



THE
ROBERT M. BUCHAN
DEPARTMENT OF MINING

Queen's University
The Robert M. Buchan Department of Mining
Goodwin Hall

**LABORATORY & DEPARTMENTAL
SAFETY MANUAL**

Release date: January 2013

**This manual is intended to inform, and should be referred to,
by any and all of the following:**

**Employees
Students
Researchers
Professors
Post-doctoral fellows
Technicians
Administrative staff
Contractors
Visitors**

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

UNIVERSITY TELEPHONES	36111
FROM ANY OTHER TELEPHONE	613-533-6111
Non-Emergency	613-533-6733

ROBERT M. BUCHAN DEPARTMENT OF MINING SAFETY MANUAL

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INTRODUCTION

The purpose of this manual is to outline procedures, rules and cautions to be observed by "everyone" in The Robert M. Buchan Department of Mining. "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 Robert M. Buchan Department of Mining at Queen's is a safe place to work and study.

The manual is divided into two sections. Part one outlines specific rules and regulations for each of the laboratories located on the 1st, 2nd and 4th floors. Part two deals with general safety rules, which should be adhered to throughout the department.

Supervisory personnel for each area within the department will be identified. Any safety concerns for a particular area should be addressed to the appropriate supervisor. Throughout this manual the term laboratory "supervisor" shall be taken as that defined in the Ontario Occupational Health and Safety Act. In addition to the above, safety concerns may also be addressed to The Robert M. Buchan Department of Mining Occupational Health and Safety Committee.

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.

A Safety Bulletin Board is located on the fourth floor and on the basement floor of Goodwin Hall. They contain important safety information and should be checked regularly for new additions. Supplements to this manual and/or up-dated laboratory rules may be issued from time to time as circumstances warrant. Such supplements or changes will be posted in the laboratories.

Safety equipment (glasses, face shields, aprons, gloves, masks etc.) will be supplied in the laboratories requiring them. Individuals must supply their own safety shoes.

Members of the safety committee to look for unsafe acts and conditions that exist in the department and to help researchers improve their health and safety practices perform safety audits. Equipment inspections are also performed to ensure that safety equipment will perform properly when it is needed.

If you have any questions or concerns please contact a member of the Queen's Environmental Health and Safety Department, the Departmental Safety Committee or the Applied Science Joint Health and Safety Committee. They are as follows:

SAFETY OFFICERS

Queen's Environmental Health and Safety

Dan Langham Director 74980

Robert M. Buchan Department of Mining Safety Committee

Dr. Takis Katsabanis Acting Head of Department, *Overall responsibility for safety*
Room: 353
Local: 33294

Wanda Badger Administrative Assistant, *Department Safety Officer*
Room 353
Local: 77137

Oscar Rielo Mining Engineering Technologist
Room: 220
Local: 32194
Cell: 449-6463

Maritza Bailey Mineral Processing Technician
Room: 436
Local: 32195

**Faculty of Engineering and Applied Science
Joint Health and Safety Committee
MEMBERSHIP**

	NAME	DEPT.	PHONE	E-MAIL
Worker – Chair	Steven Hodgson (CUPE)	Chemical Engineering	36679	hodgsons@chee.queensu.ca
Management – Co-Chair	Wanda Badger	Robert M Buchan Department of Mining	77137	wanda.badger@mine.queensu.ca
Secretary	Bonnie Hamilton	Engineering and Applied Science	32055	reception@appsci.queensu.ca
Committee Membership	Maritza Bailey (W) (CUPE)	Robert M Buchan Department of Mining	32195	bailey-m@mine.queensu.ca
	Jacque Brown (W) (QUSA)	Mechanical & Materials Engineering	32829	brownj@me.queensu.ca
	Hamid Falahati (W) PSAC901	Fuel Cell Research Centre - Chemical Engineering	613-547- 6700 Ext. 247	hamid.falahati@queensu.ca
	Stephen Hunt (M)	Engineering and Applied Science	78290	stephen.hunt@appsci.queensu.ca
	Lynn O'Malley (M)	Chemical Engineering	32766	lynn.omalley@chee.queensu.ca
	Yazan A. Qasrawi (SGPS)	Civil Engineering	78713	yazanqasrawi@ce.queensu.ca
	Steve Tanner (M)	Engineering and Applied Science	75806	steve.tanner@queensu.ca
	Adam Walker (M)	Engineering and Applied Science	75488	walkera@queensu.ca
	Gabrielle Whan (M)	Mechanical & Materials Engineering	32585	gabrielle.whan@me.queensu.ca
	Maxine Wilson (W) (QUSA)	Civil Engineering	74228	maxine@civil.queensu.ca
	Scott Yam (F) (QUFA)	Electrical & Computer Engineering	75235	scott.yam@queensu.ca
Environmental Health & Safety Representative	Dan Langham (Jennifer Spencer)	Environmental Health & Safety	74980	dan.langham@queensu.ca jennifer.spencer@queensu.ca

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 policies 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 approved by the Board of Trustees at its regular meeting held on December 7th, 2012.

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 December 7th, 2012.

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

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 considered an employee and the professor is not their supervisor in the present sense of the Act. The Queen's Robert M. Buchan Department of Mining 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.

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 in dealing with accidents involving personal injury or death.

WORKERS AND THEIR DUTIES

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.

Duties of Workers

The duties of a worker (OHSA Section 28) are:

- 1) *A worker shall,*
 - *work in compliance with the provisions of this Act and the regulations;*
 - *use or wear the equipment, protective devices or clothing that their employer requires to be used or worn;*
 - *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*
 - *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,*

- *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;*
- *use or operate any equipment, machine, device or thing or work in a manner that may endanger himself/herself or any other worker; or*
- *engage in any prank, contest, feat of strength, unnecessary running or rough and boisterous conduct.*

Students

Undergraduate students taking laboratory courses in the Department, or unpaid graduate students, are not employees under OHSA. Nevertheless, it is the policy of The Robert M. Buchan Department of Mining that the instructors in these courses shall act as direct supervisors, assuming 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.

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*
 - (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.

EXPECTATIONS

Everyone, except undergraduate students, must read this manual before commencing work in the department. Undergraduate students have a separate manual, which is located on our web site and is aimed at their specific laboratory work situations, including the general departmental safety standards from this manual.

A **signed declaration** statement is required by each person before they begin work or study in the department (next page).

Safety of **visitors** is the responsibility of the person in Mining who is hosting them or bringing them into the department. If a visitor will only be in Mining for one day or less, AND will not be performing any laboratory duties, they should be accompanied at all times so to 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 Robert M. Buchan Department of Mining Safety Expectations declaration (next page). Under OHSA, visitor safety is our responsibility.

Anyone in Mining 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 Mining safety standards, OHSA Regulations and OHSA Industrial Regulations.

Following these safety standards and regulations is a condition of doing work in the Robert M. Buchan Department of Mining. All contractors who enter the Robert M. Buchan Department of Mining must be cleared with the Safety Officer. Under OHSA, 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
ROBERT M. BUCHAN DEPARTMENT OF MINING
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. 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 Robert M. Buchan Department of Mining 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; and have available, and use 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.

I, _____ (*Name*) _____ have read, understand, and will comply with the above safety expectations, and the Robert M. Buchan Department of Mining Laboratory and Departmental Safety Manual. I understand that non-compliance could lead to withdrawal of privileges in the Department.

Signature: _____ Date: _____

Supervisor's Acknowledgement

I, _____ (*Name*) _____ have discussed the relevant sections of the Mining Laboratory and Departmental Safety Manual, and other project-related health and safety background information with the above-mentioned individual.

Signature: _____ Date: _____

Note: PLEASE OBTAIN AN ORIGINAL OF THIS FORM FOR SIGNATURES FROM THE DEPARTMENT SAFETY OFFICER AND RETURN SIGNED ORIGINAL TO SAFETY OFFICER FOR FILING.

REMEMBER!

COMMON SENSE LEADS TO SAFETY

Common sense should govern your actions at all times while working in the laboratories or other areas, regardless of what is said or left unsaid in this manual. Plan your job actions ahead of time so as to minimize safety hazards. Positioning beakers at the edge of benches or where they are likely to be knocked over, carrying too large a load or too many flasks at one time etc. are all examples of actions that common sense dictates not be done.

THINK SAFETY

DEPARTMENT SAFETY

General

Know and follow the safety rules and safe procedures.

Learn about the chemicals, equipment, 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 Committee. 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. (telephone, exits, fire extinguishers, pull boxes, safety shower and eyewash, first aid kit, evacuation route and meeting site).

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 page 61](#)).

Keep your area locked to avoid unauthorized entry.

The elevator shall not be used other than during normal working hours (you may be trapped in case of a power failure or elevator breakdown). The elevator is not a fire exit and shall not be used in the event of a fire.

Do not walk and read at the same time.

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 that drawers and doors are closed after use so they do not present a bump or trip hazard.

Ensure that 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.

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.

There are certain activities in Mining, which should not be done alone: handling dangerous chemicals, ladder or scaffold work over five feet high, and high voltage work. People should work alone only if there is minimal potential for a serious accident to occur which might render the person helpless to call for assistance.

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 or Campus Security Escort Service when you are finished.

Hazardous work performed after hours on normal work days, on weekends, or holidays should be kept to a minimum. If these activities are necessary the following procedure must be followed:

- 1) After hours, laboratory work must have your supervisor's approval.
- 2) Set up a buddy system with a friend, or 613-533-Walk
- 3) Call security at **36733** to tell them who you are, what you are doing, your location and phone number, how long you expect to be, and who to contact in case of emergency. They will then set up a check-in routine with you.
- 4) Call security when you have completed your work.

On-campus Walk-home Service
613-533-WALK (9255)

Campus Security Escort Service
If Walk home is off duty call and request an escort
36080 (on campus)
613-533-6080 (off campus)

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 they are unavailable, to either the Head of Department, Department Safety Officer or Laboratory Technician. [See page 7 for room numbers and telephone numbers.](#)

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 that may cause a trip hazard.
- Never remove the ground pin from a 3-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 the 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, halon, or dry chemical extinguishers on electrical fires.

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.

SPECIFIC LABORATORY USER REGULATIONS

General Laboratory Rules:

The following rules will apply to all students and staff.

Normal operating hours for ALL Mining laboratories are 8:30 am – 4:30 pm Monday to Friday.

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.

Wearing a lab coat which extends below the knee, when working in the laboratory, is recommended.

Keep doors locked when no one is in the room.

Aim to avoid emergencies by careful thought and planning of your work.

Certain equipment and hazardous chemicals, identified in the following sections of this manual, may only be utilized during normal operating hours and under the conditions of use specified. Other equipment, similarly defined, may be used after normal operating hours only with written permission from designated Supervisory Staff.

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 or guards are in place.

The use of any equipment or chemicals requires prior permission from the designated laboratory Supervisory Staff. In **ALL CASES**, an adequate degree of competency must be demonstrated by the user before permission will be granted to use equipment or chemicals.

Users must obey all laboratory rules of operation, including:

- specific safety regulations in effect for that area (hard shoes, safety glasses etc. to be worn)
- cleaning the work site and putting all equipment, glassware etc. away immediately after use
- no equipment may be moved from any laboratory without permission from the site supervisor, and
- no "fooling around" will be tolerated in any of the laboratory areas at any time

FAILURE TO OBSERVE THESE RULES WILL RESULT IN THE IMMEDIATE LOSS OF LABORATORY PRIVILEGES.

It is expected that any person or group using these facilities will make every possible effort to keep the area clean, neat and safe. The laboratory facility is not to be regarded as a storage site for equipment or materials which will hamper access to existing equipment or which will interfere with normal laboratory teaching or research operations.

Any equipment or materials not properly identified, or which have been laced or stored in laboratory areas without prior permission of the area supervisors, will be discarded.

ROOM 120 - Basement Rock Mechanics Laboratory

Supervisory Staff for the Rock Mechanics Laboratory (Room 120) consist solely of the Area Supervisor and Rock Mechanics Technician (Dr. J. F. Archibald and Mr. O. Rielo). No other persons should be considered to have authority to permit access or use of equipment in these facilities by unauthorized staff or students.

Laboratory equipment that is housed within this area may be used under the following rules:

Restricted Access

There are no pieces of equipment/apparatus presently existing within this basement laboratory facility that may be totally restricted from use by persons other than the principal laboratory supervisors.

Limited Access

Specific laboratory equipment items, notably:

- a) any of the powered saws (table, band, metal cutting, diamond)
- b) any welding/cutting torch equipment
- c) any bench mounted drills (drill press, diamond drill)
- d) the machine lathe

may only be used when appropriate Supervisory Staff are in attendance within the immediate laboratory area and only during regular University hours of operation. Permission to use such equipment must first be obtained, either in writing or verbally, by students (graduate or undergraduate) or other University staff from the appropriate laboratory Supervisory Staff.

Unrestricted Access

All other equipment (non-powered machinery) may be used by staff or students of the Mining Department on an unrestricted basis.

ROOM 220 - Rock Mechanics Laboratory

Supervisory Staff for the Rock Mechanics Laboratory (Room 220) consist solely of the Area Supervisor and Rock Mechanics Technician (Dr. J. F. Archibald and Mr. O. Rielo). No other persons should be considered to have authority to permit access or use of equipment in these facilities by unauthorized staff or students

Laboratory equipment that is housed within this area may be used under the following rules:

Restricted Access

Under no circumstances will students (either graduate or undergraduate) be permitted to operate either of the servo-controlled, electro-hydraulic compression test frames (MTS frames) unattended. Operation of such equipment is only to be permitted when under the direct control of Supervisory Staff or by authorized Queen's University staff (to be designated by Supervisory Staff).

Unrestricted Access

Students and staff may utilize all other laboratory equipment that exists in this site during regular University hours of operation without direct supervision. Such equipment will include heating ovens, sieve sizing apparatus, manually-operated hydraulic load frames, the Brazilian tensile strength test frame, drafting tables, freezer/humidity curing chamber unit and other assorted apparatus.

ROOM 449 - Mine Ventilation (Radiation) Laboratory

Supervisory Staff for the Mine Ventilation (Radiation) Laboratory (Room 449) consist solely of the Area Supervisors (Drs. J. F. Archibald, E. M. DeSouza, P. Katsabanis). No other persons should be considered to have authority to permit access or use of equipment in these facilities by unauthorized staff or students.

Laboratory equipment which is housed within this area may be used under the following rules.

Restricted Access

There are no pieces of equipment/apparatus presently existing within this laboratory facility which may be totally restricted from use by persons other than the principal laboratory supervisors.

Limited Access

Specific laboratory equipment items, notably:

- a) sealed radiation sources - Pylon Radon source, radon calibration cells
- b) scintillation detectors
- c) powered pumps
- d) gas chromatograph
- e) calorimeter

may only be used when appropriate Supervisory Staff are in attendance within the immediate laboratory area and only during regular University hours of operation.

Unrestricted Access

All other equipment (non-powered machinery) may be used by staff or students of the Mining Department on an unrestricted basis.

MINERAL EXTRACTION LABORATORIES

EQUIPMENT USER REGULATIONS

1. The following applies to all Mineral Extraction Laboratory users and includes all staff, graduate and undergraduate students.
2. Supervisory Queen's Staff for the Mineral Extraction Laboratories consist of Dr. S. Kelebek, Dr. J. Peacey, Dr. C. Pickles and Ms. Maritza Bailey.
3. Normal operating hours for the Mineral Extraction Laboratories are 8:30 am - 5:00 pm Monday to Friday.
4. Certain equipment and hazardous chemicals, specified in the following sections, are to be used only within normal operating hours. The remaining equipment and non-hazardous chemicals may be used after normal operating hours, but such usage will require special written permission from one of the Mineral Extraction Supervisory Staff.
5. The use of any equipment or chemicals requires prior permission from one of the Supervisory Staff. In all cases an adequate degree of competency by the user of the required equipment or chemicals must be demonstrated.

RESTRICTED EQUIPMENT AND CHEMICALS

Usage restricted to normal operating hours with Supervisory Staff approval.

- 1) All crushers (large and small jaw, Gyratory and rolls).
- 2) High Tension (Electrodynamic) Separator.
- 3) Fire assay fusion furnace.
- 4) Fire assay cupellation furnace.
- 5) Hot plates for the purpose of fuming acids.
- 6) Pressure oxidation reactors.
- 7) Chemicals with an IDLH level less than 50.
- 8) Any designated substance.

NOTE: It should be understood that FAILURE TO OBSERVE ALL SAFETY RULES AND REGULATIONS WILL RESULT IN THE IMMEDIATE LOSS OF LABORATORY PRIVILEGES.

EXPLOSIVES TEST SITE USER REGULATIONS

The following applies to all users of the Explosives Test Site and includes all staff, researchers, students and visitors. It should be understood that the following is in addition to the FEDERAL EXPLOSIVES ACT and other Federal regulations governing the use of explosives.

General Rules

Supervisory Staff for the Explosives Test Site are: Dr. P.D. Katsabanis and Mr. O. Rielo. No staff, researcher, student or visitor is permitted anywhere on Test Site property without the approval of one of the supervisors.

Appropriate eye, foot and skin protection must be worn by everyone on the property.

THERE WILL BE "NO SMOKING" AT ANY TIME ON THE TEST SITE PROPERTY
Matches, lighters and firearms must be kept secured in the Preparation Room when not being used for a specific purpose or must be stored temporarily in a designated vehicle on the property.

Test Site staff have the right to examine personal possessions of anyone leaving the property.

DETONATIONS OF EXPLOSIVE MATERIALS

Everyone in the blasting area must be inside either the firing bunker or the Preparation Room while explosive charges are being detonated. Persons outside the blasting area must not enter the area during a firing session until informed that firing has ceased. Persons inside the blasting area are responsible for informing those outside that firing has ceased.

One long siren, whistle or air horn will be sounded thirty seconds prior to detonation. **"Fire in the Hole"** will also be hailed.

During local thunderstorms there is a danger from atmospheric electrical disturbances, therefore no explosive testing is to be carried out during such times.

Should an explosive charge misfire, two minutes must elapse before anyone leaves the bunker. Safety fuse ignited charges must not be approached for at least 30 minutes or until all signs of smoke and/or fire have ceased.

FIRE FIGHTING

Small fires can be controlled (contained) to the blast site area due to the geographical surrounding. Fires outside this area will have to be reported to the Central Frontenac Fire Department (279-2935) or South Frontenac Bedford District Fire Department (273-2109). For emergencies, you may also call 911.

Burning explosive materials will be left to burn.

IN THE EVENT OF ACCIDENT

Non-Explosive

Any substances, electrical supplies, or other circumstances that may further injure, or cause injury to rescue personnel, should be removed, neutralized or dealt with in an appropriate manner.

Explosive

- The cause of any pre-detonations should be corrected or neutralized immediately if there is the likelihood of an immediate repercussion. Substances which may cause further injury should also be removed to a safe place.
- Phone Abbot Explosives at 549-5495 if further explosive removal is required.
- All personnel should evacuate the Test Site if the main mode of transportation leaves. Safety of personnel is an absolute priority. However, if at all possible, explosive products should be placed in a secure place. Everything else should be left in place pending an investigation.

First Aid

Any injury should be assessed and, if it is deemed that the person should not be moved, attempt to administer first aid and phone 911 for an ambulance.

If the person can be moved, transportation can be started to meet the attending ambulance in Verona. Inform the 911 operator of your intention and give your estimated time of arrival in Verona. If the injury does not require an ambulance, transport to the Emergency Department of either the Kingston General Hospital or the Hotel Dieu Hospital.

Report the injury to the Administrative Assistant of the Mining Department (Wanda Badger) during working hours or to the Queen's emergency centre at 533-6111 after hours.

GENERAL LABORATORY SAFETY RULES

W.H.M.I.S. Training

With the exception of undergraduate students using the lab for the purpose of completing an assigned laboratory project, all users of the laboratory facilities within the Robert M. Buchan Department of Mining must have either completed W.H.M.I.S. training or be enrolled in the first possible course offered during the term.

Handling of Chemicals/Preparation for Using Chemicals

General

- Do not requisition unnecessarily large quantities of chemicals.
- Make sure containers with chemicals are properly labelled and dated (get labels at the Mining Office). Ensure labels meet requirements of WHMIS legislation.
- Know the appropriate action to take in the event of a chemical spill. (See page 37).
- Dispose of surplus and waste chemicals promptly. For proper disposal procedures, consult with the Mineral Processing Technician, or the supplier of the chemical, or the Hazardous Material Safety Technician in Queen's Environmental Health and Safety **32999**.

Know your chemical. Before using any chemical the users should familiarize themselves with the toxicity data and other hazard information concerning the chemical. Reactions with other chemicals which may be used in the process must also be recognized and precautions taken.

Know the location, in the lab, of the spill kits, antidotes, fire extinguishers, special safety equipment etc. that might be required when using your chemical.

Transportation of Chemicals

Moving chemicals from lab to lab should be avoided where possible. If necessary however, the chemical should be transported in rubber safety buckets. All chemicals must be closed to the atmosphere while being moved. No chemicals can be removed from a laboratory without permission of the appropriate supervisor.

Transport hazardous chemicals (i.e. solvents) and chemical waste in approved safety carriers, which can be obtained from the safety officer.

Dispensing Chemicals

Protective Clothing: Face shields, rubber aprons and protective gloves must be used while dispensing all acids, liquid bases and solvents.

Strong Acids and Bases: All strong acids, bases and other reagents which may evolve toxic or irritant gases must be dispensed from a fume hood. For example: hydrochloric, nitric, acetic and sulphuric acids ammonium hydroxide, sodium hypochlorite bromine, hydrobromic acid and solutions of bromine salts

Use an approved safety carrier for carrying glass bottles of these chemicals, which can be obtained from the Mineral Processing Technician.

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 alkalis, use cold water and add the flakes or grounds of alkali slowly to avoid boiling and spattering.

Solids: Normally solids may be weighed out in the lab provided that caution is taken to prevent contact with skin. Some solids do give off harmful fumes and suitable precautions should be implemented if that is the case. An example of this type of chemical would be calcium hypochlorite which evolves strong chlorine fumes when the lid is removed from the container.

Solvents/Flammable/Toxic Liquids: All flammable liquids and solvents must be dispensed in a fume hood away from any open flame or other source of ignition. Avoid inhalation of gases or vapours. Any liquid with a flash point below 37.8°C and a vapour pressure below 275 kilopascals absolute at 37.8°C is considered to be flammable. The maximum sized container which can be used to dispense flammable liquids within the Department is 2.5 litres.

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

Examples of flammable liquids are:

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. FOUR LITRE CONTAINERS ARE NOT

RECOMMENDED FOR ROUTINE BENCHWORK. They are to be stored in a solvent safety cabinet. 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 fume-hood 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.).

Storage of Chemicals

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, oxidizers. 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.

Flammable Liquids: All flammable liquids must be stored in glass bottles with cap on and placed in the metal flammable liquid safety cabinets. The largest container volume which may be stored is 2.5 litres and no more than 2.5 litres of any one liquid is permitted. Note: there is a possibility of explosion when opening any bottle containing ether if it has been stored for a long period of time. Stored ether bottles must have the storage date written on the label. If the ether has not been used for a year, it should be turned over to the Department of Occupational Health and Safety for disposal.

Acids, Liquid and Bases: All concentrated acids, except those in use in the dispensing fume hood, must be stored in the vented storage cabinets located in the basement analytical lab and in room 443. Concentrated ammonium hydroxide, except that in the dispensing fume hood, must be stored in the storage area under the fume hoods in the same two locations. Strong oxidants such as hydrogen peroxide, bromine etc. may be stored in the freezer in room 120.

Prepared Solutions: All solutions being stored for future use must be properly labelled and the label must include the preparation date, concentration level and any other information which would be required for the safe handling of that chemical. Such solutions should be stored in "under the bench cupboards" near where they are being used. Solutions should be disposed of when no further use is envisaged. **N.B. - See the following section on disposal of chemicals for the correct procedure.**

Disposal of Chemical/Waste Solutions

Solvents must **NEVER** be dumped down laboratory sinks.

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 laboratory technician, 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.**

Solutions Containing Metal Salts: Solutions containing heavy metals must not be poured down the sink. Any such solution must be stored in a safe container, labeled and given to one of the area supervisors for disposal.

Solvents/Flammable/Toxic Liquids: Solvents, flammable liquids etc. must not be poured down the sink. Place any used solvents or flammable liquids in a properly labeled safety can and give to the laboratory supervisor.

Acids and Bases: Very dilute acids and bases may be poured down the sink and flushed with copious amounts of water.

Chemical Spills

Spills shall be cleaned up immediately.

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 Mineral Processing Technician. As indicated below, seek help to ensure safe and proper cleanup.

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 lab technician, or a member of the Department Safety Committee, or Hazardous Material Safety Technician in Queen's Environmental Health and Safety **32999**.

If 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, for example, 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**.

Acids, Bases and Solvents: There are spill kits for acids, bases and solvents in all laboratories where it is permitted to use these chemicals. Follow the instructions on the kits to deal with large spills. Small spills of acids and bases may be diluted with an appropriate volume of water and then sponged up with paper towels. Use rubber gloves while doing this. Solvents may be sponged up also but without diluting. Place the wet paper towels in a plastic bag, label it and give it to the laboratory supervisor for disposal.

Mercury: Notify the laboratory supervisor immediately of any spills of mercury, regardless of size. Use the mercury spill kits located in lab 449 to deal with any size mercury spill. Follow the instructions on the kit. Give the kit to the laboratory supervisor (normally the supervisor will be present during the clean up). The kit should then be returned to the Department of Occupational Health and Safety as soon as possible.

Heavy Metal Solutions: Any large spills of solutions containing heavy metals (Pb, As, Ag, Hg etc.) must be vacuumed up in the "labvac" located in lab 120 near the lathe. The solutions should then be bottled, labelled and given to the laboratory supervisor. Small spills may be soaked up with paper towels and the wet towels placed in plastic garbage bags.

Solid Chemicals: Non-Hazardous, non-toxic dry chemicals which will not react with water or organic material to form dangerous by products (NaCl, KG, CaCO₃ etc.) may be placed in plastic bags and put in the garbage. Hazardous material must be placed in an appropriate container, labelled and given to the area laboratory supervisor. **N.B. - Check with the lab supervisor if you are at all unsure of how reactive your spilled chemical is.**

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 (OHS Chapter 321 1.6, Chapter 0.1 Section 1[1]).

The following are designated substances:

ACRYLONITRILE
ARSENIC
ASBESTOS
BENZENE
CARBON DISULFIDE
CARBON TETRACHLORIDE
COKE OVEN EMISSIONS
ETHYLENE OXIDE
ISOCYANATES
LEAD
MERCURY
SILICA POWDER
STYRENE
VINYL CHLORIDE MONOMER

Special precautions, as dictated in the OSHA books on designated substances, must be taken when handling these items. Their use should be minimized where possible. 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, page 62](#)). When purchasing a designated substance, contact the Department Safety Officer, and/or the Mining Processing/Rock Mechanics Technician.

Mutagens, Teratogens, and Carcinogens

These chemicals fall under WHMIS Class D - Poisonous and Infectious Material, Division 2 Materials causing other toxic effects (toxic over time).

All of these chemicals or substances should be considered dangerous and require special care and handling according to 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 that contain any of these substances stating the name, classification, and any special precautions to be taken.

Toxic Chemicals or Gases

Examples of Toxic Chemicals or Gases are:

ALCOHOLS
ETHERS
KETONES
HALOGENATED HYDROCARBONS
BENZENE
TOLUENE
CARBON MONOXIDE (gas, not chemical)

- Avoid inhalation of gases or vapours when handling these materials in a fume-hood 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.

Radioactive Materials

Use of Radioactive Substances

Recognized Areas of Use: There are currently three laboratories where it is permitted to have or use radioactive material. These are rooms 138, 436 and 452. If any one wishes to use radioactive material in any area other than room 138 or 449, they must contact, and receive permission from, the Departmental Safety Officer and/or Dr. J. Archibald.

Handling Radioactive Material. No person other than Dr. J. Archibald or the Radioactive Isotope license holder for the X-Ray Fluorescence Analyzer are permitted to handle radioactive material.

Use of Instruments Containing Radioactive Material

X-Ray Analyzers: Any person using the X-Ray Fluorescence Analyzer (X.R.F.), situated in room 138 or the X-Ray Spectrometer in room 436, is required to:

Obtain prior permission from the laboratory supervisor.

Wear a radiation monitor badge at all times while using the instrument.

Sign the log book, showing the date and length of time spent at the X.R.F.

4) Wipe up all sample dust from the bench and sample cup area using a damp cloth. Rinse the cloth out thoroughly after use.

N.B.: Although the X.R.F. is shielded and uses only low yield isotopes, caution should be exercised at all times so as not to be exposed to the radiation. Don't get curious and look inside the shielded isotope container. Cleanliness is important. If any ore material is spilled inside the sample housing, notify the laboratory supervisor so that it may be cleaned up. Don't clean it yourself

Dust Control

Designated Dust Areas

N.B. There are three lab areas which have been designated as dust zones. Any person engaged in or who is planning to do any work which is likely to create a dust problem should do so in one of the designated areas. Remember: the dust you create is a health hazard for all people in the area, not just the one creating it. The three areas are:

(a) Comminution Lab The comminution lab is equipped with a dust exhaust system connected to all the crushing equipment. As well, there is a sample preparation bench connected to the system which should be used for rolling or mixing dusty samples.

b) Cement Preparation Room: There is a special room in the Rock Mechanics lab which must be used for all cement preparation (back fill, rock bolts etc.). This room is also connected to the dust exhaust system in the comminution lab.

c) Rock Lathe and Grinder: The rock lathe is equipped with a dust vacuum system which must be operating when any rock sample is being treated.

Use of Designated Dust Areas

Crushing of Ore: There are special laboratory rules, shown on [page 25](#) , which govern the use of all of the crushing equipment in the comminution lab. These rules must be followed. The dust system must be turned on when crushing or sizing ore. Dust masks should be worn during crushing and sizing operations. Face shields and/or safety glasses must be worn when operating either the large jaw crusher or the gyratory crusher.

Sample Preparation: Dust masks must be worn when mixing, coning and quartering, rolling or doing any other job which creates dust. Samples should be rolled and riffled on the special dust bench located beside the ovens with the appropriate vent(s) open.

Use of High Pressure Air: The high pressure air lines in the comminution lab are equipped with safety nozzles but they still must not be pointed at anyone. Dust should be blown towards the entrance of exhaust ducts and NOT out into the lab.

Rock bolt and Back Fill Cement Preparation Room: Large quantities of cement should be poured and mixed in the cement room with the door closed and the exhaust fan running. Dust masks should be worn. Smaller cement charges (less than 1 kg) may be prepared in the open, but masks should still be worn.

Grinding On The Lathe: Special rules are in effect which govern the use of the lathe. Check with the laboratory supervisor before using. When grinding rock cores, the vacuum system must be connected to the lathe and turned on.

Good Housekeeping

Maintain your working area in a neat and orderly condition at all times. Clean up as you work. Tidiness is an important factor contributing to safety, efficiency, and pleasant working conditions.

Promptly clean up chemicals and glassware, and 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, umbrellas).

Empty boxes and packing material must be removed from laboratory and shop areas by workers.

Be familiar with the Workplace Hazardous Material Information System (WHMIS)(OHS Ontario Regulation 644/88)

All supervisors are required to provide WHMIS training for workers who come in contact with hazardous goods (Bill C-70).

Read Material Safety Data Sheets (MSDS) before handling any chemical, and follow the guidelines indicated.

Maintain a paper file of MSDS sheets in the laboratory for every chemical contained in the laboratory. MSDS sheets must be updated every 3 years. (www.msdssearch.com)

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.

Bottled Compressed Gases

Examples of Bottle Compressed Gases:

HYDROGEN
METHANE
CARBON DIOXIDE
AMMONIA IN CYLINDERS

Purchase the smallest quantity necessary in reusable cylinders.

Cylinders of compressed gases must be properly secured at all times. (Individually chained cylinders are preferred).

When moving gas cylinders, use the carts available for that purpose. Secure the cylinder to the cart with a strap, chain, or tie. **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.

Compressed gas cylinders are potential rockets! Never drop a cylinder and prevent any violent collision with another object.

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 - leaving 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 suck-back 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.

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.

Heat Trapping

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

FIRE SAFETY

The department has two types of extinguishers:

Carbon Dioxide is 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.

Fire Extinguishers and Alarms: Become familiar with the location and type(s) of fire extinguishers available in your work area. Make sure the correct type is available to you if required. Determine the location of the nearest fire alarm box and know how to use it.

Fire Doors: Fire doors are in place at the ends of all hallways and at each laboratory entrance to stop the spread of fire. To be effective, the fire doors must be kept closed at all times.

Smoke and Fumes: If smoke or fumes from an unknown source are detected, notify the laboratory supervisor immediately or, if deemed sufficiently serious, phone 36111 and/or pull the fire alarm.

Reporting of Incidents. All fires must be reported to the Departmental Safety Officer (Mrs. Wanda Badger), regardless of size.

Small Contained Fires

Safety First: Attempt to extinguish fires yourself only if it can be done safely and quickly. If there is any possibility of chemicals being in the fire or other hazardous material (flammable liquids for example) near by, then do not attempt to put out the fire. Common sense must dictate your actions, but remember.

Safety comes first.

If you are fighting the fire, then call for help, loudly, before using the appropriate fire extinguisher.

Electrical Fires: If a small electric fire occurs in instruments, hot plates etc., turn off the power immediately before attempting to extinguish the fire. Do not put water on an electrical fire. All the laboratories are equipped with type ABC extinguishers which are suitable for this type of fire.

Large Fires or Fires of Unknown Origin

Alert all people in the area by shouting "FIRE, FIRE, FIRE". Vacate the fire area immediately and close the doors.

Actuate the nearest wall mounted fire alarm station.

Evacuate the building, but do not use the elevators. Remain in the area outside, to guide Fire Department personnel to scene of the fire.

Do not re-enter the building until authorized to do so by the Fire Department.

First Aid Equipment

First Aid Kits are available in the following areas (see floor plans on pages 54):

- Basement Lab - GOO 120
- Rock Mechanics Lab - GOO 221
- Mining Office - GOO 354
- Mineral Processing Lab - GOO 436

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.

A **Stretcher** is located near the main entry to the lab.

Safety Showers are used for large chemical spill contact on a person.

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

Respiratory Protection

Fumehoods are used for work involving hazardous or malodorous materials.

DO NOT USE THE HOOD IF THE EXHAUST FAN IS NOT WORKING.

The hood is not a substitute for personal protective equipment. Wear gloves, apron, safety glasses, etc. as needed.

All chemicals and equipment are to be used 6 inches behind the sash during experiments.

If possible, set up equipment several inches above the working surface to maintain efficient air flow. Ensure the equipment is stable.

Close the sash completely whenever the hood is on and unattended or during a no hands-on part of the experiment.

All electrical devices should be connected outside of the hood to avoid sparks that may ignite a flammable or explosive chemical.

Clean all chemical residue from the hood after each use.

Dust Masks protect from particulate matter but are useless against chemical vapours.

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.

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 in any laboratory or shop area.

Approved **Safety Glasses with side shields** are the minimum protection needed when working with chemicals or equipment in any laboratory or shop. You may choose to have your prescription eye glasses hardened (Queen's will pay \$20 for this service) AND put removable side shields on them OR purchase prescription safety glasses with built in side shields. 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 used in conjunction with safety glasses or goggles.

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.

Aprons are used when acid splashes are possible.

Gloves are used for protection against skin contact or cuts when handling certain chemicals, hot or cold objects, or glass. Gloves should not be worn around moving machinery.

There are many different types of protective gloves available and they must be chosen carefully to offer the best protection for specific procedures and chemicals. Be aware that different glove materials have different chemical permeabilities.

Ensure that all exposed skin is covered and that gloves and sleeves overlap.

Rubber or synthetic gloves are to be worn when handling solvents, corrosive chemicals, or toxic substances that may enter the body by absorption through the skin.

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. Discard gloves at first sign of deterioration.

Always remove your gloves before leaving the lab.

Wash your hands after removal of gloves.

Approved Safety Footwear must be worn in the Department on jobs with hazards of foot injury (laboratory area, or when handling heavy objects).

Head Protection

All persons are required to wear hard hats when working on any job involving a hazard of head injury. Hard hats are available from the main office and should be returned there after use.

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**.

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.

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 asked 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 instructed 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.

Emergency Reporting Procedures

The emergency reporting procedures are shown in Figure 1, Page 42. Please read these procedures carefully and be sure to follow them in the event of an emergency. Note that 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.

Emergency Features and Equipment in Goodwin Hall

Floor plans on [page 56](#), show the safety features of the Basement, Second Floor, Third Floor and Fourth Floor.

BUILDING EVACUATION PLAN

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 building safety officer, Wanda Badger.

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 & 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 to a safe location (stairwell or office with a telephone).
6. Check to ensure area has been evacuated.
7. Leave building promptly - **DO NOT USE ELEVATOR**
8. Phone the Emergency Report Centre at 36111 or 9-911.
9. **Do not re-enter building until authorized to do so** by the Fire Department.
10. Remain in the area to guide Fire Department to scene of fire and location of physically impaired.

When Fire Alarm Sounds

1. Leave the building quickly through the appropriate fire escape ([see Fire Exits](#)).
DO NOT USE ELEVATOR.
2. Proceed immediately to the front of the building on opposite side of Union Street.
3. The Safety Officer, Wanda Badger, will go to Union Street opposite the main door where she will await the arrival of the Fire Department to direct them to the location of the fire.
4. Be available to the safety officer to pass on any information.
5. Personal safety permitting, the following staff members will direct the evacuation:
 - i. Basement - Maritza Bailey
 - ii. 2nd Floor - Oscar Rielo
 - iii. 3rd Floor - Wanda Badger, alternate James Archibald
 - iv. 4th Floor - Wanda Badger
6. Verify that all personnel are safe and accounted for once they are out of the building.

Fire Exits

Basement:

Primary Route

Exit West entrance of laboratory area to Division Street and proceed to the front of the building and to the opposite side of the street.

Secondary Route

Through the lab entrance door beside the elevator and out the building door. Proceed to front of building and to the opposite side of Union Street.

Second Floor

Primary Route

Out the main entrance door to Union Street and proceed to the opposite side of the street.

Secondary Route

Down the classroom-wing hallway, down the stairwell to the first floor, and out the west entrance door to Division Street. Proceed to the front of the building on Union Street and to the opposite side of the Union Street.

Third Floor and Fourth Floors:

Primary Route

Down the main stairs and out the main entrance door to Union Street and proceed to the opposite side of the street.

Secondary Route

Down the hallway, down the stairwell to the first floor, and out the west entrance door to Division Street. Proceed to front of building and to the opposite side of Union Street.

PROCEDURES IN THE EVENT OF ACCIDENT INVOLVING INJURY OR DEATH

Accidents Involving Critical Injury or Death

- 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."

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 Claim/Consent Form" (Form 1492C 01/98).
- 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 48 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.

On Calling Ambulances

The following points should be noted:

- Call **36111**, the local ambulance telephone number. Say where the injured person is; e.g., "There has been an accident at Queen's. Please send an ambulance for an injured person located in Room XXX, Goodwin Hall, the Mining Department, on Union Street. Please tell your people to enter by the Union Street entrance."

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).

Responsibility

Supervisory Staff: It is the responsibility of all supervisory staff to ensure that the following procedures are, or have been, carried out. For this reason, the site supervisor should be notified as soon as possible following an accident.

All staff and Students: All accidents involving personal injury must be reported to the Departmental Occupational Health and Safety Officer (Mrs. Wanda Badger) within twenty-four (24) hours. Area supervisors should also be notified as soon as possible.

Minor Injuries

First Aid: someone who has received the appropriate training should give First aid as quickly as possible, following an accident. All members of the Departmental Occupational and Safety Committee have taken the St. John's Ambulance first aid course.

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. Queen's employees (see Section 6.5) should take with them, a completed copy of the small white Worker's Claim/Consent Form [1492C (01/98)] and a copy of the Functional Abilities Form for Timely Return to Work [Form 2647A (01/98)] available in the main office. If these forms do not accompany the injured employee to the treatment centre please ensure the forms are filled out and forwarded to the treatment centre ASAP.

Medical Care: After first aid has been administered, the injured person should be taken to either the Kingston General Hospital or Hotel Dieu Hospital Emergency Centres, if the injury warrants such action. If the injury is likely to have lasting effects, the injured person should make certain that the appropriate Workers Compensation Board form is filled out and returned to the Department Safety Officer.

Serious Injuries

Ambulance: The ambulance phone number is 911.

Treatment: In cases where injuries are more than minor, such first aid as is necessary should be given immediately. If the injury is severe, or there is any doubt, and ambulance should be called immediately. Severely injured persons should not be moved without the advice of medical or ambulance personnel. While waiting for the ambulance, keep the injured person still and warm. Don't apply splints or other immobilizing means to broken bones. The ambulance response time is usually fast and those personnel are better equipped to set the bones properly. Try to have someone go outside to wait for and guide the ambulance personnel to the accident site.

General Advice

when faced with an emergency....

- Try to remain calm. Don't panic. Alert the area supervisor.
- Put life ahead of property. Make sure you are in no personal danger before attempting to get the situation under control.
- Assess the situation and consider what chain of events may follow. If possible, take steps to prevent or limit further complications. Tell others what you are doing.
- If there is a danger that the affected area may grow, warn people in adjacent areas to leave or take appropriate action.
- If you are not assisting in dealing with the situation, leave the emergency area but let others know where you can be found, should there be questions that you might be able to answer.
- Persons not involved in dealing with an emergency should stay well clear of the area affected. Don't enter emergency areas "out of curiosity".

REFERENCES

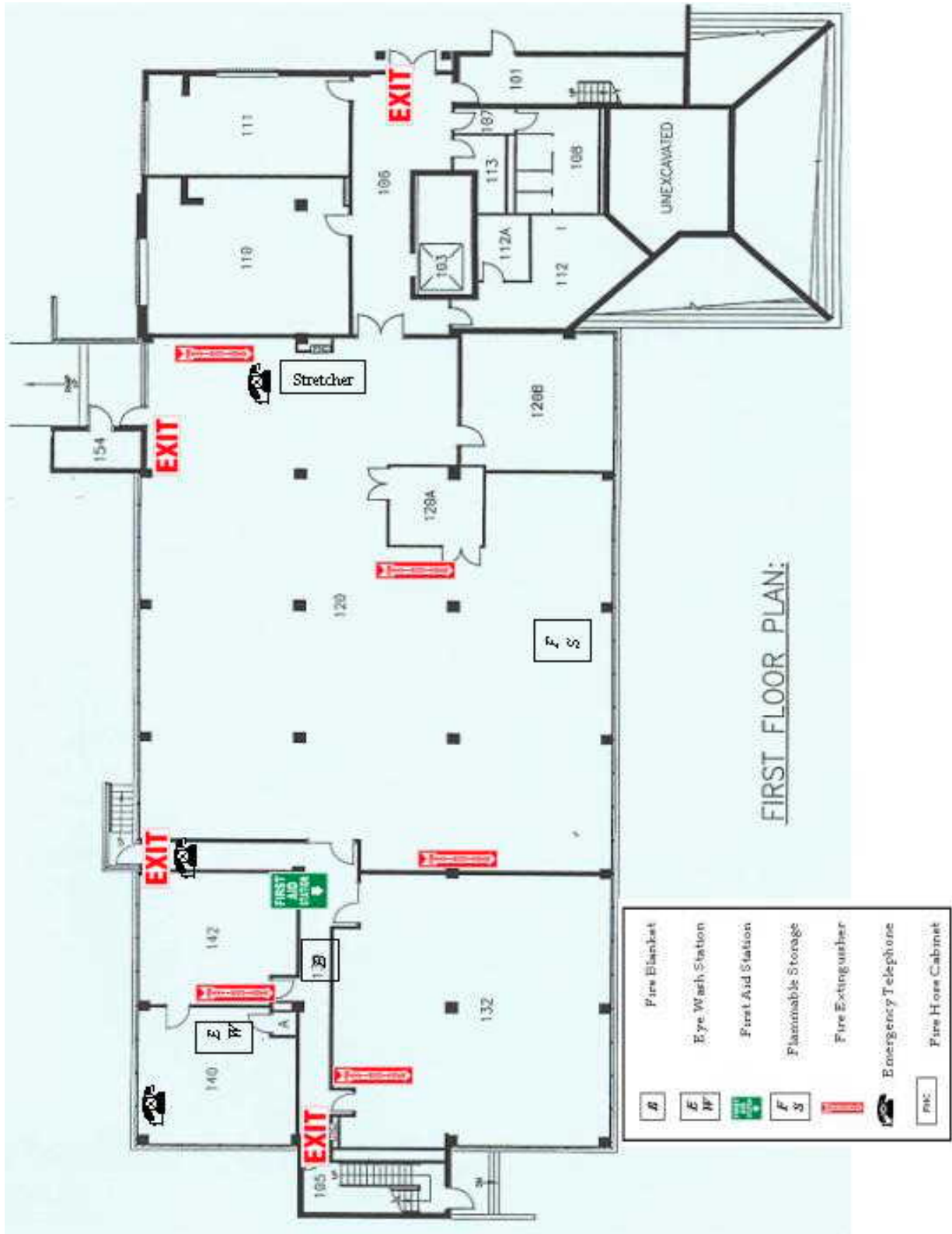
Following are some useful references on safety, laboratory practice, and material properties, available at the Douglas Library. If you cannot find what you need in these references, don't stop; you may find it in other books or by asking questions.

1. Ontario Ministry of Labour, *The Occupational Health and Safety Act, 1978, and Regulations for Industrial Establishments*. The Ministry, Occupational Health and Safety Division, (1979). (can be found on our departmental safety bulletin board located on 2nd floor)
2. Mustard, R.A., *Fundamentals of First Aid* (2nd ed.), St. John Ambulance Canada, 321 Chapel Street, Ottawa (1972).
3. Schefflan, L. & Jacobs, M.B., *The Handbook of Solvents*. Krieger (1953).
4. Schweitzer, P.A., *Corrosion Resistance Tables*. Dekker, (1976).
5. Steere, N.V., *Handbook of Laboratory Safety* (3rd ed.). Chemical Rubber Company, (1990).
6. Sunshine, I., *Handbook of Analytical Toxicology*. Chemical Rubber Company, (1969).
7. Verschuren, K., *Handbook of Environmental Data on Organic Chemistry*. Van Nostrand, (1977).
8. Weast, R.C., ed. *Handbook of Physics and Chemistry* (70th ed.). Chemical Rubber Company, (1989).
9. Sax, N.I., *Dangerous Properties of Industrial Materials* (4th ed.). Van Nostrand Reinhold, (1984).
10. Kolaczowski, S.T. and Crittenden, B.D., *Management of Hazardous and Toxic Wastes in Reprocess Industries*, Merck Index (9th ed.) Merck & Company (1976), Elsevier (1987).

University of Toronto, Office of Environmental Health and Safety, *WHMIS, WHAT YOU NEED TO KNOW*, (1989).

APPENDIX I - Floor Plans

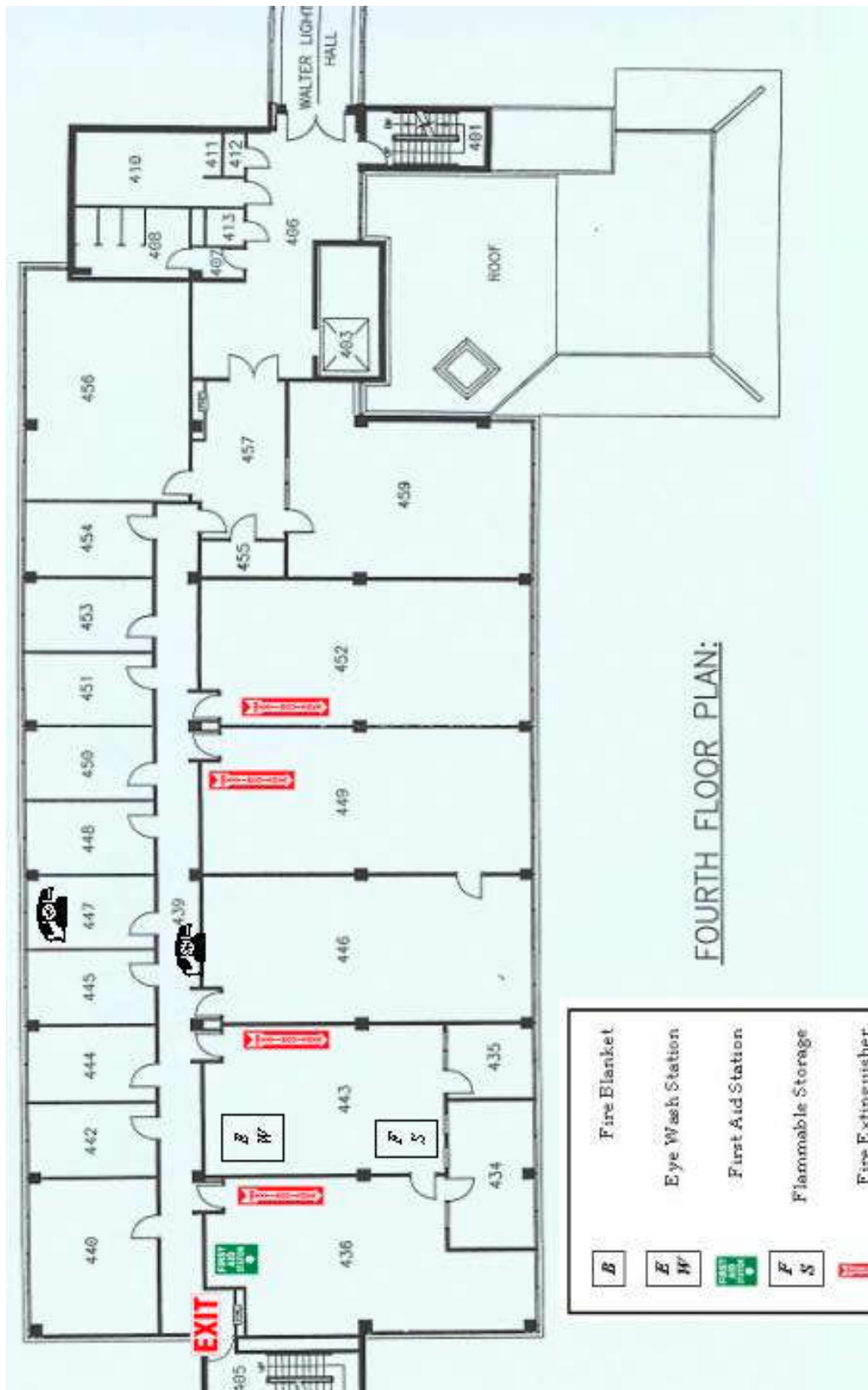
The following pages are plans of floors 1 through 4 of Goodwin Hall, with safety icons indicating emergency exits, fire extinguishers, emergency telephones, first aid kits, fire blankets, fire hose cabinets, eye wash stations and stretcher.





SECOND FLOOR PLAN:

	Fire Blanket
	Eye Wash Station
	First Aid Station
	Flammable Storage
	Fire Extinguisher
	Emergency Telephone
	Fire Hose Cabinet



APPENDIX II - Emergency Reporting Procedures

Emergency Reporting Procedures to be followed in the
Robert M. Buchan Department of Mining

EMERGENCY REPORTING PROCEDURES TO BE FOLLOWED IN THE DEPARTMENT OF MINING

QUEEN'S EMERGENCY REPORT CENTRE
24-HOUR SERVICE
LOCAL 36111

REPORT ALL EMERGENCIES AS SOON AS POSSIBLE TO:

	<i>ROOM</i>	<i>LOCAL</i>
YOUR SUPERVISOR		
Dr. Daneshmend HEAD OF THE DEPARTMENT	353	33294
Wanda Badger SAFETY OFFICER	354	32230

APPENDIX III - Forms

Designated Substances, Teratogens, Mutagens, Carcinogens Warning Sign

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.

<i>CHEMICAL(S)</i>	<i>CLASS</i>	<i>QUANTITIES</i>
	Designated Substance	
	Teratogen	
	Mutagen	
	Carcinogen	

Name of User:

PRINT

SIGN

Supervisor:

PRINT

SIGN

Special Precautions Needed:

Date:

- | | | | | |
|---|------------------|----------------------|---------------------|---------|
| * | Acrylonitrile | Carbon Disulfide | Isocyanates | Styrene |
| | Arsenic | Carbon Tetrachloride | Lead | Vinyl |
| | Chloride Monomer | Asbestos | Coke Oven Emissions | Mercury |
| | Benzene | Ethylene Oxide | Silica Powder | |

DO's and DON'Ts While Working in the Laboratory

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 LABORATORY OR SHOP

DO NOT:

SMOKE

EAT, DRINK, or CHEW GUM

STORE FOOD, DISHES or DRINKS

PIPETTE BY MOUTH

ENGAGE IN HORSEPLAY / PRACTICAL JOKES / ROUGH HOUSING/
PRANKS

WEAR:

- CONTACT LENSES
- SANDALS OR OPEN TOED SHOES
- HIGH-HEELED SHOES
- ITEMS THAT COULD BECOME ENTANGLED IN MOVING EQUIPMENT
i.e. unconfined long hair, loose jewellery, ties or loose clothing