees AND the students shall act as workers and follow the worker guidelines for performance.

6.6 Right to Refuse or to Stop Work Where Health or Safety in Danger (OSHA Section 43)

- (1) *A worker may refuse to work or do particular work where he or she has reason to believe that,*
- (a) *any equipment, machine, device or thing the worker is to use or operate is likely to endanger himself, herself or another worker;*
 - (b) *the physical condition of the workplace or the part thereof in which he or she works or is to work is likely to endanger himself or herself; or*
 - (b.1) *workplace violence is likely to endanger himself or herself; or*
 - (c) *any equipment, machine, device or thing he or she is to use or operate or the physical condition of the workplace or the part thereof in which he or she works or is to work is in contravention of this Act or the regulations and such contravention is likely to endanger himself, herself or another worker.*

(2) *Upon refusing to work or do particular work, the worker shall promptly report the circumstances of the refusal to the worker's employer or supervisor who shall forthwith investigate the report in the presence of the worker and, if there is such, in the presence of one of;*

(a) *a committee member who represents workers, if any;*

(b) *a health and safety representative, if any; or*

(c) *a worker who because of knowledge, experience and training is selected by a trade union that represents the worker, or if there is no trade union, is selected by the workers to represent them,*

who shall be made available and who shall attend without delay.

7.0 DEPARTMENT SAFETY

7.1 General

- Know and follow the safety rules and safe procedures.
- Learn about the, equipment, chemicals and hazards which exist in your area before you undertake any work.
- Treat any unknown area, substance, or equipment as hazardous.
- If you have any questions or concerns, contact a member of the Department Safety Officer. Always report unsafe conditions and accidents promptly to your supervisor and the department safety officer.
- FIRE DOORS MUST be kept closed at all times.
- Locate all safety equipment in your work area and become familiar with their use: telephones, exits, fire extinguishers, pull boxes, safety showers and eye wash stations, first aid kits, evacuation routes and meeting sites.
- Post suitable warning signs if a hazardous situation is present (i.e. designated substances, teratogens, mutagens, carcinogens, etc.). Include your name and the extension where you can be reached. (see Form 1 “POST AT SITE OF USE”, page 42)
- Keep your area locked to avoid unauthorised entry.
- DO NOT use the elevator after normal working hours (you may be trapped in case of a power failure or elevator breakdown).
- DO NOT use the elevator in the event of a fire.
- DO NOT walk and read at the same time.
- DO NOT wear rollerblades in the building, or ride skateboards/longboards.
- DO NOT bring bicycles into the building.
- All working labs must have visual access from outside the lab.
- Use the handrail at all times when using the stairs. If you do not have a free hand, use the elevator.

- The continuous practice of good housekeeping is essential for the prevention of fires, accidents, and personal injury. A crowded or cluttered workplace is a dangerous place in which to work.
- NEVER block emergency exits, emergency equipment or electrical panels.
- Ensure drawers and doors are closed after use so they do not present a bump or trip hazard.
- Ensure shelves and bookcases are secured to the wall to avoid tipping.
- Check furniture for any loose parts or sharp edges.
- Store heavy items on the lower and middle shelves of storage areas.

7.2 Working Alone

Working alone is defined as the performance of work by a person who is out of audio and visual range of other persons. Depending on the type of work being done, the work area, and the time of day or night, working alone can be harmless or it can be dangerous.

DO NOT do the following list of hazardous activities in Mechanical and Materials Engineering when alone:

- **handling dangerous chemicals/materials,**
- **machine shop activities,**
- **ladder or scaffold work over five feet high,**
- **high voltage work,**
- **entering tanks or confined spaces for cleaning or servicing, etc.**

If it is necessary to perform **hazardous work** after hours on normal work days, on weekends, or holidays the following procedure must be followed:

1. **MUST HAVE YOUR SUPERVISOR'S WRITTEN APPROVAL and you**
2. **MUST NOT WORK ALONE.**

If you are working alone on **non-hazardous** activities after regular hours you may wish to:

- have a buddy work with you,
- keep your door locked,
- inform security that you are working alone, set up a call-back procedure, and inform them when you are leaving,
- and/or call the Walk-home Service at 613-533-9255 (within Queen's 39255) or Campus Safe Walk Program at 613-533-6080 (within Queen's 36080) when you are finished.

7.3 Promptly Report Accidents, Abnormal Wear, and Damage or Loss

- Report minor accidents, wastage of materials, and abnormal wear or malfunction of equipment to your project supervisor. Report more serious accidents, equipment breakdowns, and malfunctions to your project supervisor or, if unavailable, to either the: **Department Head, Department Safety Officer or the Department Manager (for Names and Telephone Numbers, see page ii).**

7.4 Electrical Safety

- Be familiar with the locations of circuit breakers and fuse boxes.
- Watch for frayed cords and broken plugs. Take these items out of service and have them repaired.
- Avoid the use of extension cords on the floor, which may cause a trip hazard, and if water is present, a shock hazard.
- NEVER remove the ground pin from a three-pronged plug.
- Remove electrical cords from the receptacle by grasping and pulling the plug, not the cord.
- Only trained and qualified people can construct, repair or modify electrical or electronic equipment.
- DO NOT use portable space heaters in proximity of combustible and flammable material.
- If electrical equipment emits smoke or a burning smell, shut off the power immediately and take it out of service for repair.
- Use only carbon dioxide or dry chemical extinguishers on electrical fires.

7.5 Ergonomics

The study of ergonomics is concerned with the way a job, task, or workplace “fits” the worker. Some problems which may arise if this is overlooked are: fatigue, repetitive motion injuries, monotonous work, biomechanical stresses such as strains, aches, or injuries, and eye strain from video display terminals. Design your workspace to avoid these potential problems. If problems do exist, contact your supervisor or a member of the Health and Safety Committee.

8.0 LABORATORY AND WORKSHOP SAFE PRACTICES

8.1 General

- Read and follow the guidelines on Material Safety Data Sheets (MSDS) before handling any chemical.
- Approved safety glasses with side shields are the minimum required eye protection when handling chemicals or equipment in the laboratory or shop. (see also Section 9.1 - Eye Protection)
- Wearing a lab coat which extends below the knee, when working in the shop or laboratory, is recommended. (see also Section 9.3 – Protective Clothing)
- Keep doors locked when no one is in the room.
- Aim to avoid emergencies by careful thought and planning of your work.
- Read and understand the operating instructions before attempting to operate any machine or instrument.
- Beware of moving parts of machinery. Shut down the machine to make adjustments rather than risk injuring yourself or damaging the machine. Ensure that safety shields or guards are in place.
- Be sensitive to the strength (or fragility) of materials. DO NOT exert brute force on sticky controls, bottle tops, ground-glass connections and such - there is usually a non-destructive way of freeing them. Screwed fittings should be tightened but not overdriven (extra turns will only damage or seize the threads and weaken the connection).

8.2 Laboratory - General

- Communicate with fellow researchers and advise of experiments in progress.
- Work involving hazardous materials should be done in a fume hood or in another containment facility. (see Section 9.2 – Respiratory Protection)
- DO NOT cover over windows in any laboratory. Visual access is an important part of a safety regime.
- DO NOT leave an experiment running unattended when prudence dictates that you should be there to monitor performance. Exercise control, and avert the development of critical conditions.

If it is necessary to leave an experiment unattended, post a sign on the door indicating; your name, date, what experiment is underway and who to contact in case of problems.

- Label reagents and samples according to WHMIS legislation.
Experimental codes or your initials are not sufficient.
Any person entering the lab should be able to identify the contents of a container.

8.3 Workshop – General

These guidelines are not all inclusive - other references will be necessary to cover all specific activities carried out in the workshop.

All workshop personnel shall carry out their duties and handle equipment, tools and machinery in a manner so as to keep themselves and others around them safe at all times.

See also: OSHA Industrial Regulations.

- Only trained and qualified people are allowed to use the power equipment and machinery, and welding equipment in the shop.
- Face shields are required, over safety glasses, when grinding, chipping, brushing and abrasive metal cutting, or when exposed to any activity where eye and face hazards from projectiles exist.
- Goggles are required when breaking a line or fitting which has been in service.
- Goggles or face shield, over safety glasses, are required when liquid splash hazards exist.
- Proper tool pouches are required when carrying tools on your person. DO NOT carry tools in your pockets or belt.
- Gloves are to be worn when handling ragged or hot items.
- CSA Approved Safety Footwear must be worn in the Department on jobs with hazards of foot injury (workshop area, or when handling heavy objects).
- Sleeve length varies with the job: long sleeves should be worn to minimize burn hazards and UV expose hazards when welding; short sleeves or long sleeves rolled neatly above the elbow should be worn around moving parts to minimize entanglement hazards.
- Use the proper equipment for the job being done.
- Use tools only for their intended purpose.
- Post warning signs when dangerous work is being done to eliminate traffic in the area.
- Shop load will be restricted to 6 students /technician for labs and 4 students/technician for all other times.

8.4 Designated Substances

A "designated substance" means 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 (OHSA, Section 1[1]).

The following are designated substances (O. Reg. 490/09 Designated Substances Section 2):

| | |
|----------------------------|-----------------------|
| ACRYLONITRILE | ETHYLENE OXIDE |
| ARSENIC | ISOCYANATES |
| ASBESTOS | LEAD |
| BENZENE | MERCURY |
| COKE OVEN EMISSIONS | SILICA |
| | VINYL CHLORIDE |

Compliance with the various designated substances regulations (O. Reg. 490/09 is required when handling these items). This includes the completion of a designated substances assessment and the creation of a control program, to limit exposure, when applicable. Their use should be minimized where possible. When purchasing a designated substance, contact the Department Safety Officer, and/or the Chemical Technologist.

A sign must be posted on the door of any area that contains a designated substance stating what it is and the special precautions to be taken (Form 1 "POST AT SITE OF USE", pg. 42).

8.5 Mutagens, Teratogens, and Carcinogens

These chemicals fall under various WHMIS Classes.

All of these chemicals or substances should be considered dangerous and require special care and handling according to the MSDS. They are especially dangerous to pregnant women during the first trimester. **Consult with your supervisor to discuss the potential risks in your area.**

Mutagen - a material that induces genetic changes (mutations) in the DNA of chromosomes. Chromosomes are the "blue prints" of life within individual cells.

Teratogen - an agent or material that causes physical defects in a developing embryo (most dangerous during the first three months of pregnancy).

Carcinogen - a material that has either been found to cause cancer in humans or to cause cancer in animals and therefore is considered capable of causing cancer in humans.

A sign must be posted on the door of any area which contains any of these substances stating the name, classification, and any special precautions to be taken (see Form 1 "POST AT SITE OF USE", page 42).

8.6 Good Housekeeping

- Maintain your working area in a neat and orderly condition at all times. Clean up as you work. Tidiness contributes to safety, efficiency, and pleasant working conditions.
- Promptly clean up chemicals and glassware; dismantle equipment when no longer needed.
- Keep aisles and floors clear and unobstructed.
- DO NOT use fume hoods for storage.
- DO NOT overcrowd storage areas and shelves.
- Clean up spills immediately.
- Put broken glass and small sharp objects into proper metal containers to be dumped by janitors. If you put other garbage into these containers, the janitors will not dump them and you will have to. To avoid injury, dispose garbage into a cardboard box and place box in outside dumpster.
- Benches and other surfaces shall not be littered with newspapers, paper towels, scrap paper, and outer clothing (coats, hats, boots, and umbrellas). Bench surfaces should also be free and clear of any chips from machining.
- Empty boxes/packing material must be removed from laboratory and shop areas by workers.

8.7 Workplace Hazardous Material Information System (WHMIS) (OHSA Ontario Regulation 860/90)

- WHMIS training is mandatory for all faculty, staff, students and/or volunteers who work with or in close proximity to hazardous materials. This includes individuals who fall into the following categories:
 - Supervises an employee, student or volunteer who works with or in close proximity to hazardous materials.
 - Have not received WHMIS training at Queen's University.
 - Do not have or there is no record or documentation indicating the completion of WHMIS training at Queen's University.
 - Arranges for the shipment and/or receipt of hazardous materials as per SOP-Chem-02 Transportation of Dangerous Goods.
- WHMIS training is provided by the Department of Environmental Health and Safety. Course dates and registration may be found at:
<http://www.queensu.ca/safety/courses/whmis.htm>
- Employees working with hazardous materials must also complete and pass a refresher quiz on an *annual* basis. The refresher quiz can be located at:
<http://www.queensu.ca/safety/courses/quiz/whmisrefresh.htm>
- Employees who have taken WHMIS **prior to January 1, 2000** must **retake** the WHMIS course.
- The Queen's WHMIS policy is at:
<http://www.safety.queensu.ca/safety/policy/eh&s/whmis.pdf>
- MSDS's for every chemical contained in the laboratory must be kept in a binder and stored in the WHMIS station located outside the door of the laboratory. MSDS sheets must be updated every 3 years. Updated MSDS's may be obtained from the manufacturer. When an MSDS cannot be obtained from the manufacture they may be obtained at the following: <http://www.safety.queensu.ca/chem/msds.htm>
- Read Material Safety Data Sheets (MSDS) before handling any chemical, and follow the guidelines indicated.
- Label reagents and samples according to WHMIS legislation. Experimental codes or your initials are not sufficient. Any person entering the lab should be able to identify the contents of a container.
- Keep an updated list of all chemicals in the laboratory.

8.8 Handling of Chemicals

General

The general information listed below is for your knowledge in the event you have to handle chemicals and for general handling and disposal of chemicals that you may have in your labs.

- DO NOT requisition unnecessarily large quantities of chemicals.
- Make sure containers with chemicals are properly labelled and dated. Ensure labels meet requirements of WHMIS legislation.
- Know the appropriate action to take in the event of a chemical spill. (see also Section 8.11).
- Dispose of surplus and waste chemicals promptly. For proper disposal procedures, consult with EH&S **74976**, or the supplier of the chemical (see also Section 8.12).
- Transport hazardous chemicals (i.e. solvents) and chemical waste in approved safety carriers.

Strong Acids and Bases

Examples: hydrochloric, sulphuric and nitric acids, acetic anhydride, sodium and potassium hydroxides.

- Use an approved safety carrier for carrying glass bottles of these chemicals.
- Wear personal protective equipment (gloves, safety glasses, lab coat, apron) when pouring strong acids or bases.
- In making up solutions, always pour concentrated acids into water, and not vice versa.
- In dissolving alkalise, use cold water and add the flakes or grounds of alkali slowly to avoid boiling and spattering.

Flammable Liquids [A liquid is categorized as flammable if its flashpoint is below 37.8°C]

Examples: acetone, gasoline, methanol, hexane.

- The maximum capacity of any GLASS BOTTLE in which a flammable liquid is issued and stored shall NOT exceed four litres. They are to be stored in a solvent safety cabinet. FOUR LITRE Containers are NOT recommended for routine benchwork. Maximum size for routine benchwork is ONE LITRE.
Flammables in four litre containers are to be transferred to one litre containers before using (Queen's Environmental Health and Safety and NFPA 45).
- All bottles or cans of flammable liquids with the manufacturer's seal broken should be stored in a solvent safety cabinet when not in immediate use.
- Handle these liquids in a fumehood or in a well-ventilated area.
- DO NOT handle these liquids near possible ignition sources (switches and motors that are not explosion-proof, variacs, flames, open electric heaters, etc.).

Toxic Chemicals

Examples: alcohols, ethers, ketones, halogenated hydrocarbons, benzene, toluene, carbon monoxide.

- Avoid inhalation of gases or vapours by handling these materials in a fumehood or in a well-ventilated area.
- Avoid contamination of skin by wearing personal protective equipment.
- Review your working area regularly, remove hazardous chemicals promptly and dispose of properly.

8.9 Bottled Compressed Gases

Examples: hydrogen, methane, carbon dioxide, oxygen, argon, acetylene, propane, and ammonia in cylinders

READ THE FOLLOWING CAREFULLY:

- Purchase the smallest quantity necessary in reusable cylinders.
- Cylinders of compressed gases must be properly secured at all times (individually chained cylinders are preferred).
- All explosive gases must have suitable flame arrestors somewhere in the system. These arrestors can be placed on the tank valve, in the distribution valve or body or in the operating nozzle or torch (eg. an acetylene torch).
- When moving gas cylinders, use the carts available for that purpose. Secure the cylinder to the cart with a strap, chain, or tie. **NOTE: the Cylinder Cap must be in place.**
- NEVER attempt to move or lift a cylinder by holding onto the collar at the top. The collar is not welded to the cylinder and may dislodge.
- NEVER drop a cylinder and prevent any violent collision with another object.
CAUTION: compressed gas cylinders are potential rockets!
- Use the correct type of pressure regulator for the given gas and cylinders. Never interchange regulators. Note that the threads of some connectors may be left-handed.
- NEVER oil or grease the threads, and DO NOT use Teflon tape on valves, regulators, or in making connections with cylinders.
- DO NOT lay gas cylinders down for use. They must be upright and secured against falling (usually a chain or strap is used).
- Replace the cylinder cap when the cylinder is disconnected.
- When returning empty cylinders, close the valve before shipment – this leaves some positive pressure in the cylinder.
- Return empty cylinder promptly to shipping area. Mark cylinder "**EMPTY**" or "**MT**".

- Full and empty cylinders should not be stored together. Serious flow reversals can occur when an empty cylinder is attached to a pressurized system. Use check valves to avoid this problem.
- Open the cylinder valve slowly with the reducing valve closed (reducing valves close by turning counter-clockwise). With the cylinder valve open, slowly turn the reducing valve clockwise until the desired pressure is reached. To shut off gas, close the cylinder valve first. Keep both valves closed when the gas is not in use.
- When venting flammable, toxic, or corrosive gases, established waste disposal procedures must be followed. **CAUTION: some gases auto-ignite.**
- When discharging gas into a liquid, a trap or suitable check valve must be used to prevent liquid from entering the cylinder or regulator.
- NEVER use a flame or subject any part of a compressed gas cylinder to high temperatures.
- All gas delivery components shall be leak-tested when the bottle is changed.
- Lubrications shall never be applied to the high pressure side of oxygen or oxidizer regulator.

8.10 Chemical Storage

- Follow MSDS for storage suggestions and restrictions.
- Only authorized personnel should have access to chemicals.
- DO NOT store chemicals alphabetically.
- Put the date on the label when chemicals are received.
- Segregate the following groups from each other: acids, bases, flammables, water reactives, and oxidizers. NOTE: segregation means walls or distance.
- Ensure adequate ventilation.
- Ensure all containers are in good condition and properly labelled.
- Store chemicals away from direct sunlight or sources of heat.
- Store flammables in approved fire safety cabinets.
- Store solids above liquids.
- Properly dispose of empty, old or surplus chemicals.
- DO NOT stack chemical containers.
- DO NOT overcrowd shelves.
- Glass items should NOT be stored above eye level. If this is not possible, ensure a proper safe step stool is available to ensure no one uses chairs or climbs on counter tops.
- DO NOT store hazardous chemicals on high shelves out of easy reach.
- Keep corrosives away from metal containers and heat sources.
- Flammable liquids should only be stored in explosion-proof refrigerators or freezers if recommended by MSDS.
- DO NOT store items protruding beyond the shelf edge.
- Clean off containers from any drips or spills before returning container to storage.
- NEVER have too much of one chemical stored in your lab. Use chemical stores for bulk storage.

8.11 Spills

- Spills shall be cleaned up **IMMEDIATELY**.
- Clean up small spills of water, non-hazardous solutions and solvents by sponging them up with absorbent material, so as to prevent the spill from entering floor drain.
- In the case of spills of acids or bases in the laboratories, promptly dump over the spill a quantity of "soak sand" (10 % soda ash) from a Spills Bucket, which can be obtained from the Safety Officer. As indicated below, seek help to ensure safe and proper cleanup.
- In the event of a mercury spill, contact EH&S **32999**.
- In the case of spills of liquids or of any materials to sewer, or an environmental release, promptly seek help from one of the following and then assist in accordance with directions:
 - your lab instructor or project supervisor, or
 - the hazardous material technician in EH&S **32999**.
 - If the above are unavailable call **36111**.
- If there are people in the area of the spill, ask someone to stand guard at a safe distance away to divert traffic while you look for help.
DO NOT assume that a spill is too small to bother with - even the tiniest spills of mercury should be cleaned up as quickly and thoroughly as possible.
- **In the case of spills of acids, bases, or other dangerous water-miscible solutions or liquids on your person, use eyewash fountains and safety showers unhesitatingly and speedily. REMOVE contaminated clothing (AVOID MODESTY).**
- Report any spills to the sewer to the Hazardous Material Safety Technician in Queen's Environmental Health and Safety **32999**.

8.12 Waste Disposal

- **Waste organic solvents** shall be put in marked containers upon which you request from your supervisor or Department Safety Officer for disposal regulations. Solvents must **NEVER** be dumped down a drain.
- **Strong acids and bases** shall be separated and stored in a suitable container ready for disposal by Safety Department.
- **Glass and metal wastes** shall be placed in containers provided for this purpose. **No other waste shall be placed in these containers.**
- **Needles and syringes** should be disposed of in a container marked "**SHARPS**".
- **Solid wastes other than metal or glass**, reasonably inert, dry and of low bulk density shall be placed in garbage containers provided.
- If directions for special waste disposal in connection with your project have not been provided by your project supervisor, or if a problem arises, speak to your supervisor, or the EH&S Technician for Hazardous materials **32999**, about how to proceed.

PLEASE OBSERVE THE GREATEST CAUTION AND PRUDENCE IN WASTE DISPOSAL. BE ESPECIALLY WARY OF THE POSSIBILITY OF DANGEROUSLY REACTIVE MIXTURES OR UNSTABLE PRODUCTS.

8.13 Lock-Out

All sources of power (electrical, pneumatic, hydraulic, potential, chemical, etc.) must be de-energized before attempting to fix a piece of equipment or clear a jam. Pressing the stop button alone does not offer the worker any protection against someone restarting it.

Power must be locked with a padlock to which only one key exists and it is in the possession of the person doing the work. Next test the start button to ensure the power has been disengaged before starting work. A tag or sign should be attached to the lock or equipment so others will be aware of the problem. If two or more people are working on the same piece of equipment then each person must have their own lock on it. In some cases moving parts must be blocked to prevent movement.

Some pieces of equipment, machines, or pipelines will require locking out or disconnecting several power sources at once to make the job completely safe.

8.14 Heat Trapping

Equipment shall be sufficiently insulated to protect personnel and equipment from over-exposure to heat or cold.

8.15 Boilers and Pressure Vessels Act

Be aware of the Boilers and Pressure Vessels Act and the exceptions to the act. A copy of the Act is Available from the Dept. Safety Officer.

8.16 Equipment and Lab Operating Procedures

When hazardous machinery or flammable liquids or gases are being used in a lab, a procedures and operating manual should be posted in the lab, be made available to all students operating in that lab and a copy should be kept by the Supervisor and the Department Safety Officer.

9.0 PERSONAL PROTECTIVE EQUIPMENT and SAFETY EQUIPMENT

Be aware of the safety clothing and equipment available for your use and under which circumstances you are required to wear or use them. It is the responsibility of the supervisor to provide the required equipment. It is each person's responsibility for maintaining equipment in good condition.

(See Diagrams 1 to 13 – McLaughlin Hall, Jackson Hall and Nicol Hall - Appendix A)

9.1 Eye Protection

Determine the possibilities of flying particles, splashes and spills when determining the appropriate eye protection needed for a job.

- **Contact Lenses** must not be worn when handling chemicals.
- **Safety Glasses with side shields** (approved safety glasses only) are the minimum protection needed when working with equipment or chemicals in any laboratory or shop. Safety glasses provide protection against flying objects and only partial protection from splashing liquids, and provide no protection against irritating vapours.
- **Goggles** provide protection against impact, dust, vapours and splash hazards.
- **Face Shields** provide protection to the entire face and neck area against splashes or flying particles. Face shields must be worn in conjunction with safety glasses or goggles.
- **Welding Goggles and Helmets** provide protection from sparks and UV.

9.2 Respiratory Protection

- **Dust Masks** protect from particulate matter.
- **Respirators** protect from “fine particulate” and vapours. Example: when grinding or sanding dusty materials a simple dust mask is **not** sufficient and a correct fitting respirator with super fine particulate filters is recommended.
- **Fume Hoods** protect from toxic or noxious fumes or vapours. They are to be used whenever toxic or noxious fumes or vapours from acids, bases or reactions are created. Fume hoods should also be used whenever large amounts of vapours from solvents are evaporated.

9.3 Protective Clothing

Protective Clothing is designed to protect a person's skin and clothing from damage or injury caused by splashes or spills of chemicals, excessive heat, or falling objects.

- **LAB COATS**, which extend below the knee, are recommended in all laboratory work areas and must be buttoned up to be effective.
DO NOT wear your lab coat outside of the lab unless you are going to another lab.
DO NOT wash a contaminated lab coat with other laundry.
- **LEATHER SLEEVES and APRONS** provide spark and UV protection when welding.
- **LONG PANTS** are required in the shop to protect from metal chips and sharp edges like sheet metal.
- **GLOVES** are used for protection against skin contact or cuts when handling certain chemicals, hot or cold objects, glass and UV and spark protection when welding.
Ensure that all exposed skin is covered and that gloves and sleeves overlap.
 - **Different glove materials have different chemical permeabilities.** Gloves must be chosen carefully from the different types of gloves available in order to have the best protection for specific procedures and chemicals.
 - **Rubber or synthetic gloves** are to be worn when handling solvents, corrosive chemicals, or toxic substances which may enter the body by absorption through the skin.
 - **Discard gloves at first sign of deterioration.** Prolonged contact with some types of chemicals can cause deterioration of gloves and loss of their protective capability. Gloves should be kept as clean as possible and inspected regularly.
 - **Always remove your gloves** before leaving the lab.
 - **Wash** your hands after removal of gloves.
 - **DO NOT wear gloves** around moving machinery.
- **FOOTWARE - CSA Approved Safety Footwear** must be worn in the Department on jobs with hazards for foot injury (workshop area, or when handling heavy objects).

9.4 Head Protection

All persons are required to wear hard hats when working in designated areas such as the Heating Plant or on any job involving a hazard of head injury.

9.5 Hearing Protection

Hearing protection (i.e. ear plugs, ear muffs) is recommended in areas of >80dB, and **is required at >90dB**. A noise level survey can be conducted on your work area by contacting Queen's Environmental Health & Safety at **32999**.

9.6 Fire Equipment

The department has three types of extinguishers:

- **Carbon Dioxide** - the most useful type for general lab purposes. A cloud of CO₂ gas (heavier than air) plus some "snow" is discharged through the nozzle. When directed at the base of the fire, the CO₂ gas halts combustion by displacing oxygen.
- **Dry chemical** - contains powdered sodium bicarbonate which is propelled by carbon dioxide or nitrogen. It is effective on flammable liquids.
- **Water** - NOT to be used on OIL or ELECTRICAL fires.

9.7 First Aid Equipment

- **McLaughlin Hall** - Kits are located in:
 - Solar Lab - Room 406 (4th floor)
 - Main office – Room 317 (3rd floor)
 - Room 215 & 215B (Tech Shop) (2nd floor)
 - Machine Shop (1st floor)
 - Loading Bay (1st floor)
 - Dyno Lab – Room B2 (Basement)
- **Jackson Hall** – Kits are located in: Room 008 (Basement)
- **Nicol Hall** – Kits are located in:
 - Room 413 (old Electrical Shop) (4th floor)
 - Room 302 (3rd floor)
 - Main Office - Room 228 (2nd floor)

There are a limited number in the department since OSHA stipulates that for each first aid kit there must be one trained person and one back-up available to help the injured person. **The names of the qualified first aid people, with telephone numbers, are posted on each kit and on the safety bulletin board.**

- **Eyewash Stations** are to be used if something enters the eye. The eye should be held open and flushed for **10-15 minutes** minimum. After flushing seek **medical attention**.

10.0 EMERGENCY EQUIPMENT AND PROCEDURES

Definition

In the definition officially used at Queen's:

AN EMERGENCY IS AN INCIDENT, ACCIDENT OR OTHERWISE, WHICH REQUIRES IMMEDIATE ACTION TO PREVENT LOSS OF LIFE, PERSONAL INJURY, SEVERE PERSONAL HARDSHIP OR LOSS OR DAMAGE TO UNIVERSITY PROPERTY OR EQUIPMENT.

10.2 General Advice

When faced with an emergency:

- Try to remain calm; **DO NOT PANIC.**
- As quickly as you can, size up the situation and decide what to do.
- If you are in personal danger, plan first to get to safety, second to activate fire alarms and/or summon aid, and third to do what you can to bring the situation under control. **Put life ahead of saving property.**
- Consider what chain of events may follow, in view of the existing situation. If possible, take steps to prevent or limit any further incidents and complications. Act yourself or communicate your ideas to those in charge.
- If there is danger that the area affected by an emergency may grow, take steps to ensure that this threat is recognized and dealt with (warn people in adjacent areas to leave or take appropriate action, warn those in charge, etc.).
- If you are informed to leave the area; make your area safe, if time permits, by turning off hazardous experiments or equipment and closing the door; and then leave promptly. **DO NOT** re-enter the area until you have been cleared to do so.
- If you feel you cannot assist in dealing with the situation, leave the emergency area and stay away. Make sure that those involved in the operations know you are safe, should there be any question.
- **DO NOT** use the emergency telephones for other than emergency calls. During a serious emergency, **DO NOT** use any telephones for other calls.

10.3 Emergency Reporting Procedures

The emergency reporting procedures are shown in **Figure 1, Page 41**.

Please read these procedures carefully and be sure to follow them in the event of an emergency.

Note: Queen's maintains an Emergency Report Centre to provide a central point where emergency situations on campus can be reported regardless of when they occur. The personnel at the Centre have been instructed on the action to take in response to emergency calls. It is important that they receive sufficient details of the emergency to enable them to react properly.

10.4 Emergency Features and Equipment in McLaughlin Hall

Diagrams 1 to 5 (Appendix A) , show the safety features of the Basement, First Floor, Second Floor, Third Floor and Fourth Floor.

10.5 Emergency Features and Equipment in Jackson Hall

Diagrams 6-9 (Appendix A), show the safety features of the Basement, First Floor, Second Floor, Third Floor and Fourth Floor.

10.6 Emergency Features and Equipment in Nicol Hall

Diagrams 10-13 (Appendix A), show the safety features of First Floor, Second Floor, Third Floor and Fourth Floor.

11.0 BUILDING EVACUATION PLANS

11.1 Preparedness and Prevention

Familiarize yourself with the location and use of all fire extinguishers, fire alarm switches and fire exits in your area.

Report any matters relating to fire hazards to the Department safety officer.

11.2 IN CASE OF FIRE

- 1) Notify others in the immediate area that there is a **"FIRE"**.
- 2) Leave the fire area and close the doors and windows.
- 3) Activate nearest wall-mounted fire alarm.
- 4) **DO NOT** attempt to extinguish the fire if you cannot do it safely.
- 5) Assist physically impaired people to a safe location (stairwell or office with a telephone).
- 6) Check to ensure the fire area has been evacuated.
- 7) Leave building promptly - **DO NOT USE ELEVATOR**.
- 8) Phone the Emergency Report Centre at **36111** or **9-911**.
- 9) Remain in the area to guide Fire Department to scene of fire and location of physically impaired people.
- 10) **DO NOT re-enter building until authorized** to do so by the Fire Department.

11.3 When the FIRE ALARM Sounds

- 1) Leave the building quickly through the appropriate fire escape exit (see Sections 11.4, 11.5 and 11.6). **DO NOT USE ELEVATOR**.
- 2) The safety officer will go to the other side of the street across from the main door, where he will await the arrival of the Fire Department to direct them to the location of the fire.
- 3) Be available to the safety officer to pass on any information.
- 4) Personal safety permitting, there will be a staff member directing the evacuation of each floor and who will verify that all personnel are safe and accounted for once they are out of the building.

11.4 Fire Exits - McLaughlin Hall

Basement

- **Primary Route:** Out the east crash door and across Lower University Ave.
- **Secondary Route:** Up the rear stairs to the parking lot driveway door and across Lower University Ave.

First Floor

- **Primary Route:** Out the main entrance door to Stuart Street and proceed to the opposite side of the street.
- **Secondary Route:** Down the rear stairwell, out the rear exit door and across Lower University Ave.

Second Floor

- **Primary Route:** Down the main stairs, out the main entrance door to Stuart Street and proceed to the opposite side of the street.
- **Secondary Route:** Down the rear stairwell, out the rear exit door and across Lower University Ave.
- **Third Route:** Through rooms 215, 215A or 215B, out the door opening onto the east fire escape and across Lower University Ave.

Third Floor

- **Primary Route:** Down the main stairs, out the main entrance door to Stuart Street and proceed to the opposite side of the street.
- **Secondary Route:** Down the rear stairwell, out the rear exit door and across Lower University Ave.
- **Third Route:** Through room 315, out the east fire escape and across Lower University Ave.

Fourth Floor

- **Primary Route:** Down the west side stairwell, out the main entrance door to Stuart Street and proceed to the opposite side of the street.
- **Secondary Route:** Out the east side exit door, across the roof to the east fire escape and across Lower University Ave.

11.5 Fire Exits – Jackson Hall

Basement

- **Primary Route:** Out the North or South doors and proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).
- **Primary Route (Room 001):** Out the front door exit and proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).

First Floor

- **Primary Route:** Out the main entrance door and proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).
- **Secondary Route:** Out through the rear window/fire exit, down the fire escape and then proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).

Second Floor

- **Primary Route:** Down the main stairs, out the main entrance door and then proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).
- **Secondary Route:** Out through the rear window/fire exit, down the fire escape and then proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).

Third Floor

- **Primary Route:** Down the main stairs, out the main entrance door and then proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).
- **Secondary Route:** Out through the rear window/fire exit, down the fire escape and then proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Clark Hall (Book Store).

11.6 Fire Exits – Nicol Hall

First Floor

- **Primary Route:** Out the east side entrance door and proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Bruce Wing, Miller Hall.
- **Secondary Route:** Out the main entrance or rear exits and proceed to the opposite side of Fifth Field Company Drive to the steps of Bruce Wing, Miller Hall.

Second Floor

- **Primary Route:** Down the main stairs, out the main entrance and proceed to the opposite side of Fifth Field Company Drive to the steps of Bruce Wing, Miller Hall.
- **Secondary Route:** Down the rear stairs, out the rear exit door and proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Bruce Wing, Miller Hall.

Third Floor

- **Primary Route:** Down the main stairs, out the main entrance and proceed to the opposite side of Fifth Field Company Drive to the steps of Bruce Wing, Miller Hall.
- **Secondary Route:** Down the rear stairs, out the rear exit door and proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Bruce Wing, Miller Hall.

Fourth Floor

- **Primary Route:** Down the main stairs, out the main entrance and proceed to the opposite side of Fifth Field Company Drive to the steps of Bruce Wing, Miller Hall.
- **Secondary Route:** Down the rear stairs, out the rear exit door and proceed to the opposite side of the street (Fifth Field Company Drive) to the steps of Bruce Wing, Miller Hall.

12.0 PROCEDURES IN THE EVENT OF ACCIDENT INVOLVING INJURY OR DEATH

12.1 Accidents Involving Injuries

The supervisor (see Section 6.1) is responsible for ensuring that the procedures below are followed. The supervisor should be contacted immediately after an accident, if they are not available contact the Department Safety Officer or Department Head or Department Manager. (see Figure 1, page 41)

- **Apply first aid.** First aid should be given by someone who has had appropriate training.
- **In the case of minor injuries that cannot be satisfactorily treated by first aid, or if there is any doubt,** the injured person shall be sent or taken to the hospital emergency centre, or the doctor of their choice.
- **In the case of injuries that are more than minor** the injured person should, after giving first aid as is immediately necessary and possible, be taken to the Kingston General Hospital Emergency Centre.

If the person is severely injured, or if in any doubt, an ambulance should be called immediately **36111**.

A SEVERELY INJURED PERSON SHOULD NOT BE MOVED without the advice of medical or ambulance personnel.

12.2 Accidents Involving Critical Injury or Death

"Critically injured" means an injury of a serious nature that,

- (a) places life in jeopardy,
- (b) produces unconsciousness,
- (c) results in substantial loss of blood,
- (d) involves the fracture of a leg or arm but not a finger or toe,
- (e) involves the amputation of a leg, arm, hand or foot but not a finger or toe,
- (f) consists of burns to a major portion of the body, or
- (g) causes the loss of sight in an eye.

In the event of a critical injury:

- **Immediately** call **36111** for assistance.
- As soon as possible, notify (a) Supervisor; (b) the Head of the Department or Safety Officer, and (c) Queen's Environmental Health and Safety. Queen's Environmental Health and Safety will notify the appropriate government agencies.
- The following pertinent excerpt from the Act should be noted by all:

"..... no person shall, except for the purpose of

(a) saving life or relieving human suffering;

(b) preventing unnecessary damage to equipment or other property

interfere with, disturb, destroy, alter, or carry away any wreckage, article or thing at the scene of or connected with the occurrence until permission so to do has been given by an inspector.

12.3 Accident Reports

The supervisor must ensure that the necessary reports are completed and submitted to the Department Safety Officer and Queen's Environmental Health & Safety as soon as possible. All forms are available in the main office.

1. WSIB "Worker's Report of Injury/Disease"
(Form 0006A).
2. WSIB "Functional Abilities Form for Timely Return to Work"
(Form 2647A 01/98).
3. WSIB "Employer's Report of Injury/Disease Form 7"
(Form 0007A 01/98).
4. WSIB "Employer's Subsequent Statement"
(Form 0009C 01/98).

Note: Form # 3 must be submitted to Queen's Environmental Health and Safety within **24 hours** of the accident and they will forward it to WSIB. The WSIB will levy a penalty of \$250 and you may also be liable, on conviction, to a fine of up to \$25,000 for late submission of the report.

12.4 On Calling Ambulances

- 1) **Call 36111**, the local ambulance telephone number.
- 2) **Give the location of the injured person.**

"There has been an accident in the Mechanical and Materials Engineering Department at Queen's.

Please send an ambulance for an injured person located in:

Room ##, McLaughlin Hall on Stuart Street – use the _____ door".

Room ##, Jackson Hall on Fifth Field Company Drive – use the _____ door".

Room ##, Nicol Hall on Union Street – use the _____ door".

Note: If possible, have someone go to the building entrance to meet the ambulance attendants at the door and lead them to the injured person. This is particularly necessary when the outside doors are locked (during hours when the building is closed).

13.0 RESPONSIBLE CARE

Responsible Care is the **RESEARCH & DEVELOPMENT CODE OF PRACTICE - JUNE 1990**. The department of Mechanical and Materials Engineering has adopted the use of this code as its standard in August 2001.

13.1 Purpose

- Successful practices will result in new products, processes and uses which present an acceptable level of risk to employees and customers, the public at large and the environment.
- Responsible Care results in public and employee confidence in research and development.

13.2 General

- Includes: health & safety, hazard identification, training, information, and documented results.
- Security considerations include: access by the public, after hours work by employees, and access to confidential information.
- Compliance with the Code should be reviewed in regular performance assessments.
- Responsibility and accountability must be clearly assigned.

13.3 Guidelines for Safe Projects and Activities

- R&D operations will not occur unless they can be done in accordance with this Code.
- Project checklists should include: (checklists are available in the main office)
 - identify any/all health, safety & environmental hazards;
 - special personal protection equipment needed;
 - written standard operating procedures;
 - training;
 - waste handling and spill containment;
 - investigate long-term effects of chemicals, etc.;
 - regular reviews of project status for continuation or cancellation, new hazards, etc.
- Projects include new procedures for an existing facility, change in raw materials etc.
- Each new project or activity must have: a written policy on health and safety, and waste; training; MSDS for all chemicals, products and by-products; and documentation of results.
- Records should be kept in dated, bound lab notebooks which are regularly checked and signed by the project supervisor. Reporting of results done in this manner will be ethical

and maintain the legal value of the data.

FIGURE 1:

**EMERGENCY REPORTING PROCEDURES TO BE
FOLLOWED IN THE DEPARTMENT OF
Mechanical and Materials Engineering**

**QUEEN'S EMERGENCY REPORT CENTRE: (24-HOUR SERVICE)
LOCAL 36111**

REPORT ALL EMERGENCIES IMMEDIATELY to one of the following:

| | ROOM | LOCAL | HOME |
|---|----------|-----------------|----------------------------|
| YOUR SUPERVISOR | | | |
| Dr. Kevin Deluzio Department Head | McL 323A | 32578 | (retracted in web version) |
| Onno Oosten Safety Officer | McL 215 | 32572/ 78380 | (retracted in web version) |
| Charlie Cooney Safety Officer | Nic 205B | 32752 | (retracted in web version) |
| Gabrielle Whan Department Manager | McL 303B | 32585 | (retracted in web version) |

FORM 1:

POST AT SITE OF USE (and provide one copy to the Safety Officer)

This area contains the following DESIGNATED SUBSTANCES *, and/or TERATOGENS, and/or MUTAGENS and/or CARCINOGENS:

| CHEMICAL(S) | CLASS | QUANTITIES |
|-------------|----------------------|------------|
| | Designated Substance | |
| | Teratogen | |
| | Mutagen | |
| | Carcinogen | |

Name of User:

PRINT _____

SIGN

Supervisor:

PRINT _____

SIGN

Special Precautions Needed:

Date: _____

- * · Acrylonitrile · Coke Oven Emissions · Mercury ·
· Arsenic · Ethylene Oxide · Silica ·
· Asbestos · Isocyanates · Vinyl Chloride
· Benzene · Lead ·

FORM 2: Student/Worker Safety Orientation Checklist

This checklist is intended to serve as a guide to supervisors for orienting new staff, faculty, students and others (i.e. post doctoral fellows, visitors/volunteers, summer students, 4th year students doing research projects, etc.) and to assist them in carrying out their work safely in the laboratory. This checklist also serves to provide a summary of training received. Certificates for WHMIS, Radiation Safety, First Aid, CPR courses must be kept on file in the Department's main office.

This checklist is required to be completed with all new students/workers within the *first two weeks* of their arrival in the laboratory and the signed checklist must be kept on file in the Department's main office. **Return to the Department's Safety Officer.**

All pertinent safety information can be found on the Queen's University Environmental Health and Safety website <http://www.safety.queensu.ca/>

Please review the following websites:

[Health and Safety Management System](#) [Policy Statement on Health & Safety](#)
[Policy Statement on Environmental Management](#)

Please either (check) or (N/A) the boxes below

BASIC LAB SAFETY

- [] WHMIS training has been discussed.
 - [] the student/worker has already obtained training _____ (please give details)
 - [] the student/worker is registered to obtain training on _____ (date)
- [] the student/worker has been shown the location of fire alarms, extinguishers and exits
- [] the student/worker knows whom to call in case of an accident/injury and knows and understands the reporting process
- [] the student/worker has been instructed not to wear open-toed shoes or contact lenses and to keep long hair tied back, etc.
- [] the student/worker has been instructed not to eat or drink in the lab and not to apply make-up in the laboratory
- [] the student/worker has been instructed to avoid when possible, working alone. If, for some reason, hazardous work must be performed outside normal working hours then the following procedure must be followed:
 1. The work must have your supervisor's approval,
 2. A second co-worker must be available in case of an emergency, or
 3. The Emergency Report Centre (36111) and/or Campus Security (36733) must be contacted to set up a check-in routine with you; and they must be contacted once your work is completed. If you are working late at night, both the Campus Security Escort Service (36080) and the A.M.S. Walk-home Service (39255) are available.

BASIC LAB SAFETY (continued)

-] the student/worker has been instructed in the use of personal protective equipment (i.e. lab coat, safety footwear, gloves, safety glasses, etc.)
-] the supervisor and student/worker have discussed the physical requirements of the job

CHEMICAL LAB SAFETY

-] the student/worker has been instructed on the safe and proper handling of common laboratory reagents
-] the student/worker has been instructed in the safe handling and disposal of dangerous substances (e.g. acids, phenol, formalin, etc.)
-] the student/worker has been shown the location of the eyewash and safety shower and how to operate each station – DO NOT pull the handle of the safety shower during this orientation checklist
-] the student/worker has been instructed on the appropriate measures to take in case of a chemical spill
-] the student/worker has been instructed **not** to wear lab coats and gloves out of the designated lab area

RADIATION LAB SAFETY

-] the student/worker has been made aware of the regulations that govern the use of radioisotopes in Canada (from Radiation Safety Course)
-] the student/worker has been listed as an authorized user on the supervisor's radioisotope permit
-] radioisotope or sealed source safety training has been discussed with the student/worker
 -] the student has already obtained training at Queen's University
 - _____ (please give details)
 -] the student is registered to obtain training on _____ (date)
-] the student/worker has been given clear instructions regarding the lab rules (i.e. in-house procedures) for radioisotope work
-] the student/worker has been given detailed instructions on record keeping for radioisotopes as well as on their safe disposal
-] the student/worker has been instructed on the appropriate measures to take in case of a radioactive spill or exposure

BIOHAZARD LAB SAFETY

- [] the student/worker has received instruction on the safe handling of biohazardous tissues
- [] the student/worker has been taught the safe handling and decontamination procedures for the techniques performed in the lab
- [] the student/worker has read the Biohazards Safety Manual and the appropriate Biohazard Emergency Protocol specific to your laboratory
- [] the student/worker has been introduced to the faculty members in charge of the biohazard rooms
- [] the student/worker has been instructed on the appropriate measures to take in case of a biohazard spill, exposure or incident

TRAINING

List ALL formal training the student/worker has completed or requires to do his/her work.

| TYPE OF TRAINING | Registration Date for Training | Completion Date of Training | Student/Worker's Initials | Certificate on file? |
|-----------------------------------|--------------------------------|-----------------------------|---------------------------|----------------------|
| WHMIS | | | | |
| Radiation Safety | | | | |
| First Aid | | | | |
| CPR | | | | |
| Crane, Hoist & Rigging | | | | |
| Transportation of Dangerous Goods | | | | |
| | | | | |
| | | | | |

Name of student/worker (print) _____

Student/Worker's signature _____

Supervisor's signature _____

Date _____

NOTE: The completed checklist must be returned to the Departmental Safety Officer.

Appendix A

Diagrams

Safety Equipment Location Plan

McLaughlin, Jackson, Nicol Halls