Local Safety Committees

Should you feel that your concerns are not being addressed through the standard channels (i.e. your supervisor, lab coordinator and department chair), the Local Safety Committees meet on a monthly basis and are responsible for:

1. Ensuring that the safety program is maintained and reinforced.
2. Reviewing concerns and suggestions submitted to them by members of their section.

**Faculty of Science Safety Committee** ([www.sfu.ca/scisafe/index.html](http://www.sfu.ca/scisafe/index.html)): Animal Care Services, Biology, BPK, Chemistry, Earth Sciences, Mathematics, MBB, Physics, Statistics and Actuarial Sciences, Science Stores and Science Technical Centre.

**South East Campus Safety Committee**: Communication, Engineering, Computing Science, DIS 1 & 2, IRMACS, REM, Major Projects Office and Office of the Dean (Faculty of Environment and Faculty of Applied Science)

Further information and an up to date list of your local Safety Committee contacts can be found on the Joint University Safety Committee webpage at ([http://www.sfu.ca/jusc](http://www.sfu.ca/jusc)).
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Laboratory Safety Training

Course A:

General Laboratory Safety Session
University Occupational Health and Safety (GP 17)

Policy Statement
The safety of all members of the university community as well as visitors to campus is a major concern of the university. It is, therefore, the policy of the university to:

1. protect the safety of all faculty, staff, students and visitors against unsafe conditions and occupational hazards;
2. formulate and carry out continuing effective safety programs appropriate to university operations, including instructional activities in off-campus settings;
3. give priority to a safe work environment in the planning, direction and implementation of university activities; and
4. comply with all relevant statutes, regulations and standards of regulatory authorities representing occupational health and safety.

Applicability
The University safety policy and procedures and the regulations, codes and statutes of the regulatory authorities apply to all members of the university community (including university employees, students, visitors, contractors and subcontractors).

Responsibilities

Deans, Directors and Chairs are responsible for:

1. providing the management support and leadership necessary for the overall implementation and execution of the University safety policy within their areas of responsibility
2. incorporating adequate provisions for safe working practices and conditions in operational policies and procedures and in programs, projects and off-campus instructional activities; and
3. monitoring and evaluating safety performance within their areas of responsibility and recommending measures to bring about improvement.

Faculty, Instructors, Managers, Supervisors are responsible for:

1. planning and executing all activities in a manner that promotes compliance with the University safety policy;
2. informing students of the nature of potential risks involved if a course has an off-campus activity (see Appendix B);
3. ensuring that individuals in their areas of assignment, whether on or off campus, have been given adequate direction, training and instruction in the safe performance of their work and that it is performed without undue risk;
4. ensuring that work areas are inspected at regular intervals to prevent the development of unsafe conditions and practices and that inspection reports are forwarded to the University Safety Officer;
5. authorizing the action necessary to correct substandard conditions or procedures;
6. ensuring that all accidents and near accidents are reported and investigated, and action is taken to prevent a recurrence; and
7. ensuring that medical treatment is received for all injuries.

Employees are responsible for:

1. practicing safe work habits;
2. observing all safety rules and procedures established by the regulatory authorities, the University or an individual with supervisory authority;
3. promptly reporting hazardous or unsafe equipment, conditions, procedures or behavior to a supervisor; making suggestions for their correction or taking corrective action where authorized; and
4. immediately reporting to a supervisor all work related accidents or injuries and obtaining medical treatment without delay.

University Safety Office is responsible for:

1. developing, instituting and maintaining safety programs, policies and procedures to ensure compliance with occupational health and safety standards in conformity with both university policy and statutory requirements;
2. reviewing and providing assistance to departments and areas to ensure that effective safety programs and safety committees are maintained;
3. considering suggestions from the work force and recommending implementation where warranted;
4. conducting inspections of university facilities at appropriate intervals to identify potential hazards and determining that procedures, equipment, and facilities meet accepted occupational health and safety standards;
5. investigating all accidents and near accidents and
advising the Workers' Compensation Board of all reportable incidents; and
6. training or arranging for training in safe work procedures and the use of personal protection equipment.

Safety Committees

University Safety Committee
The University Safety Committee, consisting of administrative and professional staff, faculty, support staff, trade union members and students, meets on a monthly basis and is responsible for:
1. ensuring that the university safety program is maintained and reinforced;
2. reviewing concerns and suggestions in respect to industrial health and safety and recommending corrective action where considered warranted;
3. reviewing the reports of current accidents or industrial diseases, their causes and means of prevention; and
4. assisting in the dissemination of appropriate information, e.g. field trip guidelines, and fostering within the university community an awareness and appreciation of accident prevention.

Area/Departmental Safety Committees
Area/Departmental Safety Committees shall be constituted in designated areas and shall be composed of representatives from each group. Designation will be recommended by the University Safety Committee (e.g. Chemistry, Faculty of Science, Facilities Management, Athletics and Recreation). Meetings shall be held at least once per semester and minutes shall be forwarded to the University Safety Officer. These committees shall be responsible for:
1. developing ‘Guidelines for Field Trip Planning’ for field trips and field schools. These documents will help in the planning of the field trips/schools, as well providing guidance to new faculty in the mounting of a new field trip/school. Some combination of the following might be included
   - Time and date of departure and return, safety issues, risk management strategy especially for students working alone, site of fieldwork, contact telephone number(s), nearest medical help, location of first-aid supplies, food and accommodation plan, roles and responsibilities of participants, equipment inventory, personal gear (clothes, medical supplies, camera, computer, etc.), providing chair/departmental assistant with contact telephone numbers, and appropriate WorkSafeBC regulations.
   - Monitoring the safety programs within their area;
   - Reviewing and making recommendations on health and safety issues that have not been resolved through normal channels; and
2. ensuring accidents and near accidents are investigated and their causes are eliminated or controlled.

Special Safety Committees
These committees shall be composed of representatives of groups requiring special safety consideration (e.g. radiation and radioisotope safety, biological hazards). Meetings shall be held at least once per semester and minutes shall be forwarded to the University Safety Committee. These committees shall be responsible for:
1. monitoring the safety programs within their area of responsibility; and
2. conducting inspections at regular intervals and recommending corrective action to eliminate substandard conditions or procedures.

GP 17 Attachment I

University Safety Committee, Terms of Reference

Committee Membership
This committee shall consist of 15 members who are experienced in the types of work at the University. In compliance with WorkSafeBC regulations, committee members are designated as representing the management of the University or representing worker groups employed by the University as designated by WorkSafeBC (including student workers). Efforts should be made to ensure all major work groups or areas are represented on the committee (as shown in Appendix A, which can be amended from time to time by the Vice-President, Finance and Administration). Management representatives can not outnumber worker group representatives on the committee. Management representatives are appointed by the Vice-President, Finance and Administration. Worker group and other representatives shall be elected or appointed by their peers. The Vice-President, Finance and Administration may appoint non-voting observers and resource people to the Committee. Quorum at any meeting to be two-thirds of the total voting membership.

The members of the committee elect at each September meeting, from amongst themselves, a Chair and Secretary. Both offices may not be held by worker group representatives or by university management representatives at the same time. The nominating committee will consist of the past Chair and past Secretary (or designates appointed by the current Chair) who will meet at the beginning of September, and be charged with the responsibility of developing a list of candidates for the positions of Secretary and Chair. This process shall also provide for nomination from the other members of the Committee. The nominations shall be distributed by mail to all committee members prior to the September meeting.

Role of Committee
1. Review occupational health and safety policies and make recommendations for their improvement. In carrying out this work, advisory sub-committees may be formed, to be chaired by a member of the University Safety Committee.
2. Review and make recommendations concerning such occupational health and safety matters as,
reports from the Workers’ Compensation Board, monthly summaries of accidents involving SFU faculty, staff and students, issues raised by Departmental Safety Committees, and other reports as submitted for information.

3. Consider recommendations or suggestions from faculty, staff and students concerning health and safety issues, and endorse them where warranted.

4. Assist the Occupational Health and Safety Office in promoting safety awareness to the entire campus community.

5. The Committee shall report to the Vice-President, Finance and Administration.

6. The Committee shall meet once a month.

7. The Committee shall keep written minutes of the issues discussed and shall forward a copy to all committee members (including observers/resource people), the Vice-President, Finance and Administration and WorkSafeBC.

GP 17 Appendix A

A. Management Representatives
   Five - appointed by the Vice-President, Finance and Administration

B. Worker Group Representatives (except as noted, one from each of the following):
   CUPE 3338 (three)
   Polyparty (two)
   Student Society** (two) [to represent students employed by the university, not covered by the others in this section and also to represent student interests generally].
   TSSU

   Note: ** one of the two representatives from the Student Society should represent the interest of research assistants

C. Other Group Representatives (one from each of the following):
   Administrative and Professional Staff Association
   Faculty Association

D. Observer and Resource People:
   The Occupational Health and Safety Officer, Biosafety Committee Chair, Radiation Protection Officer, a representative from Harbour Centre and one from Health Services/Traffic and Security shall be appointed as non-voting observers and resource people to the Committee.

Membership representation amended by agreement between the University and TSSU March 16, 1999.

GP 17, Appendix B

Informing Students of Risk

Instructors must inform students enrolled in their courses that include off-campus activities of the reasonably predicted risks that might be associated with a field activity. This should take the form of an entry in a course outline and a field-trip orientation in class time prior to the field trip. An entry in the course outline could be, for example, along the following lines:

“Be aware that during the field trip there will be period of strenuous hiking, hiking close to cliffs and crossing roads with busy traffic. Appropriate clothing and footwear should be worn. Further details regarding safety, food, housing and field supplies will be discussed prior to the field trip.”

The length of the pre-field trip orientation should be related to the length and/or complexity of the field trip.
Accident & Incident Reporting

Standard
1. Immediately report a work related injury to the First Aid Attendant (who may refer you to a physician)
2. Immediately report an accident or incident (which had a potential for serious injury, time loss or property damage) to your supervisor, who will investigate.

Responsibilities
Supervisors and Instructors are responsible for:
1. Eliminating or minimizing the hazard
2. Investigating accidents and serious incidents
3. Ensuring that a WorkSafeBC Form 7 is completed and sent to EHS.

The WorkSafeBC Form 7 must be completed when an employee is either absent from work or has visited a physician due to a work related accident.

The top half of the incident report form is completed by the supervisor. If there was potential for major injury, a copy is sent to the local safety committee AND to EHS. If it was a minor incident, the employee and supervisor investigate, complete the form, and then send it to the safety committee and EHS.

Note: For employees, the safety committee investigates and completes the reports, for visitors, and students, Security assumes this roll.

Worker
1. Report accidents or near miss incidents to the supervisor
2. Report to First Aid when injured
3. Advise the supervisor when a physician is visited or when absent from work due to a work related injury
4. Co-operate during an investigation
5. Eliminate or minimize a hazard if within capability.

Visitors and Students:
1. Seek First Aid when injured
2. Report accidents to the class supervisor during class time
3. Report accidents, outside of class time, to Campus Security (non-emergency number is local 2-3100).
4. Report near miss incidents experienced during or outside class time, to the class supervisor.

Occupational First Aid:
1. Maintain treatment record books for all work-related injuries, keeping these records for at least five years, and
2. Fill out Form 7A for work-related injuries where an employee is referred to a physician Forward a copy to the supervisor within 24 hours.

Environmental Health and Safety Department:
1. Review accident investigation reports
2. Recommend appropriate corrective action where necessary
3. Confirm that recommended corrective actions have been taken
4. Investigate serious accidents or near miss
5. Maintain records of all accidents
6. Prepare a monthly accident summary
7. Distribute the monthly accident summary to the Joint University Safety Committee

Forms
Accident Investigation Report Forms:
http://tc055-e-alert.cso.sfu.ca/d3soc.sfu/ealert/default.aspx/

WorkSafeBC Form 7 and 7A:
http://worksafebc.ca/claims/report_injury/default.asp

Forms are also available at the Environmental Health and Safety Department (EHS), room 265 Multi-Tenant Facility.
Relevant sections must be completed on line by the injured person (Note: click on pick lists), reviewed by the supervisor and faxed within 24 hours to: Environmental Health and Safety, 778-782-5678

<table>
<thead>
<tr>
<th>Name of injured:</th>
<th>Supervisor Last Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td>First Name:</td>
</tr>
<tr>
<td>Date of Birth:</td>
<td>Job Title:</td>
</tr>
<tr>
<td></td>
<td>Department:</td>
</tr>
<tr>
<td>Phone #:</td>
<td>Work:</td>
</tr>
<tr>
<td>Home</td>
<td>Supervisor’s phone #:</td>
</tr>
<tr>
<td>Injured Person Status:</td>
<td>Employee Start date:</td>
</tr>
<tr>
<td></td>
<td>Campus:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incident Location:</th>
<th>Incident date &amp; time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>For hazardous substances - Period of exposure:</td>
<td>Incident reported to:</td>
</tr>
<tr>
<td>If reported after 24 hours, list reasons:</td>
<td>Incident report date:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(please check one)</th>
<th>Name of first Aid Attendant:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I received first aid</td>
<td>I did not receive first aid</td>
</tr>
</tbody>
</table>

| Name and address of attending physician (if any) | |
|--------------------------------------------------| |

<table>
<thead>
<tr>
<th>Potential for time loss beyond the day of injury:</th>
<th>yes</th>
<th>no</th>
</tr>
</thead>
</table>

| Incident Description: | |
|-----------------------| |

<table>
<thead>
<tr>
<th>Contributing Factors:</th>
<th>Preventive Actions Taken:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss Severity Potential:</td>
<td>Probable Recurrence Rate:</td>
</tr>
<tr>
<td>Incident Type:</td>
<td>Nature of injury:</td>
</tr>
<tr>
<td>Injured Body Parts:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Witness(s) Name(s):</th>
<th>Witness(s) Tel. # or Email:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee/Injured Person Signature:</td>
<td>Date</td>
</tr>
</tbody>
</table>

| Supervisor Signature: | Date: |

**FOR EH&S USE:**

<table>
<thead>
<tr>
<th>WSBC Form 7 - Date Received:</th>
<th>Safety Committee Investigation Date Received:</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSBC form 6A - Date Received:</td>
<td></td>
</tr>
</tbody>
</table>
EMPLOYER'S REPORT OF INJURY OR OCCUPATIONAL DISEASE

As an employer, the Workers Compensation Act requires you to submit this report within three days of an injury to one of your workers, even if you disagree with the claim. By submitting your report promptly, you avoid penalties and delays in the adjudication of the claim. Please report using one of the following options:

1. Online — The quickest and easiest option. The online screen application customizes questions to the worker's injury. You can save your report and update it later with new information. Once submitted, you can follow the status of the claim online. Go to WorkSafeBC.com and select "Report an injury or illness."

2. Fillable PDF forms. Type in your details online, print the form, and submit it by FAX or MAIL. Go to WorkSafeBC.com and select "Report an injury or illness."

3. Paper form. Clearly PRINT details, sign the form, and submit it by FAX or MAIL.

FAX: 604 233-9777 in Greater Vancouver or toll-free within BC at 1 888 922-8807
MAIL: WorkSafeBC, PO Box 4700 Stn Terminal, Vancouver BC V6B 1J1

WorkSafeBC claim number (if known)

Employer information

<table>
<thead>
<tr>
<th>Employer's name (as registered with WorkSafeBC)</th>
<th>Type of business</th>
</tr>
</thead>
<tbody>
<tr>
<td>WorkSafeBC account number</td>
<td>Classification unit number</td>
</tr>
<tr>
<td>Employer address line 1 (mailing)</td>
<td>Operating location number</td>
</tr>
<tr>
<td>Employer contact last name</td>
<td>First name</td>
</tr>
<tr>
<td>Employer address line 2 (mailing)</td>
<td>Employer contact telephone (and area code)</td>
</tr>
<tr>
<td>Employer contact fax (and area code)</td>
<td>Extension</td>
</tr>
<tr>
<td>Employer payroll contact last name</td>
<td>First name</td>
</tr>
<tr>
<td>Employer payroll contact telephone (and area code)</td>
<td>Extension</td>
</tr>
<tr>
<td>Employer payroll contact fax (and area code)</td>
<td></td>
</tr>
</tbody>
</table>

Worker information

<table>
<thead>
<tr>
<th>Worker's name</th>
<th>First name</th>
<th>Middle initial</th>
<th>Gender</th>
<th>Social insurance number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of birth (yyyy-mm-dd)</td>
<td>Home phone number (include area code)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address line 1</td>
<td>Address line 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Province/state</td>
<td>Country (if not Canada)</td>
<td>Postal code/zip</td>
<td></td>
</tr>
</tbody>
</table>

Incident information

<table>
<thead>
<tr>
<th>Date and time of incident (yyyy-mm-dd)</th>
<th>Period of exposure resulting in occupational disease (yyyy-mm-dd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.m.</td>
<td>p.m.</td>
</tr>
</tbody>
</table>

7. Did worker report injury or exposure to employer? Yes ☐ No ☐
8. The injury or disease was first reported to employer on (yyyy-mm-dd) (please check one) No ☐
9. Name of person reported to
10. Describe how the incident happened
11. Describe the injury in detail (what part of the body was involved)
12. Side of body injured
   - Left ☐ Right ☐ Both ☐ Not applicable ☐
13. Describe the workplace location (address, city, province) and where incident occurred (e.g. shop floor, lunchroom, parking lot)
14. Did the injury/exposure result from a specific incident? Yes ☐ No ☐
15. Contributing factors — select at least one, and as many as applicable
   - Animal bite ☐
   - Assault ☐
   - Motor vehicle accident ☐
   - Repetitive activity (over and over again) ☐
   - Sharp edge ☐
   - Slip or trip ☐
   - Fire or explosion ☐
   - Harmful substance in the work environment ☐
   - Struck ☐
   - Crush ☐
   - Unsafe/defective ☐ (please explain below)
Working Alone Policy GP 39

WORKING ALONE OR IN ISOLATION

Policies and Procedures

1. Purpose
To provide for measures to protect the health and safety of, and minimize risk to, any worker that works alone or at an isolated place of employment as defined in the Workers Compensation Act, Occupational Health and Safety Regulation, (Sections 4.20 – 4.23). Adherence to this policy will help to meet health and safety legal requirements and demonstrate due diligence in working alone or in isolation situations.

2. Scope
This policy applies to all SFU campuses and to work for SFU at off-campus locations.

3. Definitions

- **Office hours**: the Simon Fraser University hours during which there are people available to help in the case of an incident. Office hours are 8:30 a.m. to 4:30 p.m. at SFU Burnaby and SFU Surrey, and 9:00 a.m. to 5:00 p.m. at SFU Vancouver. Some departments have office hours that do not fall within this range. In such cases, the department must stipulate what they consider to be their office hours.

- **Supervisor**: a person authorized by an employer to oversee or direct the work of workers and students, including teaching and research supervisors, department heads, deans, managers and any other persons in positions of authority.

- **Worker**: any person engaged in an occupation in the service of an employer, including faculty, staff, graduate and undergraduate students, and volunteers.

- **Working alone or in isolation**: according to The Occupational Health and Safety Regulation, means “to work in circumstances where assistance would not be readily available to the worker in case of an emergency or in case the worker is injured or in ill health.” In these circumstances extra precautions and requirements may be warranted. A variety of work environments and situations call for various interpretations of “working alone or in isolation.” For example, a worker who comes in alone after office hours to perform paperwork duties may not be considered to be “working alone.” A laboratory worker working alone may be considered to be “working in isolation,” while a worker coming in after office hours to do laboratory testing with hazardous substances may be considered as “working alone.”

- **Worksite**: any place where work is performed, including locations such as laboratories, offices, or field work.

- **Engineering controls**: the physical arrangement, design or alteration of workstations, equipment, materials or other aspects of the physical work environment to manage risk.

- **Administrative control**: the provision, use and scheduling of work activities and resources in the workplace, including planning, organizing, staffing and coordinating to manage risk.

4. Policy
This policy requires the assessment of risk and the development of site-specific preventive and response procedures to protect the health and safety of, and minimize the risk to, any worker who works alone or in isolation, in circumstances where assistance may not be readily available in an emergency or should the worker be injured or fall ill.

For individuals required to work alone or in isolation the preventive and response procedures will address the identified risk(s), specify the types of activities that may be conducted, and any limitations on and/or prohibitions of specific activities, and procedures for securing assistance. Where possible, standard operating procedures (SOPs) can be developed to address similar activities within a department. Situations where an SOP may be appropriate include activities such as working alone in research laboratories or offices.

The site-specific policy with preventive and response procedures must be documented within the department, communicated to affected individuals, and monitored to ensure compliance and effectiveness.

5. Roles and Responsibilities

5.1 Deans and Division Heads will:

a. direct supervisors in their areas to develop and implement a site-specific policy and appropriate preventive and response procedures for working alone or
in isolation; and

b. monitor to ensure the policy and measures are communicated, enforced and effective.

5.2 Supervisors are required to review all workplaces under their jurisdiction and:

a. identify individuals required to work alone;

b. identify hazard(s) and assess risk(s);

c. take any necessary steps to eliminate the hazard(s);

d. eliminate the hazard(s) and minimize the risk(s) from the hazard(s) by using engineering controls, administrative controls or a combination of the two controls;

e. develop a site-specific Working Alone or in Isolation Policy and Procedure to address the risk(s);

f. communicate the site-specific Working Alone or in Isolation Policy and Procedure to all workers under their jurisdiction;

g. ensure understanding and compliance with the Policy and Procedure;

h. review the site-specific Policy and Procedure annually; and

i. maintain documentation of the site-specific Working Alone or in Isolation Policy and Procedure within each department.

5.3 Individuals required to work alone or in isolation will:

a. comply with the site-specific Working Alone or in Isolation Policy; and

b. advise the supervisor of arising concerns.

5.4 Environmental Health and Safety will provide guidance and act as a resource.

6. Authority

6.1 This policy is administered under the authority of the President and all Vice Presidents.
Emergency Management Policy GP 31

EMERGENCY MANAGEMENT

SIMON FRASER UNIVERSITY

Policies and Procedures

1.0 Preamble

Simon Fraser University is committed to:

• Reduce negative impacts on the health, safety and welfare of people;
• Optimize the protection of University property resulting from emergencies and disasters; and
• Optimize the protection of University property resulting from emergencies and disasters; and
• Facilitate the timely recovery of teaching and research operations.

2.0 Purpose

The purpose of this policy is to establish emergency response priorities and an Emergency Response Management System at Simon Fraser University.

3.0 Authority

The Vice-President Finance and Administration is responsible for the administration, communication and implementation of this policy.

4.0 Definitions

Emergency means a present or imminent event that is caused by accident, fire, explosion or technical failure, or by the forces of nature, and requires prompt coordination of action of persons or property to protect the health, safety, or welfare of people or to limit damage to property.

Disaster means a calamity that is caused by accident, fire, explosion or technical failure, or by the forces of nature, and has resulted in serious harm to the health, safety, or welfare of people or caused widespread damage to property.

5.0 Policy

5.1 This policy establishes the requirement for an Emergency Management Program with related procedures and plans to address emergencies and disasters. The objective of the program is intended to ensure that:

a. Emergency response priorities are identified,
b. The preparedness and response strategies to emergencies or disasters are established and well-coordinated, and;

c. Plans are in place to facilitate recovery and business continuity.

5.2 Emergency Management Program

The Simon Fraser University Emergency Management Program coordinates the systems and processes for mitigating against, preparing for, responding to and recovering from emergencies and disasters at Simon Fraser University. The Emergency Management Program is formulated by the Emergency and Business Continuity Planner in consultation with the Emergency Management Committee (EMC).

5.3 Priorities

In any emergency situation, Simon Fraser University’s priorities are to:

1. Provide for health and safety of all responders;
2. Save lives;
3. Reduce suffering;
4. Protect public health;
5. Protect university property;
6. Restore academic, research and administrative functions;
7. Protect the environment, and;
8. Reduce economic & social losses.

5.4 Emergency Preparedness

Preparedness will be accomplished by:

a. Identifying risks, prioritizing the University’s critical functions and implementing appropriate mitigating strategies;

b. Establishing effective Emergency Communication systems;

c. Providing adequate training to designated emergency responders; and

d. Exercising procedures and plans frequently.
5.5 Emergency Response, Recovery and Business Continuity

5.5.1 Response efforts will utilize the British Columbia Emergency Response Management System (BCERMS). This includes the adoption of the Incident Command System (ICS) where the Incident Commander (IC) directs the site response from an Incident Command Post (ICP), and where an Emergency Operations Center (EOC) is activated at the request of the IC or appropriate Simon Fraser University personnel to provide coordination and resource support.

5.5.2 The EOC consists of five functions: Management, Operations, Planning, Logistics and Finance/Administration. Each function plays a specific role during EOC activation. When the EOC is activated a Policy Group will be established comprised of the President, Vice-Presidents and any other senior officials deemed essential by the President in order to provide the EOC Director with policy direction.

5.5.3 Planning for restoring academic research and administrative functions is critical to the resumption of normal business operations. This planning begins as a component of response planning.

6.0 Scope
This policy applies to all SFU campuses.
During an Earth Quake

Your chances of survival are best if you stay calm. Don’t panic.

Indoors

1. **Drop:** under a heavy desk, table or bed or crouch in an interior hall or corner. Stay clear of windows, bookcases, computers, mirrors, overhead objects that can fall and exterior walls until the shaking stops.
2. **Cover:** place one arm and hand over your head and neck area.
3. **Hold:** hang on to the desk or table. The ground can pitch and roll like the deck of a ship in a storm - you need to anchor yourself.
4. Don’t exit or enter a building - there is danger of falling debris.
5. If in a crowded place (such as a cafeteria or library), take cover and watch you don’t get trampled. DO NOT HEAD FOR THE EXITS. Take cover under the nearest table and keep away from windows, skylights and display shelves of heavy objects.
6. If in an auditorium or lecture theatre, crouch on the floor between the chairs, COVER and HOLD.
7. If you are in a building, wait until the shaking has stopped. Then, and only if it is safe to do so, walk out slowly, watching for anything that could fall during aftershocks.
8. Avoid elevators. If you’re in one when an earthquake happens, hit all floor buttons and get out when you can. If the power fails, the elevator will stop and the lights will remain off until emergency power is restored. Wait for assistance.

Outdoors

1. Move away from buildings, trees, falling objects and power lines.
2. DO NOT enter buildings.

Driving

1. Pull over (leave the road clear) and stay in your vehicle. The vehicle can provide protection from falling debris.
2. If possible, do not stop on a bridge, in a tunnel, on or under an overpass, near power lines or where buildings can fall on the vehicle. If a power line falls across your vehicle, STAY IN THE VEHICLE. If possible, drive away once the shaking has stopped otherwise wait to be rescued - DO NOT GET OUT.
3. Set the parking brake and turn off the motor.
4. Do not block any lanes that are exiting a bridge or tunnel.

In a wheelchair

1. Stay in the chair. Move to a safe place away from glass, tall bookcases, etc. LOCK THE WHEELS and COVER YOUR HEAD with your arms to protect yourself from falling debris.
Cryogenic Gases

Cryogens on Campus

- Liquid Helium: -269°C
- Liquid Nitrogen: -196°C
- Solid Carbon Dioxide / Dry Ice: -78°C

Splashing Hazards

Vigorous boiling
Occurs on contact with room temperature objects (mostly for liquid nitrogen).

Film boiling
Room temperature objects are so hot that liquid nitrogen does not wet them but rather floats on a film of nitrogen vapour. There is no friction, and the heat transfer rate is moderate until the liquid wets the surface.

Goggles, Gloves, & Shoes
1. Wear eye protection
2. Stand clear of boiling or splashing liquids
3. Start slowly to avoid splashing
4. Never allow any unprotected part of your body to touch uninsulated pipes or apparatus
5. Wear gloves (loose fitting for quick removal)
6. High top shoes recommended (you don't want liquid nitrogen soaking into your socks)
7. Superconducting Magnets:
   - Large forces on ferromagnetic objects (Iron)
   - A magnet quench can boil all of the liquid helium releasing large amounts of cold gas

Fracture
Many materials become brittle when cooled to low temperatures.
Rubber hoses can shatter so ensure you will not be hit with liquid nitrogen if the hose breaks or falls off.
High pressure cylinders may explode if cooled.

Contact with Cold Surfaces

Wet objects: don't stick your tongue on the tracks
Low temperature baths (dry ice acetone): No gas film forms so cold liquid sticks to your body
Cryogenic Burns: Immediately place affected part in warm water bath (40-46°C) and get help.

Venting
Containers or pipes containing cryogenic gases need to be vented to limit pressure buildup
LHe, LN2 and dry ice all expand by a factor of about 1000 upon warming. If confined this would lead to pressures of up to 15,000 psi ... BOOM.
Chemists... beware of warming up of cryopumped materials.

Ice and Air Plugs

Never leave a dewar open to the air.
Liquid Helium can freeze air and cause a plug in the dewar neck leading to pressure buildup.
Ice plugs can also form in liquid nitrogen dewars.

Water
Water can freeze valves and vents when dewars are repeatedly used. This is caused by frost building up and melting, causing water to run into the valve stem. If this occurs and the valve is stuck open, vent the dewar to relieve pressure.

Gas Properties

Asphyxiation
See next page

Oxygen enrichment
Oxygen in the air will condense on to liquid nitrogen cooled surfaces
Collection of liquid oxygen in organic insulation results in an explosive mixture
Cryotrapped organic compounds mixed with oxygen from an air leak creates an explosive mixture
Liquid oxygen-methane mixtures can be detonated with light
As liquid air evaporates it becomes enriched in oxygen
20 Simple Rules Using Gas

These 20 rules for safe operation of compressed-gas cylinders are adapted from an article by J. MacNeal on selecting specialty gas regulators (Am. Lab., 1984, 16[3], 142). It sometimes comes as a surprise to the uninitiated to learn that different gases require different regulators. The biggest surprise comes when it’s learned that the regulator for an oxygen cylinder will fit absolutely no other cylinder. This is because any organic material trapped inside a pressure regulator can and will explode when pressurized with pure oxygen.

1. With the cylinder secured in place, remove the cap.
2. Look for debris in the valve opening. Remove any that’s found. If it is difficult to remove, call the supplier.
3. With the regulator in hand, make certain the pressure adjustment knob is turned counterclockwise as far as it will go.
4. Make sure the on-off valve is in the off position.
5. By hand, connect the regulator to the cylinder. If there is a mismatch, find the correct regulator or call your supplier. Never use an adapter.
6. Tighten the regulator onto the cylinder with a wrench, using no more force than you can exert with two fingers on the end of the wrench.
7. Connect the process or instrument to the regulator.
8. Stand to the side so that you are not in front of or behind the pressure gauge. Slowly open the cylinder valve, a quarter turn at first, until steady pressure is shown on the inlet gauge. Then open the valve all the way and back it off a half turn. In that way, someone can later sense the position of the valve. A valve that’s open all the way feels the same as one that’s stuck in the closed position. (Acetylene cylinder valves are opened only a quarter turn and no further).
9. Using an oxygen-compatible, soap-type leak detector, make sure the cylinder fitting is tight.
10. Turn the pressure-adjusting knob slowly clockwise until the desired delivery pressure is observed on the process pressure gauge.
11. Check the entire regulator, including the gauge connections, for leaks. If leaks appear, turn off the cylinder, repair the leaks, and turn it on again. If the body of the regulator leaks, call your supplier.
12. Fully open the on-off valve.
13. Check all downstream fittings, including the on-off valve. Do not tamper with the packing nut on the on-off valve. Only a qualified mechanic should do any repairs to the pressure regulator.
14. To shut down the system, first turn off the cylinder or the main cylinder valve. Allow the pressure gauge to vent, then back out the adjusting valve counterclockwise and, finally, slowly disconnect the cylinder valve and the system.
15. Slowly disconnect the process or instrument fitting.
16. Slowly remove the regulator from the cylinder, bearing in mind that a small amount of gas might be trapped in the fitting.
17. Recap the cylinder.
18. Make sure that the cylinder is stored in a supported position.
19. If the cylinder is empty, place a tag to that effect on the cylinder rather than on the cap.
20. Be especially careful when handling toxic or pyrophoric gases. It is advisable to have the cylinder in a hood or otherwise ventilated.
Compressed Gases & Gas Regulators

Cylinders
They are very heavy. Don’t become injured trying to stop a cylinder from falling. Stand back and let it fall.
Cylinders must always be securely restrained.
The cap must be on while transporting.

Valve shear
If the valve is knocked off of a full cylinder it will take off like a rocket.

Removing the cap
Be careful not to open the valve when removing a tight cylinder cap.

CGA fittings
There are a large number of different connectors used on the cylinders and regulators.
This is done to prevent mixing of incompatible gases or the use of unsuitable regulators.

Adiabatic compression & Oxygen/reactive gas hazards
Never allow any lubricant to contact with compressed oxygen.
Open valves slowly, high velocities or rapid compression of the gas in the pipe can ignite the tubing (even stainless steel).
Hydrogen requires special care due to its wide flammability limits.

Venting
The system should have a properly vented relief valve.

Regulator type
The output of a single stage regulator will rise as the tank drains.

Sudden release
Would you be safe if there was a sudden release of gas?
Know what hazards the gas presents
Is it toxic? Flammable? Reactive?

What is the difference between a Single Stage and Two Stage regulator?
Single-stage pressure regulators reduce the cylinder pressure to the delivery or outlet pressure in one step. Two-stage pressure regulators reduce the cylinder pressure to a working level in two steps.
The best recommended action is to determine how you intend to use the pressure regulator. Generally a single-stage regulator is good for short duration applications; a two-stage regulator is good for long duration applications, such as gas chromatography.
Asphyxiation

Adequate ventilation is essential when working with cryogenics. A small amount of cryogenic liquid can rapidly convert to a large volume of gas and create a breathing hazard, and in the case of hydrogen, an explosive mixture. After a recorded double fatality where the victims did nothing to escape or attract attention, safety engineers identified the following physiological stages associated with reduced oxygen:

1st Stage
Oxygen reduced from 21 to 14 percent by volume - The breathing volume increases, the pulse rate is accelerated, and the ability to maintain attention and think clearly is diminished. Muscular coordination is somewhat disturbed.

2nd Stage
Oxygen reduced to between 14 and 10 percent by volume - Consciousness continues, but judgment becomes faulty. Severe injuries may cause no pain. Muscular efforts lead to rapid fatigue. Emotions, particularly ill temper, are easily aroused.

3rd Stage
Oxygen reduced to between 10 and 6 percent by volume - Nausea and vomiting may appear. Victim loses ability to perform any vigorous muscular movements or even to move at all. Up to this stage, or even in it, the person may be unaware that anything is wrong. Then his legs give way, leaving him unable to stand, walk, or even crawl. This is often the first and only warning and it comes too late. The victim may realize that he/she is dying, but he/she does not greatly care. It is all quite painless. Even if resuscitation is possible, permanent damage to the brain may result.

4th Stage
Oxygen reduced below 6 percent - Respiration consists of gasps, separated by periods of increasing duration. Convulsive movements may occur. Breathing then stops but the heart may continue to beat for a few minutes.

Hazards
As can be seen from the descriptions, any reduction in the normal content of the oxygen in the breathing atmosphere must be considered a hazard. In sudden asphyxia, such as that from inhalation of pure nitrogen, unconsciousness is immediate. The individual falls as if struck on the head and may die in a few minutes. If a person becomes groggy or loses consciousness because of displaced breathing air, get the person to a well-ventilated area immediately. If breathing has stopped, apply CPR. Whenever a person loses consciousness, call a doctor immediately.

Where cryogenics are used, a hazard assessment is required to determine the potential for an oxygen-deficient condition. Controls such as ventilation and/or gas detection systems may be required to safeguard personnel.

Dewar Recommendations

Given that large Dewars are heavy enough to cause significant injuries if they tip over, it is recommended that:

1. When moving a wheeled Dewar along a route which will present a tipping hazard the use of no fewer than two personnel to maintain the stability of the Dewar.

2. For future purchases of Dewars larger wheels and wider bases should be selected if possible.

Acknowledging that there is a significant risk of asphyxiation by the large volumes of gas contained in these Dewars, it is recommended that:

1. If more than 1 liter of cryogen (He, LN2 or Dry Ice) per 20 m^3 of air volume is evaporated than precautions must be taken to prevent the creation of an Oxygen depleted atmosphere.

2. If more than 0.1 liter of Dry Ice (CO2) per 20 m^3 of air volume is evaporated than precautions must be taken to prevent Carbon Dioxide poisoning.

3. In light of the small air volume in an elevator and the restricted access that no actively venting Dewars be moved in an elevator and that the liquid and gas valves must remain closed while in the elevator.

4. If possible when two people are moving a Dewar by elevator one person should ride with the Dewar and the other should take an alternate route to the elevators destination. If there is a problem the person outside can then report it.
Working with Laboratory Glassware

A significant part of working safely involves hazard awareness. The most frequent laboratory glassware accidents result in minor cuts. More serious accidents include hazards associated with flying glass, fire, and chemical exposure. Wear safety goggles when working in the laboratory! Aside from injury reduction, hazard awareness can save you time (ruined reactions) and money (broken glassware and ruined reagents).

Glass Types
Glasses contain silica, an element found in sand. There are three primary glass types found in laboratories: soda lime (soft), borosilicate (hard) and pure fused quartz (99% silica). Pyrex™ is a brand of hard glass. Soft, hard and quartz glass have working temperatures of up to 110, 230, and 1000°C, respectively.

Hot Glass
A problem with hot glass is that it looks the same as cool glass. Try to establish routines that allow hot glass to cool in out-of-the-way locations. For example, before removing glassware from an autoclave, crack the door and allow the glass to cool for several minutes before handling. The use of gloves and tongs can prevent burns, but they may make handling items awkward.

Preventing Cuts
Heavy gloves should be worn when washing glassware by hand. Glassware cuts are more common than you might expect and can be serious. In one accident, an Iowa State University laboratory employee suffered cuts to five wrist tendons. Fortunately, the cuts were shallow and the injury did not result in permanent impairment.

Inserting a glass stem into a rubber stopper can be dangerous without proper precautions. The task can be made safer and easier by first lubricating the glass. Laboratory grease works well, but even deionized water is better than nothing. Protect hands with gloves, rags, or a shield fashioned from wood or plastic.

When connecting plastic tubing to the side arm of a flask, condenser, etc., grease or wet the tubing (acetone works well on vinyl tubing). Then, with some type of hand protection, slowly work the tubing onto the glass nipple. When removing tubing from glassware, do not attempt to pull it off. First lay the item on the lab bench, if possible. Cut the tubing near the end of the glass. Always cut away from your body. Next, slice the tubing lengthwise and slide the material off the glass nipple.

Fittings
An alternative to barbed glass nipples are threaded fittings. Plastic tubing is typically connected via a screw cap with a plastic barb fitting and synthetic “rubber” gasket.

Several manufacturers also offer “quick-connect” fittings. One piece of the connector is threaded semi-permanently into glass. The other side attaches to tubing.

The most common method of connecting laboratory glass apparatus is by ground-glass joints. Typically these are round (image) or tapered. Of the two types, round ground-glass joints are less likely to “freeze.”

Frozen Joints
When taper joints are used, the likelihood of “freezing” can be reduced by applying grease. If grease is not an option, or if solvents remove the grease, tetrafluoroethylene (Teflon®) sleeves (inset) can be used to eliminate “freezing.”

Once a joint is frozen, try soaking it overnight. If it remains frozen, do not attempt to force it apart. It may be possible to loosen the joint with heat. A hot air gun may be used, but a bunsen burner will likely result in better outcomes.
Once all flammable solvents are removed, and proper personal protective eyewear is donned, rapidly apply heat to the outer surface (try to keep the inner glass piece from heating).

While heating, apply a modest pulling force on the two pieces. Tapping lightly with a wooden stick may help. If using a bunsen burner, do not heat longer than 30 seconds.

If you do not have a burner or are not interested in performing this procedure, Glass Shop staff can provide this service for you.

**Pressure / Vacuum**

When glass is used under pressure or vacuum, taking extra precautions is advised.

Surface scratches are the most common defect causing weakness and breakage.

Be sure to inspect glassware for small defects before applying pressure or vacuum.

If possible, mechanically pressured or vacuum pump systems should be operated in a fume hood with the sash down. Pressure-relief and vacuum-relief devices can reduce hazards and improve research outcomes by reducing the chance of glass breakage.

When working with vacuum systems outside of a fume hood, consider using epoxy-coated apparatus or tape the vessel to help contain glass in the event of failure. Where practical, use a bench-top shield.

Keep in mind that round vessels will tolerate more pressure or vacuum than flat-sided vessels of similar construction.

**Glass Repair**

Star cracks and other small defects can be “repaired” at the Glass Shop by annealing. Annealing is a process of heating glass to a specified temperature followed by slow cooling.

The “harder” the glass, the higher the applied temperature. A more insidious glassware hazard is glass stress. Glass can be stressed when heated unevenly above its strain point. It is difficult to stress quartz glass, but relatively easy to stress borosilicate (Pyrex™) glass, which has a strain point of 510°C. Additionally, thermal strain is most severe in thick glass.

Glass Shop staff use polarized light to identify glass stress lines.

If you have borosilicate glass that is routinely heated (e.g., distillation equipment), you may wish to get glassware checked out regularly.

Annealing (right) removes the stress, making the glassware safer and more reliable.

Chips weaken glassware and may present an injury hazard. Chips and major breaks (reaction vessel, right) can be taken to the Glass Shop for economical repair.

Before taking glassware in for repair, be sure to empty and clean each item. If acetone or other flammable solvents are used, rinse glassware with water and allow to dry.

**Apparatus Set-up**

When connecting lab apparatus, it may be necessary to clamp glass to ring stands or other supports. Care should be taken to avoid overtightening glassware clamps as this may induce mechanical strain.

**Glass Disposal**

Used and/or broken glassware should be free of chemical and biological hazards prior to disposal.

Place glass in a broken glass container. Do not dispose of broken glass in regular garbage.
Electricity

Energized equipment can be very dangerous

- You can be killed or maimed by electrical energy that is not well controlled.
- If you are not confident of your ability to work safely with a piece of electrical or electronic equipment, don’t do it. Obtain assistance or training.

Common equipment safety design features

- Three wire ground circuit
- Double insulation
- On-off switches
- Fuses and circuit breakers.
- GFCI (ground fault current interrupter)
- AFCI (arc fault current interrupter) * New *

Avoiding exposure to electrical hazards

- Use well-grounded or double insulated equipment.
- Don’t open enclosures of energized electrical equipment
- Avoid using electrical equipment under wet conditions. (Unless the equipment is designed to be used under such conditions) GFCI outlets should be installed in wet labs.
- Avoid the unnecessary use of extension cords or outlet boxes.
- Don’t use damaged power cords.
- Unplug equipment before working on it.
- Don’t overload outlets, or extension cords.
- If equipment sparks, smokes or shocks, repair it.
- Replace fuses only with the correct type.
- Use common sense. Stop. Think. Is it safe?

Need Help?

If you are making or want to make some electrical device and need some help or advice, come and talk to us at the Electronics Shop. If you have modified or repaired some equipment yourself please bring it to the Electronics Shop where we can inspect it and certify that it is safe to use. In the Electronics Shop, we can repair almost any device that runs on electricity. **Contact the Electronics Shop in Room C8008 at 778-782-3303.**

<table>
<thead>
<tr>
<th>Type of Contact</th>
<th>Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Skin</td>
<td>100,000 to 600,000</td>
</tr>
<tr>
<td>Wet Skin (fresh Water)</td>
<td>1,000</td>
</tr>
<tr>
<td>Internal Body</td>
<td>400 to 600</td>
</tr>
</tbody>
</table>

Table 1: Human resistance to electrical current.

<table>
<thead>
<tr>
<th>Effect</th>
<th>DC mA</th>
<th>AC(60Hz) mA</th>
<th>AC (10 kHz) mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight sensation</td>
<td>0.6</td>
<td>0.3</td>
<td>5</td>
</tr>
<tr>
<td>Threshold of perception</td>
<td>3.5</td>
<td>0.7</td>
<td>8</td>
</tr>
<tr>
<td>Painful, muscle control main-tained</td>
<td>41</td>
<td>6</td>
<td>37</td>
</tr>
<tr>
<td>Painful, unable to let go of wires</td>
<td>51</td>
<td>10.5</td>
<td>50</td>
</tr>
<tr>
<td>Severe pain, difficulty breathing</td>
<td>60</td>
<td>15</td>
<td>63</td>
</tr>
<tr>
<td>Possible heart fibrillation after 3 seconds</td>
<td>500</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Effect of current on human body.

Ohm’s Law

\[ E \text{ volt} = \frac{V}{R \text{ ohm}} \times I \text{ ampére} \]

Dry: \[ 110 \text{ V} = \frac{100,000 \text{ Ω}}{A} = \frac{1.1 \text{ A}}{110} = 1.1 \text{ mA} \]

Wet: \[ 110 \text{ V} = \frac{1000 \text{ Ω}}{A} = \frac{0.11 \text{ A}}{110} = 110 \text{ mA} \]

Overloaded Outlets

Most 110V wall outlets are rated for 15A Maximum. This allows a quick calculation of how many Watts you may draw from that outlet. \[ W = 110 \times 15 = 1650 \text{ Watts} \]. To be safe we should round that number down to 1500 Watts. If we take 1500 watts as our self imposed limit and solve the above equation for Amps we can calculate that we should try not to exceed drawing more than 13.6 Amps \[ A = \frac{W}{V} = \frac{1500}{110} = 13.6 \].

Electrical appliances you plug in to the wall outlet will usually be labeled with how many Amps the device will draw when operating. If they are not labeled, check the instruction manual. If you add up all the amps from all the loads and you get more than 13, you are getting very close to overloading the outlet. Some examples are shown in the following table.

<table>
<thead>
<tr>
<th>Device</th>
<th>Current, A</th>
<th>Watts, W</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 inch computer monitor</td>
<td>1.5</td>
<td>165</td>
</tr>
<tr>
<td>typical desktop computer</td>
<td>2.3 – 2.8</td>
<td>250 - 300</td>
</tr>
<tr>
<td>electric kettle</td>
<td>13.6</td>
<td>1500</td>
</tr>
<tr>
<td>microwave oven</td>
<td>13.2</td>
<td>1450</td>
</tr>
<tr>
<td>laser printer</td>
<td>8</td>
<td>880</td>
</tr>
<tr>
<td>desk lamp (incandescent)</td>
<td>0.9</td>
<td>100</td>
</tr>
<tr>
<td>desk lamp (fluorescent)</td>
<td>0.3</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 3: Typical loads for equipment

Outlet Extension Devices or Power Bars are usually rated at 15A maximum. So all the above discussion applies. You really should not attempt to draw more than 13.6A through a power bar.
Another error that people sometimes make is attempting to plug two power bars into the same wall outlet which commonly has two sockets. Both Power Bars are rated for 15A and they think this means they can safely draw 30A from the same wall outlet. In most cases, the two sockets on a standard 110V wall outlet are connected together and the combined total current for the two sockets together is still 15 Amps.

Currents between 30 and 250mA are the most likely to be fatal. This is based on normal adult body weight. For smaller people, especially children, the effects occur at lower current levels. The effects also depend upon the path the current takes through the body. Currents passing through the heart and diaphragm are most dangerous.
Laboratory Safety Training

Course C: Chemical Safety Session
Door Hazard Signs

Purpose
The door signage program provides the fire department personnel with immediate life safety information to enable a carefully planned entry response. Without this information, they will not risk sending crews into rooms where the hazards are unknown; they would rather let equipment (and research) burn. WorkSafeBC endorses their concerns and has a written order instructing the University to comply.

Chemical hazard
Found on the left side of the door plaque, this sign indicates the health, flammability, and reactivity hazards, as well as the relative quantity. Each number is on a scale from 0 (no hazard) to 4 (severe hazard).

Biohazard
This orange and black sign is only for labs requiring level 2 containment for the organisms they are working with. Level 1 labs do not require a biohazard sign but must still comply with applicable requirements.

Radiation
This red and yellow trefoil identifies those areas containing radioisotopes. Contact the radiation safety office for more information or signage.

Wet mopping
For rooms with a biohazard or radioactive sign, wet mopping will only be provided if it has been pre-arranged for a designated night, and if the wet-mop sign is displayed on that night. By displaying the wet-mop sign, you are ensuring the cleaning staff that there are no biohazardous or radioactive contaminants on the floors. On your designated night of each two-week period, the cleaning staff will check your door plaque for the wet-mop sign; if no wet-mop sign is displayed on your designated night, the cleaning staff will skip your lab until the next two week period.

Do not enter
These signs are useful for restricting entrance due to light sensitive reactions. Custodians will not enter for any reason.

Other signage
Laser, magnet, and x-ray signs are also available to slide into the door plaques.

Custom signage
If custom signage is needed for a lab, contact EHS.

How To Generate A Door Hazard Sign
Go to the Door Hazard Signage URL:
https://at.its.sfu.ca/EHS/Introduction.aspx

Follow the online instructions on how to search for your room, edit which contacts are assigned to your room, and how to enter hazard data for the chemicals you have in your lab.

General Instructions for Completing a Door Sign
1. Follow the link above to access the webform.
2. Select the left button to “Update Your Personal Contact Information” and press save.
3. Navigate to the “Hazardous Materials Declaration” and either select the room you are already assigned to or search for the room by typing the building code SLOWLY and selecting from the drop down menu.
4. SLOWLY enter the emergency contact information by LAST name and select from the drop down menu and press save.

NOTE: contact information will not save unless the contact was selected from the drop down menu and the contact number was auto-populated.
5. Select the “Materials Information” tab (all contact information must be complete and inputted correctly in order for this tab to be available), read the instructions and enter in the information as it pertains to your lab.
6. Indicate how many signs you need then click the box confirming that the room’s information is complete.

If you have questions regarding the webform, please contact Claire Mocock at cmocock@sfu.ca.
## WHMIS Symbols

<table>
<thead>
<tr>
<th>Compressed Gas</th>
<th>Materials which are normally gaseous kept in a pressurized container. May explode due to pressure. May explode if heated or dropped. Possible hazard from the force of explosion and the release of contents.</th>
<th>Ensure containers are always secured. Store in appropriate designated areas. Do not drop or allow to fall.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable and Combustible</td>
<td>Materials which will continue to burn after being exposed to a flame or other ignition source. May ignite spontaneously. May be a material which will release flammable liquids if allowed to degrade or when exposed to air.</td>
<td>Store in properly designated areas. Work in well-ventilated areas. Avoid heating. Avoid sources of sparks/ignition. Ensure electrical sources are safe.</td>
</tr>
<tr>
<td>Oxidizing Material</td>
<td>Materials which can cause other materials to burn or support combustion. Can cause skin or eye burns. Increase fire and explosion hazard. May cause combustibles to explode or react violently.</td>
<td>Store in areas away from combustibles. Wear body, hand, face and eye protection. Store in proper containers which will not rust or oxidize.</td>
</tr>
<tr>
<td>Toxic Immediate And Severe</td>
<td>Poisons/potentially fatal materials which cause immediate and severe harm. May be fatal if ingested or inhaled. May be absorbed through the skin. Small volumes have a toxic effect.</td>
<td>Avoid breathing dust or vapours. Avoid contact with skin or eyes. Wear protective clothing which is effective against flames and vapours. Wear face and eye protection. Work in well ventilated areas and wear breathing protection.</td>
</tr>
<tr>
<td>Toxic Long Term Concealed</td>
<td>Materials which have harmful effects after repeated exposures or over long periods of time. May cause death or permanent injury. May cause birth defects or sterility. May cause cancer. May be sensitiser causing allergies.</td>
<td>Wear appropriate personal protection. Work in a well-ventilated area. Avoid direct contact. Use hand, body, face and eye protection. Ensure respiratory and body protection is appropriate for the specific hazard.</td>
</tr>
<tr>
<td>Biohazardous Infectious</td>
<td>Infectious agents or a biological toxin causing a serious disease or death. May cause anaphylactic shock. Includes Viruses, Yeasts, Moulds, Bacteria and Parasites which affect humans. Includes fluids containing toxic products. Includes cellular components.</td>
<td>Special training required work in designated biological areas with appropriate engineering controls. Avoid forming aerosols. Avoid breathing vapours. Avoid contamination of people/areas. Store only in designated areas.</td>
</tr>
<tr>
<td>Corrosive Materials</td>
<td>Materials which react with metals and living tissue. Eye and skin irritation on exposure. Severe burns/tissue damage on longer exposure. Lung damage if inhaled. May cause blindness if eyes contacted. Environmental damage from flames.</td>
<td>Wear body, face and eye protection. Use breathing apparatus. Ensure protective equipment is appropriate. Work in well ventilated area. Avoid all direct body contact. Use appropriate storage containers and ensure proper nonventing closures.</td>
</tr>
<tr>
<td>Dangerously Reactive</td>
<td>Materials which may have unexpected reactions. May react with water. May be chemically unstable. May explode if exposed to shock or heat. May release toxic or flammable vapours. May vigorously polymerize. May burn unexpectedly.</td>
<td>Handle with care avoiding vibration, shocks and sudden temperature changes. Store in appropriate containers. Ensure storage containers are sealed. Store and work in designated areas.</td>
</tr>
</tbody>
</table>
WHMIS overview

WHMIS – WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

- Label all controlled hazardous materials.
- Obtain MSDS for all controlled materials.
- Employees must be trained.

WHMIS is a comprehensive plan for providing information on the use of controlled hazardous materials in the workplace. There are six classifications in WHMIS, several of which have divisions or sub-divisions.

WHMIS classifications

**Compressed Gases** - Class A - indicates a container with pressure inside. If the container is damaged or dropped so as to weaken it in any way it may rupture and explode. Examples include propane, oxygen and acetylene.

**Flammable & Combustible** - Class B - are products that may ignite or burn or even explode in some situations. It may react with other materials to form flammable gas. Examples include gasoline and paint thinners.

**Oxidizing Material** - Class C - this material can create a fire in the presence of flammable or combustible materials. It can also react violently or cause an explosion when in contact with organic materials. May burn eyes and skin on contact.

**Poisonous** - Class D1 (A & B) - this material can act quickly to produce toxic effects or death if it enters the body. Examples include pine oil and cyanide. Two sub-divisions are:
   A – Very toxic material
   B – Toxic material

**Other Toxic Effects** - Class D2 (A & B) - this symbol covers a wide range of potential hazards both acute and chronic. Acute (immediate) effects can include eye or skin irritations or respiratory inflammation. Chronic (long-term) effects can include lung problems, liver or kidney damage, eventual cancer, birth defects, etc. Two sub-divisions are:
   A – Very toxic material
   B – Toxic material

**Biohazardous Infectious Materials** - Class D3 - these materials are likely to infect the body with diseases. Example is from a used hypodermic needle

**Corrosive Material** - Class E - these materials can cause severe tissue damage with prolonged contact. It can cause severe eye and skin irritation upon contact, for example, chromic acid.

**Dangerously Reactive Material** - Class F - this material can react with other materials and is unstable. Dangers may occur from jarring, heating or exposure to light, for example, acetylene.

Labels

All hazardous products in the workplace must be labeled with one of two types of labels, supplier and workplace.

A supplier label must appear on all products received at workplaces, and contain the following information: product identifier, information on safe handling, supplier identification, statement that the MSDS is available, hazard classification symbols, risk phrases, precautionary measures and first aid measures, have text in English and French and have the WHMIS hatched border.

A workplace label is used when some of the controlled product is put into another container for use, a controlled product arrives in bulk without a supplier label, where a product is produced in the workplace and where a supplier label has become illegible or has been accidentally removed.

Workplace labels must contain the following information: product identifier, information on safe handling of the product, a statement that the MSDS is available. There is no specific design for workplace labels other than the content requirements.

Workplace Identifier

A workplace identifier is a substitute for the workplace label. Its use is permitted in circumstances where a workplace label might not be practical, for example, controlled substances in pipes.

A workplace identifier could be any means of identification such as a color coding, warning signs and pictures that convey the message.

http://www.sfu.ca/ehs.html
# Sample Canadian MSDS

## MATERIAL SAFETY DATA SHEET — 9 Sections

### SECTION 1 — PRODUCT INFORMATION

<table>
<thead>
<tr>
<th>Product Identifier</th>
<th>WHMIS Classification (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>B2, D2B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Use</th>
<th>Solvent, general-purpose cleaning of adhesives, contact cements, printing inks, gums, waxes, resins, greases, and oils</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Manufacturer’s Name</th>
<th>Supplier’s Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happy Chemical Company</td>
<td>Big Chemical Company</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Street Address</th>
<th>City</th>
<th>Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>556 Helium Lane</td>
<td>Gassous Bay</td>
<td>BC</td>
</tr>
<tr>
<td>123 Nitro Avenue</td>
<td>Vapour Town</td>
<td>BC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Postal Code</th>
<th>Emergency Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0X 0X0</td>
<td>(604) 234-5678</td>
</tr>
<tr>
<td>X5X 5X5</td>
<td>(604) 345-6789</td>
</tr>
</tbody>
</table>

### SECTION 2 — HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>Hazardous Ingredients (specific)</th>
<th>%</th>
<th>CAS Number</th>
<th>LD₅₀ of Ingredient (specify species and route)</th>
<th>LC₅₀ of Ingredient (specify species)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>99-100</td>
<td>67-64-1</td>
<td>5,800 mg/kg (oral, rat)</td>
<td>30,000 ppm (inhal., 4 hr.)</td>
</tr>
</tbody>
</table>

### SECTION 3 — PHYSICAL DATA

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Colour and Appearance</th>
<th>Clear, colourless liquid with mildly pungent, sweet and fruity odour</th>
<th>Odour Threshold (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td></td>
<td></td>
<td>62 (average)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific Gravity</th>
<th>Vapour Density (g/m³)</th>
<th>Vapour Pressure (kPa)</th>
<th>Explosion Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.791 at 20°C</td>
<td>2.0</td>
<td>24-24.7 1 kPa</td>
<td>5.6 (n-butyl acetate=1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Boiling Point (°C)</th>
<th>Freezing Point (°C)</th>
<th>n/ap</th>
<th>Coefficient of Water/Oil Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>56.2</td>
<td>-94.6</td>
<td></td>
<td>0.58</td>
</tr>
</tbody>
</table>

### SECTION 4 — FIRE AND EXPLOSION DATA

- **Flammability**: Yes. Flammable liquid
- **Means of Extinguishment**: Carbon dioxide, dry chemical powder, “alcohol” foam, polymer foam. Water may be ineffective because it will not cool acetone below its flashpoint.

<table>
<thead>
<tr>
<th>Flashpoint (°C) and Method</th>
<th>Upper Flammable Limit (% by volume)</th>
<th>Lower Flammable Limit (% by volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-18°C (cc)</td>
<td>12.8% at 25°C</td>
<td>2.5% at 25°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Autoignition Temperature (°C)</th>
<th>Explosion Data</th>
<th>Satisfactory to Impact</th>
<th>Explosion Data — Satisfactory to Static Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>465°C</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

- **Hazardous Combustion Products**: Carbon monoxide and carbon dioxide

### SECTION 5 — REACTIVITY DATA

- **Chemical Stability**: Yes. If no, under which conditions?
- **Incompatibility with Other Substances**: Yes. Which ones?

<table>
<thead>
<tr>
<th>Incompatibility with Other Substances</th>
<th>If yes, under which conditions?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acids (for example, nitric acid); Strong oxidizing agents (for example, hydrogen peroxide); Bases (for example, sodium hydroxide)</td>
</tr>
</tbody>
</table>

- **Reactivity, and under what conditions?**: Attacks many forms of plastics and rubber, including rayon

| Hazardous Decomposition Products | | |
|----------------------------------||Carbon monoxide from prolonged exposure to sunlight|

© 57M2 (RC/98) SAMPLE FORMAT PROVIDED BY THE WORKERS’ COMPENSATION BOARD OF BRITISH COLUMBIA Please continue on reverse side
**SECTION 6 — TOXICOLOGICAL PROPERTIES**

**Product Identifier**  
Acetone

**Route of Entry**  
- **Skin Contact**: ☑
- **Skin Absorption**: ☑
- **Eye Contact**: ☑
- **Inhalation**: ☑
- **Ingestion**: ☑

**Effects of Acute Exposure to Product**  
Irritation; possible effects on central nervous system (CNS); at air concentrations above 8,000 ppm may cause drowsiness, incoordination, loss of reflexes, unconsciousness, and respiratory failure.

**Effects of Chronic Exposure to Product**  
Dermatitis. No significant harmful effects from oral or inhalation exposures.

**Exposure Limits (area, source, data)**  
250 ppm, 8-hour exposure limit (WCB)

**Sanitization (if yes, explain)**  
- Yes ☑

**Reproductive Toxicity (if yes, explain)**  
- Yes ☑

**Mutagenicity (if yes, explain)**  
- Yes ☑

**Intoxication (if yes, explain)**  
- Yes ☑

Severe eye irritant, skin and respiratory irritant.

**SECTION 7 — PREVENTIVE MEASURES**

**Personnel Protective Equipment**  
- Gloves ☑
- Respirator ☑
- Eye ☑
- Footwear ☑
- Clothing ☑
- Other ☑

If checked, specify type: Butyl rubber gloves. NIOSH-approved respirator with organic vapour cartridge for air concentrations up to 2,500 ppm. Splash-proof chemical safety goggles or face shield.

**Engineering Controls (specify, such as ventilation, enclosed process)**  
Use mechanical ventilation to reduce exposure. Use non-sparking and grounded ventilation system.

**Leak and Spill Procedure**  
Eliminate all ignition sources. Wear adequate protective equipment. Contain spill with absorbent material and place in a suitable covered and labelled container for disposal.

**Waste Disposal**  
Check with federal, provincial, and local government requirements for disposal.

**Handling Procedures and Equipment**  
Use in a well-ventilated area, away from heat and all ignition sources (including sparks, open flames, and hot surfaces). Do not use with incompatible substances. Use grounded and non-sparking equipment.

**Storage Requirements**  
Store in cool, well-ventilated area out of direct sunlight, away from heat and ignition sources. Storage facilities should be made from fire-resistant materials.

**Special Shipping Information**  
TDG shipping name: Acetone, Classification 3, Flammable liquid, Packing Group II

**SECTION 8 — FIRST AID MEASURES**

**Inhalation**  
Remove source of contamination or move victim to fresh air.

**Ingestion**  
If conscious, have victim rinse mouth thoroughly with water; do not induce vomiting; have victim drink 240-300 mL of water. Obtain medical attention immediately.

**Skin Contact**  
Flush with water for 15 minutes.

**Eye Contact**  
Immediately flush contaminated eye(s) with lukewarm, gently flowing water for 20 minutes, while holding eyelids(s) open. Obtain medical attention immediately.

**SECTION 9 — PREPARATION INFORMATION**

<table>
<thead>
<tr>
<th>Prepared by (Group, Department, etc.)</th>
<th>Telephone Number</th>
<th>Prepared Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally Safemesier</td>
<td>(604) 123-2222</td>
<td>January 4, 1999</td>
</tr>
</tbody>
</table>
What is an LD-50

LD stands for “Lethal Dose”. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. The LD50 is one way to measure the short-term poisoning potential (acute toxicity) of a material.

It is usually expressed as the amount of chemical administered (e.g., milligrams) per 100 grams (or kilogram) of the body weight of the test animal. The LD50 can be found for any route of entry or administration but dermal (applied to the skin) and oral (given by mouth) administration methods are the most common.

<table>
<thead>
<tr>
<th>Substance</th>
<th>LD-50 [mg/kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>10,000</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>4000</td>
</tr>
<tr>
<td>Ferrous sulfate</td>
<td>1500</td>
</tr>
<tr>
<td>Phenobarbital sodium</td>
<td>150</td>
</tr>
<tr>
<td>Picrotoxin</td>
<td>5</td>
</tr>
<tr>
<td>Strychnine sulfate</td>
<td>2</td>
</tr>
<tr>
<td>Nicotine</td>
<td>1</td>
</tr>
<tr>
<td>d-Tubocurarine</td>
<td>0.5</td>
</tr>
<tr>
<td>Tetrodotoxin</td>
<td>0.1</td>
</tr>
<tr>
<td>Dioxin</td>
<td>0.001</td>
</tr>
<tr>
<td>Botulinum toxin</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

Table 2: Examples of LD-50’s

What is an LC-50

LC stands for “Lethal Concentration”. LC values usually refer to the concentration of a chemical in air but in environmental studies, it can also mean the concentration of a chemical in water.

For inhalation experiments, the concentration of the chemical in air that kills 50% of the test animals in a given time (usually four hours) is the LC50 value.

Flash point: the minimum point (or temperature) at which the vapour of a liquid will ignite when it contacts a spark or flame.

Flammable liquid: flash point less than 38 C (100 F)

Inflammable liquid: same as flammable

Combustible liquid: flash point between 38 and 93 C (100-200 F)

Vapour pressure: a measure of the ability of a liquid to form vapours.

Autoignition temperature: temperature at which vapour will ignite when coming into contact with something hot like a hot plate

Risk: probability that a substance will produce an adverse effect

LEL: lower explosive limit

UEL: upper explosive limit

IARC: International Agency for Research on Cancer

Peroxide: contains an O-O single bond

IDLH: immediately dangerous to life and health

OEL: occupational exposure limit stated by WorkSafeBC.

Table 1: MSDS Terms

<table>
<thead>
<tr>
<th>WHMIS Labeling Requirements</th>
<th>Workplace</th>
<th>Supplier</th>
<th>Supplier</th>
<th>Supplier</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Identifier</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Supplier identifier</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Risk phrase</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Precautionary measures</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>MSDS reference</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>First Aid</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Hazardous ingredient disclosure</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Emergency phone number</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Hazard symbols</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Hatched border</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
</tbody>
</table>

"Hazardous Lab Sample” Statement | Required |

Table 3: WHMIS labeling
### CONSUMER PRODUCT SYMBOLS

These warning labels are used for household, science education kits and special products.

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Precautions</th>
<th>Degrees of Hazard</th>
<th>Label Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOXIC PRODUCT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poisonous</td>
<td>Do not get in eyes or on skin. Do not breathe fumes. Wear protective clothing and safety equipment as indicated on the label.</td>
<td>Very toxic</td>
<td>Extreme Danger</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sales Restricted</td>
</tr>
<tr>
<td></td>
<td>Toxic</td>
<td></td>
<td>Danger</td>
</tr>
<tr>
<td></td>
<td>Harmful</td>
<td></td>
<td>Caution</td>
</tr>
<tr>
<td><strong>CORROSIVE PRODUCT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Causes Burns</td>
<td>Do not mix with other chemicals. Do not get in eyes or on skin. Do not breathe fumes. Do not swallow. Wear protective clothing as indicated on the label.</td>
<td>Very Corrosive</td>
<td>Extreme Danger</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Danger</td>
</tr>
<tr>
<td></td>
<td>Irresistible</td>
<td></td>
<td>Caution</td>
</tr>
<tr>
<td><strong>FLAMMABLE PRODUCT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire hazard</td>
<td>Read the specific instructions on the label. Use only in well ventilated areas. Keep away from flames and objects that spark. Store in a safe location.</td>
<td>Very Flammable</td>
<td>Extreme danger</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Danger</td>
</tr>
<tr>
<td></td>
<td>Flammable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spontaneously Combustible</td>
<td></td>
<td>Caution</td>
</tr>
<tr>
<td><strong>PRESSURIZED CONTAINER</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explosion Hazard</td>
<td>Do not puncture. Do not burn. Store away from heat.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>QUICK SKIN BONDING ADHESIVES</strong></td>
<td>Bonds Skin Instantly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sample MSDS Acrolein

1. Product Identification
   
   **Synonyms:** Acraldehyde; Acrylic Aldehyde; Allyl Aldehyde; Ethylene Aldehyde; 2-Propenal  
   **CAS No.:** 107-02-8  
   **Molecular Weight:** 56.06  
   **Chemical Formula:** CH2:CHCHO  
   **Product Codes:** A384

2. Composition/Information on Ingredients
   
<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS No</th>
<th>Percent</th>
<th>Hazardous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrolein</td>
<td>107-02-8</td>
<td>90 - 100%</td>
<td></td>
</tr>
</tbody>
</table>

3. Hazards Identification

   **Emergency Overview:**
   POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT. AFFECTS THE HEART. MAY CAUSE LUNG DAMAGE. EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. MAY FORM EXPLOSIVE PEROXIDES.

   **SAF-T-DATA™ Ratings (Provided here for your convenience)**

   - **Health Rating:** 4 - Extreme (Poison)  
   - **Flammability Rating:** 3 - Severe (Flammable)  
   - **Reactivity Rating:** 3 - Severe (Explosive)  
   - **Contact Rating:** 4 - Extreme (Corrosive)  
   - **Lab Protective Equip:** GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER  
   - **Storage Color Code:** Red (Flammable)

   **Potential Health Effects:**
   **Inhalation:**  
   Toxic. Highly irritating. It can injure the lungs and bronchial airways. Symptoms include severe irritation of the mucous membranes, burning of the throat, cough, difficulty breathing, tightness in the chest, nausea, vomiting and diarrhea, pulmonary edema, high blood pressure, and unconsciousness. A weak sensitizer; may cause asthmatic reaction. Inhalation of high concentrations can cause permanent lung damage. Fatalities have occurred from exposure to levels as low as 10 ppm; irritating at 0.54 ppm.

   **Ingestion:**  
   May produce severe irritation of the mouth and gastrointestinal tract.  
   **Skin Contact:**  
   Causes severe irritation with redness, pain, and possibly skin burns. Contact may cause sensitization dermatitis.  
   **Eye Contact:**  
   Causes severe irritation, extensive tearing, pus-like discharge, corneal damage and damage to area around eyelids. May cause corneal burns.
Chronic Exposure:
The violent irritating effects of acrolein generally prevents any chronic toxicity. Repeated inhalation can sensitize some individuals resulting in an asthmatic response.
Aggravation of Pre-existing Conditions:
Persons with pre-existing respiratory disorders may be more susceptible to the effects of this substance.

4. First Aid Measures
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. Prompt action is essential.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures
Fire:
Flash point: \(-26^\circ C \ (-15^\circ F)\) CC
Autoignition temperature: \(235^\circ C \ (455^\circ F)\)
Flammable limits in air % by volume: LEL: 2.8; UEL: 31.0
Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.
Contact with strong oxidizers may cause fire.

Explosion:
Vapors can flow along surfaces to distant ignition source and flash back. Vapor may polymerize explosively at elevated temperatures. Closed containers exposed to heat may explode.
Fire Extinguishing Media:
Use dry chemical, carbon dioxide, “alcohol-resistant” foam, or flooding quantities of water. Do not get water inside container because of exothermic reaction; water can be used to fight fires because in flooding quantities, excessive heat will not be generated. Do not release runoff from fire control methods to sewers or waterways.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures
Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e.g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.
7. Handling and Storage
Protect from direct sunlight. Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Inside storage should be in a standard flammable liquids storage room or cabinet. No alkaline material such as caustics, ammonia, or amines or oxidizing materials permitted in storage room or cabinets. Do not store acrolein uninhibited under any circumstances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection
Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL): 0.1 ppm (TWA).
- ACGIH Threshold Limit Value (TLV): 0.1 ppm (Ceiling), Skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).

NOTE: The IDLH concentration for acrolein is 2 ppm.
The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protective equipment every effort should be made to exit immediately.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties
Appearance: Colorless to yellow liquid.
Odor: Irritating odor.
Odor Threshold: 1.8 ppm
Solubility: Appreciable (> 10%)
Specific Gravity: 0.84 @ 20C/4C
pH: 6 (10% solution)
% Volatiles by volume @ 21C (70F): 100
Boiling Point: 53C (127F)
Melting Point: -88C (-126F)
Vapor Density (Air=1): 1.9
Vapor Pressure (mm Hg): 210 @ 20C (68F)
Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity
Hazardous Decomposition Products: Peroxides.
Hazardous Polymerization: Polymerizes readily unless inhibited (usually with hydroquinone). Hazardous polymerization can occur from exposure to heat, sunlight, acid, or alkalis. Formation of peroxides over time can also lead to polymerization. Reaction may be violent.
Incompatibilities: Reacts with acids, amines, alkalis, sulfur dioxide, metal salts, oxidants, thiourea, dimethylamine, or weak acid conditions such as nitrogen or carbon oxide gases. Reactions may be very rapid and violent.
Conditions to Avoid: Insufficient inhibitor, heat, flame, ignition sources, sunlight, air and incompatibles.

11. Toxicological Information
Toxicological Data:
- Toxicological Data -
Oral rat LD50: 26 mg/kg;
Inhalation rat LC50: 18 mg/m3 / 4 H;
Skin rabbit LD50: 200 mg/kg.

- Irritation Data -
Skin rabbit (std Draize, 2 mg / 24 H): Severe;
Skin rabbit (open Draize, 5 mg): Severe;
Eye rabbit (std Draize, 50 ug / 24 H): Severe;
Eye rabbit (std Draize, 1 mg): Severe.

Investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
The International Agency for Research on Cancer (IARC) has concluded that this chemical is not classifiable as to its carcinogenicity to humans (Group 3).

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>NTP Carcinogen</th>
<th>IARC Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrolein (107-02-8)</td>
<td>No</td>
<td>3</td>
</tr>
</tbody>
</table>

12. Ecological Information
Environmental Fate: When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is not expected to be degraded by photolysis. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.):
Proper Shipping Name: ACROLEIN, INHIBITED, TOXIC-INHALATION HAZARD ZONE A
Hazard Class: 6.1, 3
UN/NA: UN1092
Packing Group: I
Information reported for product/size: 250ML

International (Water, I.M.O.):
Proper Shipping Name: ACROLEIN, INHIBITED
Hazard Class: 6.1, 3.1
UN/NA: UN1092
Packing Group: I
Information reported for product/size: 250ML

15. Regulatory Information

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Environmental Toxicity: This material is expected to be very toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l.

Chemical Weapons Convention: No  TSCA 12(b): No  CDTA: No
SARA 311/312: Acute: Yes  Chronic: Yes  Fire: Yes  Pressure: No
Reactivity: Yes  (Pure / Liquid)
Australian Hazchem Code: 2WE  
Poison Schedule: None allocated.  
WHMIS:  
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 4 Flammability: 3 Reactivity: 3
Label Hazard Warning:  
POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT. AFFECTS THE HEART. MAY CAUSE LUNG DAMAGE. EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. MAY FORM EXPLOSIVE PEROXIDES.
Label Precautions:  
May form explosive peroxides.  
Keep away from heat, sparks and flame.  
Keep container closed.  
Use only with adequate ventilation.  
Do not breathe vapor or mist.  
Do not get in eyes, on skin, or on clothing.  
Wash thoroughly after handling.
Label First Aid:  
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:  
Laboratory Reagent.
Revision Information:  
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:  
Company provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose.
Prepared by: Environmental Health & Safety  
Phone Number: (555) 555-5555 (CAN)
MSDS Online

SFU now subscribes to the online MSDS service offered by the Canadian Centre for Occupational Health and Safety (CCOHS). The CCOHS link can be accessed through the SFU library webpage at:

http://cufts2.lib.sfu.ca/CRDB/BVAS/resource/5963

CCOHS covers an extensive list of suppliers with the notable exception of Sigma Aldrich (Sigma, Aldrich, Fluka, Riedel de Haen and Supelco products). The MSDS from this supplier can be found at:

http://www.sigmaaldrich.com/Area_of_Interest/The_Americas/Canada.html

A login is not required.

FAQ: Frequently Asked Questions

Q: If we have online access to MSDS do we need printed MSDS's?
A: No, as long as people know how to find the information and it is easily accessible.

Q: What is meant by ‘easily accessible?’
A: All people are informed about where to find the MSDS. They have access to the distribution method (computer) and know how to find the relevant MSDS. It is recommended that a quick link to CCOHS be added to the computer desktop.

Q: What happens in the case of a blackout?
A: No MSDS access. People working with toxic chemicals should be knowledgeable about the dangers of the chemical, how to protect themselves and where to get more information before it arrives (in case it arrives in a broken container). In the case of an emergency it is often too late to find an MSDS, especially if you have other problems to deal with (i.e no light).
Carcinogens

IARC - International Agency for Research on Cancer

Category 1
For substances for which there is sufficient evidence for a causal relationship with cancer in humans (confirmed human carcinogen).

Category 2A
For substances for which there is a lesser degree of evidence in humans but sufficient evidence in animal studies, or degrees of evidence considered appropriate to this category, e.g., unequivocal evidence of mutagenicity in mammalian cells (probable human carcinogen).

Category 2B
For substances for which there is sufficient evidence in animal tests, or degrees of evidence considered appropriate to this category (possible human carcinogen).

Category 3
Excluded from the list above are IARC category 3 carcinogens for which assessment evidence is ‘limited’.

ACGIH - American Conference of Governmental Industrial Hygienists

A1 Confirmed human carcinogen
The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies.

A2 Suspected human carcinogen
Human data are accepted as adequate in quality but are conflicting or insufficient to classify the agent as a confirmed human carcinogen; or, the agent is carcinogenic in experimental animals at dose(s), by route(s) of exposure, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. The A2 is used primarily when there is limited evidence of carcinogenicity in experimental animals with relevance to humans.

A3 Confirmed animal carcinogen with unknown relevance to humans
The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.

A4 Not classifiable as a human carcinogen
Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animals studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.

A5 Not suspected as a human carcinogen
The agent is not suspected to be a human carcinogen on the basis of properly conducted epidemiologic studies in humans. These studies have sufficiently long follow-up, reliable exposure histories, sufficiently high dose, and adequate statistical power to conclude that exposure to the agent does not convey a significant risk of cancer to humans; or, the evidence suggesting a lack of carcinogenicity in experimental animals is supported by mechanistic data.

OSHA - Occupational Safety and Health Administration (US Dept. of Labor)

Group RR
OSHA regulated carcinogen (may require medical or biological monitoring)

Group S
OSHA select carcinogen

Natural Gas Hazards

Detection Response
If you open a door and smell gas in the room, or if you are in a room, smell gas, and cannot shut it off, then proceed with step 1.

1. Evacuate room and close door
2. Only in the South Science Building and TASC 2: Press the nearest gas shut off button on the appropriate side of the hallway (this shuts off all gas to that quadrant of rooms).
3. Notify the facilities service desk (local 2-3582) that there may be a gas leak.
   Or for SSB and TASC 2: Notify FM that the gas was shut off due to a potential leak and needs to be reset.
4. During off hours, call security at 2-4500 and they will contact Facilities Management.
5. Notify room occupants on that quadrant that the gas has been shut off.

Picture of Gas Shut off panel
Allowed Concentration
For a room with one fume hood pulling 600 cfm, the maximum concentration of natural gas (with good mixing) will be 1466 ppm (regardless of room size). The time required to reach this concentration will however depend on room size and will be about 34 minutes for a small room (20 x 20 feet), and about 2 hrs and 49 minutes for a large room (43 x 43 feet). Research fumehoods are not shut down overnight.

The explosive range for methane (which makes up 90% of natural gas) is between 30,000 and 170,000 ppm, so 1500 ppm is not too close, even if there are pockets of natural gas (which is twice as light as air). A room with only 50 cfm exhaust will reach a maximum (steady state) concentration of about 17,600 ppm in 10 hrs for a small room and 49 hrs for a large room.

Chemical Spill Response

Information
1. Advise lab occupants of the spill and evacuate the area.
2. Notify your supervisor and/or lab coordinator of the spill. Provide details such as quantity spilled and chemical name.

Risk Assessment
3. Conduct an initial risk assessment to determine if: (i) building evacuation is required. If yes, pull the fire alarm and contact Campus Security at 2-4500.
   (ii) external resources are required to contain and clean-up the spill. If not, continue with step 4.

Clean-Up
4. Ensure the spill area has adequate ventilation to clear gases or vapours generated during the neutralization process. If there is a potential for gases to concentrate in the area, or if odours are overpowering, leave, mark the door, and contact security at 2-4500.
5. Wear appropriate personal safety equipment such as safety glasses, and gloves.
6. Select the appropriate neutralizer or vapour inhibitor.
   - Spill-X-A for acid spills
   - Spill-X-C for caustic spills
   - Spill-X-S for solvent spills.
7. Apply the powder around the edge of the liquid.
8. Sprinkle the powder toward the centre. With a plastic dustpan and brush, push the powder toward the centre until all liquid is absorbed. If necessary, add more neutralizing powder.
9. If cleaning up a solvent, proceed to step 13.
10. For acids and caustics, use a spatula to place a small quantity of mixture into a beaker of water.
11. Stir the mixture and test with pH paper. The pH should be between 3 and 10.

Disposal
12. When neutralization is achieved, scoop the mixture with a dustpan into a disposal bag.
13. Rinse the spill area with water and wipe up.
14. If uncertain about disposal, contact your supervisor or Environmental Health and Safety.
15. Disposal will vary depending on the liquid neutralized. After neutralization, some liquids produce a mixture which can go to landfill. Other liquids retain toxic properties and must be handled as special waste. For example, chromic acid can be neutralized but not detoxified.

Documentation
17. If an employee visited a physician, or was absent beyond the day of the incident (due to the incident), then the supervisor must complete a WorkSafeBC Form 7.

Chemical Spill Kit
Recommended items to include in a chemical spill kit:
- Spill Response Procedures
- Spill – X neutralizer for acid, caustic and solvent spills
- Dust pan and broom
- 20 L plastic pail
- Garbage bags
- Disposable Nitrile gloves
- Safety goggles
- pH paper
- Small glass beaker

The majority of these items can be purchased at Science Stores.
Exposure Routes & Control

Routes of Exposure
The most common routes of exposure for laboratory chemicals include:

- Inhalation

- Dermal absorption (includes skin and eyes)

- Ingestion (eating with contaminated hands)

Modes of Controlling Exposure

Elimination / Substitution
- Most desirable control
- Can potentially remove the hazard completely
- Find products that are less toxic and easier to dispose of
- Ensure the safety and suitability of the product to be substituted is thoroughly examined
- Example: using water based instead of solvent based

Engineering Controls
- Usually built into equipment
- Can be expensive, and can take a long time to implement
- Example: local exhaust ventilation, fume hood

Administrative Controls
- Limit exposure time
- Implement safe working procedures for specific chemicals (EH&S can assist in reviewing these for your lab)
- Example: brush or dip instead of spraying

Personal Protective Equipment (PPE)
- Most common but least desirable control
- Does not control the exposure at the source, exposure is controlled at the user
- Limited protection
- Examples: respirators, gloves, safety glasses
Fume Hood Safety

General Guidelines for Safe Fume Hood Use

- Confirm the fume hood is fully operational before each use (ensure hood is not in standby mode and check the magnehelic gauge, indicator ribbon or the visual face velocity display).
- Work with the sash at the proper operating level as indicated by the sash arrows.
- Set up apparatus as close to the back of the hood as possible. Apparatus should not be closer than 15 cm (6 inches) from the front of the hood.
- Do not block airflow. Raise large objects 5 cm (2 inches) off the counter by placing them on blocks.
- Avoid rapid removal of objects or arms from the hood and never place your head inside the hood.
- Avoid filling the hood with excessive equipment and do not store chemicals in the fume hood. Excess clutter and chemicals can impede airflow.
- Limit foot traffic around the fume hood. People walking by the hood face will disrupt the airflow in the hood.
- Radioisotopes and Perchloric Acid must only be used in designated fume hoods.
- Keep lab doors and windows closed at all times to ensure maximum hood performance and to maintain negative pressure in the room.
- Use only grounded (3-prong) electrical equipment.

In Case of Emergency

- If the low flow alarm sounds, lower the sash to the designated operating level. If the alarm continues to sound, immediately stop work, turn off all equipment and close the sash. Evacuate the area if highly volatile or toxic chemicals are being used. The alarm can be silenced but do not reset it. Contact Facilities Management (ext. 23582).
- If a power failure or other emergency occurs (e.g., building fire or explosion within the fume hood) immediately stop work, turn off all equipment, close the sash and evacuate the building. Contact Campus Security (ext.24500).
PPE: Glasses & Goggles

Lens Colours

**Clear** - Indoor: For normal indoor use.

**Yellow** - Indoor: for low light applications where contrast enhancement is required

**Blue** - Indoor: for areas with high levels of yellow light (such as sodium vapour lights)

**Pink** - Indoor: for use where contrast enhancement is required. They reduce glare from fluorescent and halogen lights without compromising colour perception.

**Tinted** - Outdoor: use where glare reduction is desired. Easy for eyes to adjust between indoor and outdoor environments.

**Mirror** - Outdoor: for use where bright sunlight and glare cause eye strain and fatigue.

Standards

Canada - The CSA standard (Z94.3) specifies that a quarter inch steel ball is fired at the lens and frame at 152 ft/s (104 mph). Side shields are required with the following minimum dimensions: 2 cm from eyeball centre to outside, and 1 cm for each of eyeball centre to top and eyeball centre to bottom edge of lens.

United States - The ANSI standard (Z87.1-1989) specifies that a quarter inch steel ball is fired at the frame at 150 ft/s (102 mph). Then, a one inch steel ball is dropped from 50 inches on the lens. No side shields are specified.

US Military - This standard requires that a projectile be fired at the lens and frame at 650 ft/s (443 mph).

The UVEX Genesis glasses available in Science Stores meet all three standards.

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PPE: Particulate Respirators

Nine Respirator Classes

Three levels of efficiency based on filtering a 0.3 micrometer particle are:

- 95 95% efficient
- 99 99% efficient
- 100 99.97% efficient

and three categories of filtering properties are:

- **N** Not for use in oil environments
- **R** Oil Resistant
- **P** Oil Proof

The respirator must have one of the above combinations such as N95 or R99. If working with pesticides which contain oil, use the P100 respirator.

A single stringed mask (often called a dust mask or comfort mask) is not a respirator.

Fit testing is required yearly and you must be clean shaven.

**Replace Your Respirator When It Is:**

- Damaged
- Soiled
- Causing increased breathing resistance

**Hazard Ratio**

\[
\text{Hazard Ratio} = \frac{\text{particulate concentration}}{\text{exposure limit}}
\]

Example: silica gel exposure at 4 mg/m³, WorkSafeBC exposure limit = 1.5 mg/m³

\[
\frac{4}{1.5} = 2.7
\]

**Assigned Protection Factor**

Should be greater than the hazard ratio

Respirators (two stringed paper masks) have a protection factor of 5

Since 5 > 2.7, this is suitable protective equipment, but remember the fit testing.
# PPE: Gloves

## Permeation/Degradation Resistance Guide for Ansell Gloves

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Laminate Film</th>
<th>Nitrile</th>
<th>Unsupported Neoprene</th>
<th>Supported Polyvinyl Chloride (High)</th>
<th>Natural Rubber</th>
<th>Neoprene/Natural Rubber Blend</th>
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</thead>
<tbody>
<tr>
<td>1. Acetic Acid</td>
<td>E 380</td>
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<td>E 300</td>
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<td>11. Amyl Acetate</td>
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<td>12. Amyl Alcohol</td>
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<td>16. Benzene, Benzol</td>
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Note: All numeric designations within the product classifications are denoted in minutes.

- A degradation test against this chemical was not run. However, since its breakthrough time is greater than 450 minutes, the Degradation Rating is expected to be Good to Excellent.
- A degradation test against this chemical was not run. In view of degradation tests performed with similar compounds, the Degradation Rating is expected to be Good to Excellent.

**CAUTION:** This product contains natural rubber latex which may cause allergic reactions in some individuals.
<table>
<thead>
<tr>
<th>CHEMICAL</th>
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<th>POLYVINYL CHLORIDE (PVC)</th>
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</table>

Note: All numeric designations within the product classifications are denoted in minutes.

▲ A degradation test against this chemical was not run. However, since its breakthrough time is greater than 480 minutes, the Degradation Rating is expected to be Good to Excellent.

■ A degradation test against this chemical was not run. However, in view of degradation tests performed with similar compounds, the Degradation Rating is expected to be Good to Excellent.

*CAUTION: This product contains natural rubber latex which may cause allergic reactions in some individuals.

http://www.sfu.ca/ehs.html
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<th>NEOPRENE/NATURAL RUBBER BLEND</th>
<th>CHEMI-PRO*</th>
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<tr>
<td>104. Methyl-2-Pyrrolidone</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>105. Methyl tert-Butyl Ether</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>108. Morpholine</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>109. Muriatic Acid</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>+360</td>
<td>E</td>
<td>+480</td>
<td>E</td>
<td>NR</td>
</tr>
<tr>
<td>110. Naphtha VM&amp;P</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>+360</td>
<td>E</td>
<td>G</td>
<td>100</td>
<td>F</td>
</tr>
<tr>
<td>111. Nitric Acid, 10%</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>112. Nitric Acid, 70%</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>113. Nitric Acid, Acid Burning</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>116. Nitroglycerine, 55.5%</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>117. Octyl Alcohol</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>+30</td>
<td>F</td>
<td>218</td>
<td>E</td>
<td>G</td>
</tr>
<tr>
<td>118. Chloroform</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>120. Parachloroaniline</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>121. Palmitic Acid, saturated</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>122. Pentane</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>123. Pentachlorophenol, 5%</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>124. Perchloric Acid, 60%</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>125. Perfluoroethylene</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>126. Phenol</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>127. Phosphoric Acid, conc.</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>128. PMA Glycerol Ether Acetals</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>129. Potassium Hydroxide, 50%</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>130. Propene</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>131. Propyl Alcohol</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>133. Pyridine</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>134. Rubber Solvent</td>
<td>▲</td>
<td>440</td>
<td>E</td>
<td>NR</td>
<td>—</td>
<td>NR</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: All numeric designations within the product classifications are denoted in minutes.
▲ A degradation test against this chemical was not run. However, since its breakthrough time is greater than 480 minutes, the Degradation Rating is expected to be Good to Excellent.
■ A degradation test against this chemical was not run. However, in view of degradation tests performed with similar compounds, the Degradation Rating is expected to be Good to Excellent.
*CAUTION: This product contains natural/rubber latex which may cause allergic reactions in some individuals.
<table>
<thead>
<tr>
<th>CHEMICAL</th>
<th>LAMINATE FILM</th>
<th>NITRILE</th>
<th>UNSUPPORTED NEOPRENE</th>
<th>SUPPORTED POLYVINYL ALCOHOL</th>
<th>POLYVINYL CHLORIDE BLENDS</th>
<th>NATURAL RUBBER</th>
<th>NITRILE POLYURETHANE</th>
<th>CHEMICAL PRO BLEND</th>
</tr>
</thead>
<tbody>
<tr>
<td>136. Silicon Etch</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>137. Skydrol Hydraulic Fluid</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>138. Sodium Hydroxide, 50%</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>139. Stannous Solvent</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>140. Styrene</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>141. Sulfur Dichloride</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>142. Sulfuric Acid, 95%</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>143. Sulfuric Acid 100%, Osmium</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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</tr>
<tr>
<td>144. Sulfuric Acid Battery Acid</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>145. Toluene, Isopropyl</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>146. Toluene, Isopropylamine</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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</tr>
<tr>
<td>147. Tetrahydrofuran, THF</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>148. Toluene, n-pentane</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>149. Toluene, n-Cyclohexane</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>150. Trichloroethylene</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>151. Trichloroethylene, TCE</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>152. Trichloroethylene, TCE</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>153. Trimethyl Phosphate, TCP</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>154. Triphenolamine, 85%</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>155. Tropolone</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>156. Vinaleryl MCA</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>157. Vinaleryl MMT</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>158. Vinaleryl ME</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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</tr>
<tr>
<td>159. Vinaleryl MVE</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
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<tr>
<td>160. Vinaleryl VF</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>161. Vinyl Acetate</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>162. Vinyl Chloride</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>163. Xylene, Xylole</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
</tbody>
</table>

*Note: All numeric designations within the product classifications are denoted in minutes. *A degradation test against this chemical was not run. However, since its breakdown time is greater than 480 minutes, the Degradation Rating is expected to be Good to Excellent. *A degradation test against this chemical was not run. However, in view of degradation tests performed with similar compounds, the Degradation Rating is expected to be Good to Excellent. *CAUTION: This product contains natural rubber latex which may cause allergic reactions in some individuals.

**NOTE:**

These recommendations are based on laboratory tests and reflect the best judgement of Ansell Occupational Healthcare in the light of data available at the time of preparation and in accordance with the current revision of ASTM F 739. They are intended to guide and inform qualified professionals engaged in ensuring safety in the workplace. Because the conditions of ultimate use are beyond our control, and because we cannot run permeation tests in all possible work environments and across all combinations of chemicals and solutions, these recommendations are advisory only. The suitability of a product for a specific application must be determined by testing by the purchaser.

The data in this guide are subject to revision as additional knowledge and experience are gained. Test data herein reflect laboratory performance of partial gloves and not necessarily the complete unit. Anyone intending to use these recommendations should first verify that the glove selected is suitable for the intended use and meets all appropriate health standards. Upon written request, Ansell will provide a sample of material to aid you in making your own selection under your own individual safety requirements.

**NEITHER THIS GUIDE NOR ANY OTHER STATEMENT MADE HEREIN BY OR ON BEHALF OF ANSELL SHOULD BE CONSTRUED AS A WARRANTY OF MERCHANTABILITY OR THAT ANY ANSELL GLOVE IS FIT FOR A PARTICULAR PURPOSE. ANSELL ASSUMES NO RESPONSIBILITY FOR THE SUITABILITY OR ADEQUACY OF AN END-USER'S SELECTION OF A PRODUCT FOR A SPECIFIC APPLICATION.**
How to Read the Charts

Three categories of data are represented for each Ansell product and corresponding chemical: 1) overall degradation resistance rating; 2) permeation breakthrough time, and 3) permeation rate.

Standards for Color-Coding

A glove-chemical combination receives GREEN if either set of the following conditions is met:
- The degradation rating is Excellent or Good
- The permeation breakthrough time is 30 minutes or longer
- The permeation rate is Excellent, Very Good, or Good.

OR
- The permeation rate is not specified
- The permeation breakthrough time is 240 minutes or longer
- The degradation rating is Excellent, Very Good, or Good

A glove-chemical combination receives RED if the degradation rating is Poor or Not Recommended, regardless of the permeation rating.

All other glove-chemical combinations receive YELLOW. In other words, any glove-chemical combination not meeting either set of conditions required for Green, and not having a Red degradation rating of either Poor or Not Recommended, receives a YELLOW rating.

Key to Permeation Rate

<table>
<thead>
<tr>
<th>Key to Permeation Rate</th>
<th>Simply Stated, Drops/hr Through a Glove (eyedropper-size drops)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E - Excellent; permeation rate of less than 0.9 µg/cm²/min.</td>
<td>0 to 1/2 drop</td>
</tr>
<tr>
<td>VG - Very Good; permeation rate of less than 9 µg/cm²/min.</td>
<td>1 to 5 drops</td>
</tr>
<tr>
<td>G - Good; permeation rate of less than 90 µg/cm²/min.</td>
<td>6 to 50 drops</td>
</tr>
<tr>
<td>F - Fair; permeation rate of less than 900 µg/cm²/min.</td>
<td>51 to 500 drops</td>
</tr>
<tr>
<td>P - Poor; permeation rate of less than 9000 µg/cm²/min.</td>
<td>501 to 5000 drops</td>
</tr>
<tr>
<td>NR - Not Recommended; permeation rate greater than 9000 µg/cm²/min.</td>
<td>5001 drops up</td>
</tr>
</tbody>
</table>

Note: The current revision to the ASTM standard permeation test calls for permeation to be reported in micrograms of chemical permeated per square centimeter of material exposed per minute of exposure, µg/cm²/min.

Key to Permeation Breakthrough

> Greater than (time) < Less than (time)

Key to Degradation Rating

E - Excellent; fluid has very little degrading effect.
G - Good; fluid has minor degrading effect.
F - Fair; fluid has moderate degrading effect.
P - Poor; fluid has pronounced degrading effect.
NR - Fluid was not tested against this material.

NOTE: Any test samples rated P (poor) or NR (not recommended) in degradation testing were not tested for permeation resistance. A dash (-) appears in those cases.

Specific Gloves Used for Testing

<table>
<thead>
<tr>
<th>Degradation</th>
<th>Permeation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrile</td>
<td>Sol-Vex® 37.145 (11 mil/0.28 mm)</td>
</tr>
<tr>
<td>Neoprene Unsupported</td>
<td>29-965 (18 mil/0.46 mm)</td>
</tr>
<tr>
<td>Polysiloxane Alto</td>
<td>PVA™</td>
</tr>
<tr>
<td>Polycrystalline Supported</td>
<td>Snorkel®</td>
</tr>
<tr>
<td>Natural Rubber Latex</td>
<td>Cannans 392 (19 mil/0.48 mm)</td>
</tr>
<tr>
<td>Neoprene/Butadiene Blend</td>
<td>Chem-Pro 224 (27 mil/0.67 mm)</td>
</tr>
<tr>
<td>Laminated LCP™ Film</td>
<td>Barrier 2-100 (2.5 mil/0.06 mm)</td>
</tr>
</tbody>
</table>

Single palm thickness is listed in both mil and metric millimeter (mm) for Unsupported Gloves. Supported Gloves are specified by glove weight, not thickness.

Why is a product with a shorter breakthrough time sometimes given a better rating than one with a longer breakthrough time?

One glove has a breakthrough time of just 4 minutes. It is rated "very good," while another with a breakthrough time of 30 minutes is rated only "fair." Why? The reason is simple: in some cases the rate is more significant than the time.

Imagine connecting two hoses of the same length but different diameters to a faucet using a "Y" connector. When you turn on the water, what happens? Water goes through the smaller hose first because there is less space inside that needs to be filled. But when the water finally gets through the larger hose it really gushes out. In only a few minutes, the larger hose will discharge much more water than the smaller one, even though the smaller one started first.

The situation is similar with gloves. A combination of a short breakthrough time and a low permeation rate may expose a glove wearer to less chemical than a combination of a longer breakthrough time and a much higher breakthrough rate, if the glove is worn long enough.
Transportation of Dangerous Goods (TDG)

Certification
Anyone involved with packaging, shipping, transporting, or receiving dangerous goods must be certified. Certificates for shipping by air are valid for two years, and those for road are valid for three years. All certification is organized through the EH&S Department.

Receiving at SFU
Dangerous Goods packages may be received by any designated person in your department or area who holds a valid TDG certificate. Dangerous Goods destined for the Faculty of Science must pass through Science Receiving. These packages should not be accepted in departmental offices or labs.

How do you know if a package is considered dangerous goods? An incoming package will be marked with special labels and markings.

The labels (stickers) are a diamond shape and have specific colours, pictures, & numbers.

The markings (writing) on the box will include a shipping name and a United Nations number such as Gasoline, UN 1203, or Infectious substances, affecting animals only (Risk group II) UN 2900.

Most dangerous goods shipments will also include shipping papers; and the waybill should show the words “Dangerous Goods”.

Shipping at SFU
For questions regarding outgoing shipments, you can contact the designated TDG certified shipper for your area.

Dry Ice Shipments
The Styrofoam box must be unsealed but placed inside a cardboard box which is sealed. The package must have a label showing the shipping address and return address.

When package is ready, it may be shipped from your departmental office.

The waybill must contain this exact wording:

UN1845
Dry Ice
Class 9
1x__kg

Fill in the blank with the kilograms of dry ice at time of shipping.

Shipping by ground transportation only (road, rail, or ship) is different than shipping by air, and requires additional training.

Visit Science Stores for boxes, labels, and markings.

Transport On Campus

Hazardous Material Delivery Service
A delivery service is now available for all hazardous material purchases (including stock items) made through Science Stores. If you would like your chemicals/biological materials delivered directly to your lab, please specify the room number that the materials should be delivered to in the notes section of the online order form:

http://www.sfu.ca/ehs/research/chemsafety/protocols_and_procedures/chemtransport.html

All labs are encouraged to use the delivery service, especially those labs which are located furthest away from Science Stores (e.g., Blusson Hall, Saywell Hall). There is no fee for this service.

If you choose to pick up your chemicals/biological materials directly from Science Receiving, you MUST either have a cart (with raised edges) or a bottle carrier to safely transport your hazardous materials back to your lab. There is a limit of one bottle carrier per person.

General Points on the Transport of Chemicals

• When moving several containers at once use a low cart with a substantial rim around the edge.
• The container size should be as small as possible and should not exceed 4.4 liters
• Where possible avoid the use of stairs and elevators during transport. Where elevators must be used ensure the elevator is not crowded with passengers. When stairs must be used, limit the amount of chemicals being carried.
• Don't transport chemicals at peak times such as class changes

Additional points for Corrosive solids and liquids

• Purchase in containers with a protective plastic coating whenever available.
• The use of a safety carrier is required for transport of glass bottles.

Additional points for Toxic Substances

• When transporting these substances a secondary container must be used.
• The container size should be as small as possible and should not exceed 4.4 liters

Additional points for Flammable liquids

• Place in metal safety cans whenever feasible.
• Use only appropriate manufacturer supplied containers. The size should be as small as possible and should not exceed 4.4 liters. For containers exceeding 4.4 liters, prior department approval is required.
Chemical Storage

For storage requirements for individual chemicals, consult the MSDS and the safe work procedures. As a general rule, flammable or combustible liquids, toxic chemicals, explosive chemicals, oxidizing agents, corrosive chemicals, water-sensitive chemicals, and compressed gases should be segregated from each other. They must be stored in a way which will not allow chemicals to mix with one another if a container breaks e.g. secondary containment. For more details visit the EHS website:

http://www.sfu.ca/ehs/research/chemsafety/chemstorage.html

Flammables

- Eliminate ignition sources and combustible materials within areas that flammable liquids are stored.
- Storage areas must be well-ventilated.
- Within the open laboratory a maximum of 25 litres is allowed and bottles must be capped tightly when not in use.
- Solvent waste containers should be stored in the flammable storage cabinet.
- Only one flammable storage cabinet per lab without prior approval.
- Flammable storage cabinets do not require venting if safety caps remain in place. If vented, vent from the bottom of the cabinet, duct and joints should be as fire resistant as the cabinet.
- Flammable liquids are incompatible and must not be stored with ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, and halogens.
- Consult the MSDS for storage requirements of the specific flammable liquid, and a list of incompatible chemicals.

Perchloric Acid

Cautions

The Chemical formula for perchloric acid is HClO4. It is a strong oxidizing agent that will ignite when in contact with organic materials. Anhydrous perchloric acid may explode at room temperature. This acid must be inspected monthly for discoloration.

Fume Hood Use

Perchloric acid bottles are only stored in Science Stores. Room temperature perchloric acid may be used on open (non-wooden) bench tops, however, any experiments requiring exhaust extraction may only be conducted in the designated perchloric acid fume hood located in SSB 6166. No other fume hood at SFU may be used for this acid. Please arrange with the staff of this laboratory if you must use the special stainless steel fume hood that allows the duct work and inside walls to be washed down after use.

Spill Kit

Transfer of perchloric acid to and from Science Stores must be accompanied by the perchloric acid spill kit which consists of acid neutralizer and items enabling a user to scoop the material into a metal can to be filled with water.

Incompatibilities

The following chemicals have been known to cause fires or explosions upon contact with perchloric acid; therefore, do not store perchloric acid with, or allow contact with the following chemicals:

| Acetic acid | glycol ethers |
| Acetic anhydride | hydriodic acid |
| Alcohols | hydrochloric acid |
| Aniline & formaldehyde mixtures | hydrophosphites |
| Antimony compounds (trivalent) | ketones |
| Bismuth | nitrogen trioxide |
| Dehydrating agents | nitrosophenol |
| Diethyl ether | organic matter (paper, wood) |
| Fluorine | sodium iodide |
| Glycerine and lead oxide mixtures | sulfites |
| Glycols | sulfur trioxide |
Explosive Chemicals

Azides
Azides have the chemical formula R(N3)X. All heavy metal azides, most light metal ones, and many organic azides are explosive.

Picric Acid
Picric acid has the chemical formula C6H2(NO2)3OH. Do not open old bottles as crystals may have formed within the cap threads, creating the potential for a shock-sensitive explosion. Bottles with less than 10% water should not be touched or moved.

Other Explosive Compounds
The following compounds may detonate, decompose, or explode at normal room temperature and pressure. Some are also heat and shock sensitive.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetyl peroxide (25% in dimethyl phthalate)</td>
<td>tert-dibutyl peroxide</td>
</tr>
<tr>
<td>Ammonium perchlorate</td>
<td>diethyl peroxide</td>
</tr>
<tr>
<td>3-bromopropane</td>
<td>disopropyl peroxydicarbonate</td>
</tr>
<tr>
<td>tert-butyl hydroperoxide</td>
<td>o-dinitrobenzene</td>
</tr>
<tr>
<td>tert-butyl perbenzoate</td>
<td>ethyl methyl ketone peroxide</td>
</tr>
<tr>
<td>tert-butyl peroxypivalate (75% in benzene)</td>
<td>ethyl nitrate</td>
</tr>
<tr>
<td>tert-butyl peroxyacetate (75% in mineral spirits)</td>
<td>nitroglycerine</td>
</tr>
<tr>
<td>nitromethane</td>
<td>2-nitro-p-toluidine</td>
</tr>
<tr>
<td>1-chloro-2,4-dinitrobenzene</td>
<td>peroxyacetic acid (in 60% acetic acid)</td>
</tr>
<tr>
<td>cumene hydroperoxide</td>
<td>picric acid</td>
</tr>
<tr>
<td>diacetyl peroxide</td>
<td>trinitrotoluene</td>
</tr>
<tr>
<td>dibenzoyl peroxide</td>
<td>trinitrobenzene</td>
</tr>
</tbody>
</table>

Unstable Chemicals

Peroxides
A peroxide is any compound containing an O-O bond. Since these compounds can readily release oxygen, they are considered to be strong oxidizing agents and fire hazards. Peroxide inhibitors are included in most compounds, but may not be sufficient once the container is opened.

Test Every 3 Months
Test the following compounds for peroxides every 3 months, after opening, and before use. They can form explosive peroxides during storage.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>divinyl acetylene</td>
<td>isopropyl ether</td>
</tr>
<tr>
<td>potassium metal</td>
<td>sodium amide</td>
</tr>
<tr>
<td>vinylidene chloride</td>
<td></td>
</tr>
</tbody>
</table>

Test Every 12 Months
Test the following compounds for peroxides every 12 months, after opening, and before use. They can form explosive peroxides during concentration.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetal</td>
<td>dioxane</td>
</tr>
<tr>
<td>cyclohexene</td>
<td>ethylene glycol dimethyl ether</td>
</tr>
<tr>
<td>diacetylene</td>
<td>methyl acetylene</td>
</tr>
<tr>
<td>dicyclopentadiene</td>
<td>tetrahydrofuran</td>
</tr>
<tr>
<td>diethylene glycol dimethyl ether</td>
<td>tetrahydronaphthalene</td>
</tr>
<tr>
<td>diethyl ether</td>
<td>vinyl ethers</td>
</tr>
<tr>
<td>tert-butyl peroxyacetate (75% in benzene)</td>
<td>picric acid</td>
</tr>
<tr>
<td>cumene hydroperoxide</td>
<td>picric acid</td>
</tr>
<tr>
<td>diacetyl peroxide</td>
<td>trinitrotoluene</td>
</tr>
<tr>
<td>dibenzoyl peroxide</td>
<td>trinitrobenzene</td>
</tr>
</tbody>
</table>

Test these compounds every 12 months also. They can initiate explosive conditions once peroxides are formed.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>acrylic acid</td>
<td>tetrafluoroethylene</td>
</tr>
<tr>
<td>acrylonitrile</td>
<td>vinyl acetate</td>
</tr>
<tr>
<td>butadiene</td>
<td>vinyl acetylene</td>
</tr>
<tr>
<td>choroprene</td>
<td>vinyl chloride</td>
</tr>
<tr>
<td>chlorotrifluoroethylene</td>
<td>vinlylidene chloride</td>
</tr>
<tr>
<td>methyl methacrylate</td>
<td>vinyl pyridine</td>
</tr>
<tr>
<td>styrene</td>
<td></td>
</tr>
</tbody>
</table>
# Incompatible Chemicals

<table>
<thead>
<tr>
<th>Chemical 1</th>
<th>Chemical 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetaldehyde</td>
<td>acetic anhydride, acetic acid, acetone, ethanol, sulfuric acid</td>
</tr>
<tr>
<td>acetic acid</td>
<td>chromic acid, nitric acid, hydroxyl compounds, ethylene, glycol, peroxides, permanganates</td>
</tr>
<tr>
<td>acetone</td>
<td>concentrated nitric and sulfuric acid mixtures</td>
</tr>
<tr>
<td>acetylene</td>
<td>chlorine, bromine, copper, fluorine, silver, mercury</td>
</tr>
<tr>
<td>alkaline metals</td>
<td>water, carbon tetrachloride and other chlorinated hydrocarbons, carbon dioxide, halogens</td>
</tr>
<tr>
<td>ammonia (anhydrous)</td>
<td>mercury, chlorine, calcium, hypochlorite, iodine, bromine, hydrofluoric acid (anhdydrous)</td>
</tr>
<tr>
<td>ammonium nitrate</td>
<td>acids, powdered metals, flammable liquids, chlorates, nitrates, sulfur, finely divided, organic or combustible materials</td>
</tr>
<tr>
<td>aniline</td>
<td>nitric acid, chromic acid, hydrogen peroxide</td>
</tr>
<tr>
<td>bromine</td>
<td>ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbonate, turpentine, benzene, finely divided metals</td>
</tr>
<tr>
<td>carbon (activated)</td>
<td>calcium hypochlorite, all oxidizing agents</td>
</tr>
<tr>
<td>carbon tetrachloride</td>
<td>diborane, fluorine</td>
</tr>
<tr>
<td>chlorates</td>
<td>ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials</td>
</tr>
<tr>
<td>chromic acid and chromium trioxide</td>
<td>acetic acid, naphthalene, camphor, glycerol, alcohol, turpentine, all other flammable, liquids</td>
</tr>
<tr>
<td>chlorine</td>
<td>ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbonate, turpentine, benzene and finely divided metals</td>
</tr>
<tr>
<td>chlorine dioxide</td>
<td>ammonia, methane, phosphate, hydrogen sulfide</td>
</tr>
<tr>
<td>copper</td>
<td>acetylene, hydrogen peroxide</td>
</tr>
<tr>
<td>cumene hydroperoxide</td>
<td>acids (organic or inorganic)</td>
</tr>
<tr>
<td>cyanides</td>
<td>acids</td>
</tr>
<tr>
<td>dimethyl sulfoxide</td>
<td>perchoric acid, silver fluoride, potassium permanganate, acetylchloride, benzene, sulfonyl chloride</td>
</tr>
<tr>
<td>flammable liquids</td>
<td>ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens</td>
</tr>
<tr>
<td>fluorine</td>
<td>isolate from everything</td>
</tr>
<tr>
<td>hydrocarbons (propane, benzene, gasoline, etc.)</td>
<td>fluorine, bromine, chlorine, chromic acid, sodium peroxide</td>
</tr>
<tr>
<td>hydrocyanic acid</td>
<td>nitric acid, alkali</td>
</tr>
<tr>
<td>hydrofluoric acid (anhdydrous)</td>
<td>ammonia, aqueous or anhydrous</td>
</tr>
<tr>
<td>hydrogen peroxide</td>
<td>copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, flammable liquids, combustible materials</td>
</tr>
<tr>
<td>hydrogen sulfide</td>
<td>fuming nitric acid, oxidizing gases</td>
</tr>
<tr>
<td>iodine</td>
<td>acetylene, ammonia (aqueous or anhydrous), hydrogen</td>
</tr>
<tr>
<td>mercury</td>
<td>acetylene, fulminic acid, ammonia, oxalic acid</td>
</tr>
<tr>
<td>nitric acid (concentrated)</td>
<td>acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases</td>
</tr>
<tr>
<td>oxalic acid</td>
<td>silver, mercury agents</td>
</tr>
<tr>
<td>phosphorus (white)</td>
<td>air, oxygen, alkalis, reducing</td>
</tr>
<tr>
<td>potassium</td>
<td>carbon tetrachloride, carbon dioxide, water</td>
</tr>
<tr>
<td>potassium chloride</td>
<td>sulfuric and other acids</td>
</tr>
<tr>
<td>potassium permanganate</td>
<td>glycerol, ethylene glycol, benzaldehyde, sulfuric acid</td>
</tr>
<tr>
<td>silver</td>
<td>acetylene, oxalic acid, tartaric acid, ammonium compounds</td>
</tr>
<tr>
<td>sodium</td>
<td>carbon tetrachloride, carbon dioxide, water</td>
</tr>
<tr>
<td>sodium peroxide</td>
<td>ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural</td>
</tr>
<tr>
<td>sulfuric acid</td>
<td>potassium chloride, potassium perchlorate, potassium permanganate (similar compounds of light metals such as sodium, lithium)</td>
</tr>
</tbody>
</table>
Hazardous Waste Disposal

GVRD Local Laws

Sewer Use Bylaw No. 299 regulates waste discharges into all sewers in the District. Liquid waste is divided into Prohibited Waste, which may never be disposed of down drains, and Restricted Waste, which have established concentration limits for their disposal.

Prohibited Waste

Prohibited Waste cannot be disposed of down drains and sewers at any time, as it poses a significant risk to both worker health and safety, and to the integrity of SFU building and sewer infrastructure. The following is a list of prohibited waste.

- Corrosive waste. Any waste with a pH of lower than 5.5 or higher than 10.5 or any corrosive properties that may damage drain, building, or sewer infrastructure
- Biohazardous Waste (see pages 63-67)
- Radioactive Waste (see the Radiation Safety Manual)
- High Temperature waste, meaning any liquid waste at a temperature higher than 65 degrees Centigrade, or any waste that will raise the temperature of waste entering a sewage facility to 40 degrees Centigrade or more

Restricted Waste

Below are two tables listing metal and other contaminants with their corresponding maximum concentration. Restricted Waste exceeding the following criteria may not be disposed of down drains and into sewers. In accordance with the British Columbia Hazardous Waste Regulation, waste may NOT be diluted for the purpose of meeting the allowable concentration limits.

<table>
<thead>
<tr>
<th>Metal Contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum (50.0 mg/L)</td>
</tr>
<tr>
<td>Arsenic (1.0 mg/L)</td>
</tr>
<tr>
<td>Boron (50.0 mg/L)</td>
</tr>
<tr>
<td>Cadmium (0.20 mg/L)</td>
</tr>
<tr>
<td>Chromium (4.0 mg/L)*</td>
</tr>
<tr>
<td>Cobalt (5.0 mg/L)</td>
</tr>
<tr>
<td>Copper (2.0 mg/L)</td>
</tr>
<tr>
<td>Iron (10.0 mg/L)</td>
</tr>
</tbody>
</table>

Metal Contaminants

<table>
<thead>
<tr>
<th>Other Contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene (0.1 mg/L)</td>
</tr>
<tr>
<td>Total BETX (1.0 mg/L)</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand (BOD) (500 mg/L)</td>
</tr>
<tr>
<td>Chlorophenols including tetra- &amp; penta-chlorophenols (0.05 mg/L)</td>
</tr>
<tr>
<td>Cyanide (1.0 mg/L)*</td>
</tr>
<tr>
<td>Phenols (1.0 mg/L)</td>
</tr>
</tbody>
</table>

NOTE: The following guidelines do not replace the risk assessment users must perform when working with hazardous materials to determine their safest method of disposal.
Lab Decommissioning

Purpose
To protect the health and safety of workers involved in the remodeling and reconstruction of a laboratory.

Application
This applies to preparation of equipment for moving or servicing and to full or partial renovations of a laboratory including but not limited to any room where chemical, biological, or radioactive materials were handled or stored.

Responsibilities

Principal Investigator
Ensuring that lab spaces have been cleared of chemical, physical, biological, and radiological hazards on all surfaces and equipment and signing the clearance form to indicate this.

Emergency Equipment: Ensures the following emergency equipment remains functional during the decommissioning: eye washes, nearest showers, fire extinguishers.

Lab Administrator or Designate
Conducts a final inspection and signs the clearance form. For full decommissioning, notifies EHS prior to lab being cleared out and at time of final clearance inspection. Leave a copy of the decommissioning checklist at the worksite.

Contents Disposal

Transportation of Dangerous Goods Act
Any materials that are to be transported on roadways to other buildings or off campus must be in accordance with the Transportation of Dangerous Goods Act.

Biohazards
Disinfect all biohazards using the autoclave or bleach solutions.

Chemicals
Remove all chemicals including cleaning compounds, surplus chemicals, stock solutions, and experimental products. Contact Science Stores to arrange for disposal of unwanted chemicals. Unknown chemicals, or those that may be shock or light sensitive should not be touched.

Gas Cylinders
Arrange with Central Stores to have your gas cylinders picked up. Lecture Bottles: Arrange through Science Stores.

Equipment & Miscellaneous
Arrange with the department lab coordinator for disposal of equipment. Remove all rags, empty bottles, and boxes.

Radioactive materials and waste
Check with the Radiation Safety Officer or consult the Radiation Safety Manual for detailed procedures.

Cleaning

Biohazards
Clean all surfaces where biohazards were used with a 10% chlorine bleach solution.

Fume hoods
Clean inside and outside with soap and water.

Fridges and Freezers
Clean inside and outside with soap and water.

Cabinets, cupboards, and drawers
Ensure all cabinets (wooden or metal) are completely emptied, and washed down with soap and water, including all interior and exterior surfaces.

Bench tops & Sinks
Once all contamination has been removed, wash with soap and water.

Flooring
Once all contamination has been removed, arrange for wet mopping.

Biosafety cabinets and laminar flow hoods
Disinfect inside and wash outside with soap and water.

Discovery of Contamination during renovation
During the removal of cabinetry or flooring materials, previously hidden hazards may become evident. Should this occur, contact the lab coordinator and EHS, and remove the clearance notice until deemed acceptable to proceed. No work may proceed until the contamination is removed.

Clearance Notice
To be posted at the lab or on a piece of equipment until the work is completed.
# Decontamination Checklist

<table>
<thead>
<tr>
<th>Compliance Item</th>
<th>Lab Administrator or Designate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>For full decommissionings, Environmental Health &amp; Safety has been notified</td>
<td></td>
</tr>
<tr>
<td>All chemicals and biohazards have been removed.</td>
<td></td>
</tr>
<tr>
<td>Gas cylinders have been removed</td>
<td></td>
</tr>
<tr>
<td>Cupboards and cabinets have been wiped down inside and outside</td>
<td></td>
</tr>
<tr>
<td>All drawers have been washed out</td>
<td></td>
</tr>
<tr>
<td>Fumehoods have been cleaned inside and outside</td>
<td></td>
</tr>
<tr>
<td>Biosafety cabinets have been decontaminated and cleaned</td>
<td></td>
</tr>
<tr>
<td>Fridges &amp; Freezers have been cleaned inside and outside</td>
<td></td>
</tr>
<tr>
<td>Lab has been checked for mercury contamination if Hg was used.</td>
<td></td>
</tr>
<tr>
<td>All boxes and hardware have been removed</td>
<td></td>
</tr>
<tr>
<td>All equipment not required in the room has been removed</td>
<td></td>
</tr>
<tr>
<td>Radiation swipe test &amp; survey results have been reviewed by the Radiation Safety Office</td>
<td></td>
</tr>
<tr>
<td>All radioisotopes have been removed</td>
<td></td>
</tr>
<tr>
<td>Radiation stickers have been removed</td>
<td></td>
</tr>
<tr>
<td>Door signs indicating hazards within the room have been removed</td>
<td></td>
</tr>
</tbody>
</table>
Course B: Bio Safety Session
What is a Biohazard

Definitions

SFU Policy R20.02

Biohazards are defined as biological agents and materials which are potentially hazardous to humans, animals and other forms of life. They include known pathogens and infectious agents including bacteria and their plasmids and phages, viruses, fungi, mycoplasmas, and parasites; cell lines, animal remains, and laboratory animals including insects which might harbor such infectious agents; and primate body fluids. Also included are potentially biohazardous organisms used in procedures such as recombinant DNA and genetic manipulations. Biohazards will be classified according to risk levels requiring appropriate containment.

Who regulates biosafety work in Canada?

The Human Pathogens and Toxins Act (HPTA) (2009) “establishes legal prohibitions and authorities to govern human pathogens and toxins in Canada. It is designed to protect the health and safety of the public against the risks posed by human pathogens and toxins, while allowing science and research to progress.”

Separate guidelines currently exist for the safe use of human and terrestrial animal pathogens:

1. Public Health Agency of Canada (PHAC)
2. Canadian Food Inspection Agency (CFIA)

PHAC & CFIA are developing joint guidelines. Until then, separate guidelines exist. To access both, see http://canadianbiosafetystandards.collaboration.gc.ca/index-eng.php

CFIA also regulates use of plants with novel traits (PNT), e.g., transgenic plants as well as aquatic animal pathogens.

Risk Groups = Containment levels

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Individual Risk</th>
<th>Community Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Unlikely to cause disease in healthy workers</td>
<td>[e.g. many E.Coli types]</td>
</tr>
<tr>
<td>2</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Can cause disease that is easily treatable</td>
<td>Not easily spread [e.g. Legionella spp.]</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Can cause serious disease that is treatable</td>
<td>Not easily spread by casual contact [e.g. Bacillus anthracis.]</td>
</tr>
<tr>
<td>4</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
|            | Can cause serious, often untreatable disease | Is easily transmitted by casual contact [e.g. Ebola.]

Working with Biohazards

Know Which Risk Group you are Working with

If the organism is already in the lab, your supervisor should know the risk group, because it is on the permit.

PHAC has created Pathogen Safety Data Sheets for many Level 2 to 4 organisms. See www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php

If it isn’t on that list you must ask the Public Health Agency of Canada - email: biosafety_biosecurity@phac-aspc.gc.ca

For a good guess, or to know where it stands in the USA (for import purposes) check with the American Type Culture Collection website: www.atcc.org. However the official regulations are in the websites of the CDC and NIH (www.cdc.gov/biosafety/publications/bmbls/index)

You will need import permits from PHAC and/or the CFIA to purchase or receive any level 2 organism (or soil) from outside of Canada.

You need to follow special packaging instructions to ship one of your strains to a colleague, and follow international rules for level 2 and up. Material transfer agreements may also be required (even for UBC).

SFU Biosafety Permits

If you are working with a biohazard, your supervisor must have a permit issued by the university Biosafety committee that lists that hazard and describes the work.

Before you start the work (or obtain the organism) the permit must be approved.

There is detailed information about permits in this manual.

Pathogen Safety Data Sheets

These can be found for microorganisms of risk level 2 and above, on the PHAC website at: www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php

These are designed with the safety of laboratory workers in mind, and list such useful information as: symptoms of infection, mode of transmission, infectious dose (how many organisms it takes to start an infection), host range, incubation period, which disinfectants work, whether heat treatment kills the organism, and how to clean spills.
Working with Biohazards continued

Selected Regulations for CL1 and CL2 Laboratories

<table>
<thead>
<tr>
<th>Regulation</th>
<th>CL 1</th>
<th>CL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doors closed to aid containment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative pressure (air moves inward)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street clothes not stored with lab coats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of safety cabinet to contain aerosols</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restrictions to entry, visitor log book</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signs indicating presence of biohazards, entry protocols</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training in biocontainment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly checklist to be maintained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All wastes disinfected or covered prior to disposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No infectious materials to be poured down sinks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate disinfectants must be kept on hand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paperwork stations kept away from biohazard work area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work surfaces decontaminated at least daily</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usual laboratory practices, including:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of PPE (lab coats, gloves, proper footwear, goggles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jewelry, contact lenses discouraged, long hair tied back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No eating, drinking, food storage, smoking or mouth pipetting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R= required

Working with Risk group 1 organisms in the Research Laboratory

If it can’t hurt me, why do I need to be careful?

1. If you culture an organism, the concentration and potential dose to you can be very high, perhaps $10^9$ microorganisms/ ml.
2. Microorganisms may gain direct entry to the body during a laboratory accident.
3. You may not be growing the intended CL1 organism, but a pathogenic contaminant.
4. Some organisms are not fully characterized and pose unknown hazards.
5. Precautions must be increased above those taught in this course when working in a large scale, (>10L) even with a well characterized organism. There are excellent books in the SFU library on this topic.

Consequences of Exposure to Biohazards

How about illness and death?

Infections from
1. Microorganisms under study (plague).
2. Microbial contamination of other biological samples (viruses in tissue culture).

Poisoning from microbial toxins (botox).

Allergies many toxins and some organisms are allergenic (mold allergy).
Biohazard Exposure Routes

Statistics on Laboratory Accidents

Only 20% of the time was exposure obvious to the worker

Wounds: scalp nicks, culture tube breaks, opening freeze-dried ampoules.

Ingestion: mouth pipetting, dirty hands touch mouth, pen in mouth, coffee cup on lab bench where it can be splashed (all can be easily avoided).

Injection: needle sticks while injecting animals with organisms, or recapping a used needle.

Inhalation: dropped flask, splashes while pouring, heat-cracked glassware, lid off centrifuge tube, exploding cryovials.

Eye contact: splashes, hand to eye, or aerosols. Some organisms enter via the conjunctivae.

Other 80% of the time exposure was less obvious to the worker

Small aerosols: entry is the same as above, but less expected to have caused a problem, small aerosols are encountered during many routine procedures such as:
  - flaming a loop with culture on it
  - careless loading of autoclave bags
  - pouring supernatant from a centrifuge tube
  - pipetting up and down, or ejecting pipette tips
  - loading slides with culture, catalase test (bubbles)
  - opening tubes or petri dishes where the caps have been wetted

Inadequate hand washing

Minor skin abrasions: cuts, dermatitis, eczema, the skin does not provide a proper barrier to organisms in these situations.

Poor technique: can spread biohazards beyond the immediate work area via spills on racks, pens, lab books and from there onto desks and bench tops. As most organisms are viable on surfaces, they can affect co-workers, custodians, or even those who we live with.

Immune Status

Fortunately, your immune system can generally handle small exposures in the lab. However, some of your co-workers could have suppressed immune systems: e.g, pregnant women, those with mononucleosis, those being treated with steroids and those undergoing cancer treatment.

Exposure Control Plan

Biohazard Exposure Control Plan

Exposure

Splash to face or eyes
1. Advise lab occupants
2. Rinse for 15 minutes with water at eye-wash station
3. Remove contaminated clothing or lab coats for autoclaving (fold them inwards)
4. Proceed with emergency treatment below

Needle sticks or cuts
1. Advise lab occupants
2. Wash with soap and water
3. Apply a bandage if necessary
4. Proceed with emergency treatment below

Emergency treatment
  - If worker cannot move, call security at 24500
  - If possible, retain the product causing the exposure for testing purposes
  - Proceed to SFU health services in the Maggie Benston building (open Monday-Thursday 8:30 – 5:30 and Fri 8:30-4:30).
  - Otherwise, attend the Emergency Room at

<table>
<thead>
<tr>
<th>Royal Columbian</th>
<th>330 East Columbia, New Westminster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burnaby General</td>
<td>3935 Kinkaid, Burnaby</td>
</tr>
<tr>
<td>Eagle Ridge</td>
<td>475 Guilford Way, Port Moody</td>
</tr>
</tbody>
</table>

  - Indicate to the Admitting Clerk the possibility of a biohazard infection
  - Provide personal history to the health nurse
  - Blood may be examined, and a physician may recommend anti-viral pills
  - Further blood work and counseling may be required throughout the year
  - Have your supervisor complete a WorkSafeBC Form 7, and an SFU incident report

Vaccinations

If you suspect you will be working with a virus for which a vaccine is available, you may be entitled to have the cost of your vaccinations covered by your department. You will be required to acknowledge that a vaccine has been made available to you.
Safety Techniques

Reduce or Contain Aerosols

1. Dry contaminated metal inoculating loops before flaming or use plastic loops.
2. Spread and pipette in a controlled manner.
3. Mix by vortexing where possible. Use tightly closed caps on tubes.
4. Cap all solutions for the centrifuge and do not overfill.
5. Sonicate cells in a biosafety cabinet.
6. Carry tubes and flasks in the proper racks, or on trays.
7. Contain dry spores by working on a damp mat in a biosafety cabinet. Discard waste into a sealed container, such as a Ziploc bag, before adding to (open) biohazard bags.
8. Use a biosafety cabinet (never a laminar flow hood) when aerosols are generated.
9. Use a properly fitted respirator, if none of the above will provide adequate protection.

Avoid Injection Injuries

1. Use syringes/needles only when no other method of transfer will work.
2. Use Safety Engineered Sharps (SES) when possible and **NEVER Recap** needles; discard in the red plastic biohazard sharps containers with the syringe attached.
3. When opening sealed glass ampules containing biohazardous materials, score the glass with a file, wrap the vial in paper towel and wear sturdy gloves before breaking the ampule.
4. When working with pipettes insert the pipette into a pipette-aid or bulb, by grasp the upper part of the pipette. Plastic pipettes are safer than glass.
5. Use proper glass test tubes if working with pathogens; not disposable glass which has a greater probability of breakage. Disposable plastic culture tubes are safer then glass.

Use the Spread of Biohazards

1. Keep required waste containers in your immediate work area.
2. Disinfect or use secondary containment for any biohazardous materials that may leave the labs. This could be anything from wastes to equipment that may leave the lab for repair.

Use Personal Protective Equipment

Personal Protective Equipment is the last line of defense against exposure to hazardous materials. It should only be worn if all other exposure control strategies (e.g., elimination/substitution, engineering controls, administrative controls) are not effective in reducing exposure. If you have any questions regarding the selection of appropriate personal protective equipment, please contact Mike Neudorf at 778-782-7265.

Types of Personal Protective Equipment (PPE)

1. Safety glasses/goggles
2. Gloves
3. Lab Coats
4. Appropriate footwear
5. Respirator
Disposable Plastics

Biohazardous waste from risk groups 1 or 2 must be disposed of using the SFU specified autoclave bags and bag holders. Please note the colour of bags to use based on the containment level required for the research project. Level 1 waste must only be placed in the clear autoclave bags. Level 2 waste must only be placed in the orange autoclave bags. All biohazard bags (level 1 and 2) must be placed in a labeled bag holder, either a metal rack or a sturdy plastic container labeled with a biohazard sign.

Once full, all bags must have a piece of autoclave tape adhered to the bag. Tape with hatched markings should be used for level 1 waste. Tape with the word “autoclaved” should be used for level 2 waste. The bags should be loosely closed to allow steam penetration into the bag.

Disposal of Level 1 Biohazards in Autoclave Bag Procedure

Please follow the instructions below for preparing your level 1 biohazardous waste for pick-up:

1. Each lab needs a plastic bin for the collection of full autoclave bags. Affix a label to the plastic container/bin indicating that it is biohazard level 1 waste.
2. Seal the bags loosely with a twist tie and a strip of hatched autoclave tape.
3. Before placing the waste bags into the plastic containers, decontaminate the outside of the bags with a suitable disinfectant.
4. Fill out the online waste disposal form at: http://www.sfu.ca/science-stores/ (Please note that a separate form has not been created for biohazardous waste therefore please use the chemical waste disposal form. Under “chemical name” please write “level 1 biohazardous waste” and indicate the number of waste bags under “quantity”).
5. If you require a weekly automatic pick-up of your level 1 waste, please contact EHS. This will eliminate the need for those researchers to fill-out the online form every week.

Once you have submitted the waste disposal form, the disposal company will come to your lab either on Tuesday or Friday between 10:00-12:00 noon to pick up the waste. The disposal company does NOT have keys to your labs so please ensure someone is present in the lab during the waste pick-up hours.

Disposal of Level 2 Biohazards in Autoclave Bag Procedure

Level 2 (orange) bags should be closed loosely with a twist tie. Attach a strip of autoclave tape that will develop the words “autoclaved”. The outside of the bag should be disinfected or the bag placed inside a larger clean autoclave bag prior to transport into the autoclave room.

All level 2 biohazardous waste must be autoclaved on site then placed in the designated bins in each autoclave room for pick-up by the waste disposal company. The following autoclaves can be used for treatment of level 2 biohazardous waste:

- SSB 6113
- B8213
- K9605
- BH 9805
- ARC: ACF 6703 and TT 6475.1

Nucleic Acids

Microorganisms in the environment are capable of incorporating genes from naked nucleic acids. Many of the genes that researchers work with at SFU are potentially harmful in the environment (e.g., antibiotic resistance genes, pathogenicity genes and transgenic plant genes). The safest policy is to dispose of nucleic acids as biohazardous materials. The flow chart on the following page should be followed for disposal of nucleic acids on campus.
Liquids

Liquids can be autoclaved or bleached (all bleached to 20% v/v), allow for off-gassing to occur in fumehood. If liquids are to be aspirated into a trap, the pump or aspirator must be protected by a secondary trap and/or autoclavable in-line filter.

Blood, Body Fluids and Biomedical Waste

Blood and body fluids may contain viruses and therefore may be treated as biohazards, depending on the animal from which they originated. For example, clean samples from humans are treated as biohazard level 2 as are many samples from birds. However, fluids from uninfected fish are not treated as biohazards. Protocols for handling and disposal of these potentially infectious samples may be obtained upon consultation with EHS. Specific lab protocols will need to be established to receive the required permits.

Biomedical and pathological waste that is generated in Health Services must be treated as biohazardous waste if it is heavily soiled (e.g. bandages or dressings which are dripping blood). This waste must be collected in orange autoclave bags, autoclaved on site (there is an autoclave in Health Services) and stored in a plastic bin for pick-up by the waste disposal company.

Animal and Fish Tissues

Animal and fish tissues should be placed in heavy (high mil number) plastic bags and stored in a designated tissue freezer. Staff from the Animal Resource Centre will pick up the packaged tissues directly from the freezer and will arrange for their disposal.

Radioactive tissues must be held for decay before disposal. When adequately decayed, the radioactive symbols should be removed.
The Biohazardous Waste Stream continued

Glass Waste

**Broken glassware** contaminated with biohazards is to be autoclaved or bleached in a sturdy means of containment, and then disposed of with regular broken glassware in the “broken-glass” buckets. **Non-broken glassware** for disposal should also be placed in the “broken-glass” buckets.

**Sharps and Needles**

Sharps containers are designed to contain needles, scalpel blades, razor blades, and similar items. All used sharps must be placed in the appropriate sharps container. Sharps contaminated with biohazardous materials (level 1 and 2) should be placed in the red sharps containers. Sharps which are contaminated with radioisotopes should be placed in the clear plastic sharps containers. Sharps which are neither biohazardous or radioactive should be placed in the yellow sharps containers. The following sharps container table provides more information.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Container Type</th>
<th>Required Word or Symbol</th>
<th>Available at</th>
<th>To be Autoclaved</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biohazardous Level 1</td>
<td>Designated red plastic</td>
<td>Sharps, Biohazard</td>
<td>Science Stores</td>
<td>NO</td>
<td>Weekly pick-up by waste company</td>
</tr>
<tr>
<td>Biohazardous Level 2</td>
<td>Designated red plastic</td>
<td>Sharps, Biohazard</td>
<td>Science Stores</td>
<td>YES</td>
<td>Placed in bin in autoclave room after autoclaving</td>
</tr>
<tr>
<td>Biohazardous and Radioactive</td>
<td>Designated red plastic</td>
<td>Sharps, Biohazard, Radioactive</td>
<td>Science Stores</td>
<td>NO</td>
<td>See Radiation Safety or EHS</td>
</tr>
<tr>
<td>Radioactive Only</td>
<td>Designated clear plastic</td>
<td>Sharps, Radioactive</td>
<td>Hot Lab B7249</td>
<td>NO</td>
<td>Radiation Safety</td>
</tr>
<tr>
<td>Non Biohazard AND Non Radioactive</td>
<td>Designated yellow plastic</td>
<td>Sharps</td>
<td>Science Stores</td>
<td>NO</td>
<td>Science Stores</td>
</tr>
</tbody>
</table>

Before autoclaving, place autoclave tape on top of the sharps container – do not cover holes. Do not autoclave biohazardous radioactive sharps. Please consult with EHS and the Radiation Safety Office for disposal.

**Mixed Biohazards**

**Biohazardous and Radioactive Waste**

Do not autoclave radioactive materials. Please consult the Radiation Safety Office for information on disposal of radioactive materials.

**Biohazardous and Chemically Toxic Waste**

Toxic and/or volatile chemicals should not be autoclaved (e.g., Ethidium Bromide, bleach). Biohazardous materials that are contaminated with chemicals should be destroyed first by sterilizing with bleach in a fume hood. The inactivated biohazardous waste can now be treated as chemical waste. If bleach cannot be used for sterilization, please consult EHS.
## Disinfectants

<table>
<thead>
<tr>
<th></th>
<th>Quaternary ammonium</th>
<th>Phenols</th>
<th>Chlorinated</th>
<th>Iodophors</th>
<th>Alcohols</th>
<th>Formaldehyde</th>
<th>Glutaraldehyde</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disinfecting Properties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Bacterial spores</td>
<td>~</td>
<td>~</td>
<td>(+)</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Fungi</td>
<td>~</td>
<td>~</td>
<td>(+)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Viruses</td>
<td>+</td>
<td>~</td>
<td>+</td>
<td>+</td>
<td>~</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Lipo-viruses</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

### Chemical Properties

<table>
<thead>
<tr>
<th></th>
<th>0.1-2%</th>
<th>1-5 %</th>
<th>500 ppm*</th>
<th>25-1600 ppm</th>
<th>70-85%</th>
<th>0.2-8%</th>
<th>2%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active concentration</strong></td>
<td>week</td>
<td>week</td>
<td>1 day</td>
<td>week</td>
<td>week</td>
<td>week</td>
<td>week</td>
</tr>
<tr>
<td><strong>Shelf life (diluted)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrosive</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flammable</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Inactivated by organic matter</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Skin irritant</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Eye irritant</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Respiratory irritant</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Toxic</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>For use with liquid waste</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>For use on glassware</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>For use on surfaces</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

### Examples

- hyamine
- lysol
- bleach**
- ioprep
- ethanol/isopropanol
- sterac
- cidex

Table: Disinfectants

*500 ppm available chlorine

** use 20% for disinfectant baths and 2% to disinfect counters. To kill supernatants, add bleach to 20% final conc

### Standard use of disinfectants:

- Clean counters and metal surfaces with mild detergent followed by 70% alcohol
- Use bleach to kill liquid cultures or traps. Bleach is also OK on spills but it corrodes metal, so be sure to rinse the area well after cleaning up a spill with bleach.
- If using bleach to sanitize surfaces, surfaces should be cleaned with detergent and water first, then wiped with 2% bleach solution
- Phenolics are sometimes used in disinfectant baths
Biohazard Spill Kit

The Spill Kit should be geared toward the type of biohazards you are working with and should include, but is not limited to:

- Biohazard Spill Clean-up instructions (photocopy from the Lab Safety Manual or more specific instructions based on this design.)
- Gloves, goggles, and face mask for 2 people
- Disposable shoe covers (booties or large plastic bags + strings).
- Absorbent paper towels, or other absorbent material.
- All-purpose disinfectant, such as bleach.
- Bucket (can be used to store the spill kit)
- Tongs and/or forceps for picking up broken glass or contaminated sharps.
- Sharps container if you use sharps frequently
- Sturdy plastic bags (6 mill), autoclave bag.
- Biohazard spill warning signs, and flagging tape.
- All non disposable items should be compatible with the disinfectant to be used or autoclavable. The items should also fit in bags for disinfection or in the autoclave bag.

Clean Up

1. Wearing gloves, mark the spill perimeter with a grease pen or masking tape. Remember that some evaporation may have occurred on flat and vertical surfaces.
2. If spill is in a piece of equipment, unplug it, and post a notice.
3. Set up the disposal bucket with a plastic bag liner.
4. Do not recap or bend needles; using tongs, place them in a sharps container.
5. Remove broken glass with tongs into an autoclavable container for autoclaving.
6. If practicable, begin cleaning upper surfaces and vertical surfaces before floors.
7. Soak paper towel in decontaminant such as bleach and lay them over the perimeter of the spill. Continue laying soaked paper towels, moving towards the centre of the spill.
8. Place dry paper towels on top to soak up remaining liquid and apply more disinfectant. Keep spill area covered with decontaminant for 30 minutes.
9. Remove paper towels to lined bucket and wipe up until all material is absorbed and the area is dry.
10. Add more bleach to the bucket to ensure organism kill.
11. Place bucket in a fume hood for venting for 24 hours and wash hands.
12. After 24 hours, lift out bag and while standing over a sink with running water, poke a hole in the bottom of the plastic bag to drain the bleach.
13. Place the drained plastic bag with solids into the waste basket.
14. Wash hands.

Biohazard Spills

Initial Response

1. If switches are accessible, shut off air conditioning units and ceiling fans.
2. Evacuate the lab if there is potential for aerosol generation from the spilled material. Spills in biosafety cabinets will likely be contained within the cabinet.
3. Post a “do not enter” sign on the door.
4. Secure corridor near lab entrance with “do not enter” tape.
5. Assess whether people or clothing require treatment for exposure to hazardous organisms.
6. Consult with supervisor.
7. Consult with lab coordinator.
8. Allow 60 minutes for aerosols to settle before initiating clean-up.

Documentation

Complete an SFU incident report form, available on the Environmental Health and Safety website or Security website.

If an employee visited a physician, or was absent beyond the day of the incident (due to the incident), then the supervisor completes a WorkSafeBC Form 7.
Working in Biosafety Cabinets

Before using a BSC

- If equipped with a UV (purple) light, ensure it is turned off.
- Place all materials needed for a procedure inside the cabinet before starting.
- Place supplies, equipment and absorbent towels so that air intake or exhaust grills are not obstructed.
- If the cabinet is not turned on, allow the fan to operate for 15 minutes to reach the proper operating speed and to remove the particle load in the cabinet. Check the magnahelic gauge to know where your cabinet operates at.
- Place your gloves over the cuff of your lab coat.

Using a BSC

- Movement of arms and materials in and out of a BSC may disrupt the "curtain of air" which may cause exposure of bioaerosols.
- Vortexes and mixers should be placed toward the rear of the cabinet
- Work at least 4-6 inches inside the cabinet window. Do not block the front grill
- Clean up spills as soon as they occur; remove and disinfect the grill if contaminated.
- Minimizing active motions behind you will minimize disruption of the air curtain that protects you.
- Your head should be above the front opening.

After using a BSC

- Leave blower on for at least five minutes to purge the cabinet.
- Remove and decontaminate equipment and materials, and disinfect cabinet surfaces.
- Turn off the fan and fluorescent lamp, and turn on the UV light to help decontaminate surfaces.
### Biosafety Cabinets

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Chemical fume hood</th>
<th>Laminar flow hood (clean bench)</th>
<th>Biosafety Cabinet Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Classes</td>
<td>None</td>
<td>yes</td>
<td>I</td>
</tr>
<tr>
<td>New Classes*</td>
<td>None</td>
<td>no</td>
<td>IIA  IIB1  IIB2  IIB3  III</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>I</th>
<th>IIA</th>
<th>IIB1</th>
<th>IIB2</th>
<th>IIB3</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>May be used with Risk Group 1, 2, or 3 organisms</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>May be used with Risk Group 4 organisms</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>May be used with chemicals only</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>May be used with infectious materials and small quantities of volatile toxic chemicals or radionuclides</td>
<td>no</td>
<td>no</td>
<td>no**</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Protects worker from infectious aerosols</td>
<td>not appl</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Protects Product from airborne contamination in lab</td>
<td>not appl</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
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<td>30-50</td>
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<td>Number of HEPA filters that “contaminated” air passes through prior to re-entering the cabinet workspace</td>
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<td>not appl</td>
<td>not appl</td>
<td>1</td>
<td>2</td>
<td>not appl</td>
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<tr>
<td>Number of HEPA filters that “contaminated” air passes through prior to discharge to duct or room</td>
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<td>not appl</td>
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<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Relative cost (1-low, 5-high)</td>
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<td>not appl</td>
<td>1</td>
<td>2</td>
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</table>

* In accordance with NSF/ANSI Standard 49-2002

** Airflow into cabinet may be increased from 75 fpm to 100 fpm, permitting the use of small quantities of radioisotopes or chemicals

Adapted from Laboratory Control and Safety Solutions Application Guide, Landis & Gyr 1993, and from Biosafety in Microbiological and Biomedical Laboratories, US Dept of Health, 1999

### Autoclaves

#### Locations

Autoclaves can be found in several locations around campus. The four main locations are B8213 (Biology), SSB 6113 (MBB), K9605 (Kinesiology) and BH 9805 (Health Sciences). There are several others that belong to specific research or teaching labs. You need permission of the operators to use these.

#### How they Work

Autoclaves are devices which use moist heat (steam) under pressure to destroy microorganisms by denaturing proteins and nucleic acids. This is the fastest and one of the most effective means of sterilization available, although it is not suitable for all materials. Organisms are killed in an exponential fashion, and so the exposure time required depends on the rapidity with which the steam is able to penetrate and heat the material, as well as the overall microbial load.

#### General Operation

There are two types of cycles, liquid and dry (labeled “wrapped” on the autoclave). It is important to choose the cycle wisely. Autoclave tape which develops words or stripes is used as a communication tool to be certain which items have been through the procedure.

#### Dry cycles

The temperature and pressure mount rapidly to 121°C/15 psi and hold for the desired time. At the end of this “exposure” time the pressure drops rapidly until the autoclave is in a state of vacuum. It remains in a vacuum during the drying stage of the cycle. This can damage fragile containers, cause liquids to boil over or loose particles to be drawn into the plumbing. Therefore it should only be used for sturdy materials that have no loose or liquid components, such as empty glass, polypropylene and metal.

#### Liquid Cycles

The temperature and pressure rise slowly to 121°C/15 psi and are held for the exposure period. The autoclave returns slowly to ambient pressure and unlocks at approximately 100°C. This cycle is the safest for all materials, but particularly liquids, garbage (especially agar which becomes liquid with heating or plastics which melt) and soils. The average cycle with an exposure time of 20 minutes, will take an hour to complete.
Autoclaves continued

Load preparation

1. Solutions: there are two main cautions here: Don’t overfill the containers, or they will boil over (2/3 full is the maximum; if there is a stir bar in it, only half full). Don’t forget to loosen the lids or the bottles will explode.
2. Use foil over opening of graduated cylinders, flasks etc.
3. Plastic containers with lids may melt/deform and form a vacuum inside if the lids are too tight; these containers should just have the lids taped on and foil placed over that. They may survive a liquid cycle better than dry.
4. Put autoclave tape on each item; this will indicate whether your load has been sterilized. Label the items with your name or room number.
5. Never leave materials in the autoclave overnight – they stay hot and many loads are ruined this way.

Wastes

This applies to level 2 wastes at this time.

Disposable plastic ware is collected into autoclave bags for sterilization before disposal. Do not tape them tightly shut – steam must be able to enter/escape.

Do not overfill large bags – they will not fit into the autoclave, and the weight can be difficult for smaller researchers to lift.

Sterilized level two wastes are collected into the designated bins for pickup.

Operator Safety - Burn Prevention

1. Stand to the side when opening the door – steam escapes at face level.
2. Use heavy heat-proof gloves to remove items.
3. Occasionally liquids are super heated and may boil over explosively especially if a stir bar is autoclaved in the liquid. Stir bars can be autoclaved in screw cap tubes.
4. All items should be loosely capped – the pressure may cause tightly capped bottles to explode.

Equipment Protection

Materials which spill into the autoclave and are pulled through the drain can block the plumbing. The chief culprit is agar, which solidifies as it cools in the drains, and the greatest damage is caused by liquefied plastics. Soil or sand in the plumbing is also hard to clear. For this reason, as well as for convenience, metal bins are provided to contain all the items to be sterilized. Boil overs occur even without operator errors, so it is important to keep the bins clean so the media from lab A is not transferred to the pipettor tips of lab B.

Testing

Every week ampules containing endospores of a difficult to kill organism, *Bacillus stearothermophilus* are autoclaved and cultured. The results are recorded, and are available to inspection agencies such as Health Canada and the Canadian Food Inspection Agency.

Required Orientation

Anyone intending to use the autoclaves must be trained. Molecular Biology and Biochemistry (MBB) and Biology offer group training every semester. Kinesiology offers training by appointment. These are given at the beginning of each semester and you will be notified about them via email.

Contacts

<table>
<thead>
<tr>
<th>Where</th>
<th>Who</th>
<th>Room</th>
<th>Local</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBB</td>
<td>Monika Syrzycka</td>
<td>SSB 8158</td>
<td>25648</td>
<td><a href="mailto:syrzycka@sfu.ca">syrzycka@sfu.ca</a></td>
</tr>
<tr>
<td>Biology</td>
<td>David Qu</td>
<td>B 8206.1</td>
<td>23785</td>
<td><a href="mailto:dqu@sfu.ca">dqu@sfu.ca</a></td>
</tr>
<tr>
<td>Kinesiology</td>
<td>Haruyo Kashihara</td>
<td>K 9606</td>
<td>24974</td>
<td><a href="mailto:kashihar@sfu.ca">kashihar@sfu.ca</a></td>
</tr>
<tr>
<td>Health Sciences</td>
<td>Lingling Zhang</td>
<td>BH 9610.1</td>
<td>28627</td>
<td><a href="mailto:lza43@sfu.ca">lza43@sfu.ca</a></td>
</tr>
</tbody>
</table>
Centrifuges

Training
You must be trained before using a high speed centrifuge. Find the person in charge of the centrifuge you wish to use and arrange for them to show you the protocols and proper use of the machine. This applies to everyone regardless of whether you have used a centrifuge elsewhere.

Rotor cleaning
Always rinse with distilled water and turn upside down to dry. If a spill containing a microorganism or biohazard occurs, use ethanol to rinse the rotor and wipe the inside of the machine. For radioisotope spills, contact the person in charge of that machine to help you clean it up. Never use Decon for radioactive materials as it damages the rotor surface.

Tube removal
If a tube is stuck DO NOT pry it out with a metal implement. Try using a hemostat or contact the person in charge of the machine to help you.

Metal fatigue
Weak rotors can split. If you notice pitting, deep scratches, or cracks on the rotor DO NOT use it! Contact the person in charge of the machine if you are uncertain or have questions.

Rotor documentation and retirement
Damaged and old rotors must be retired and are very expensive to replace. Help prolong their lives and document use so we can insure we have no major accidents.

Microwave Ovens

Locations
Do not use microwaves in common eating areas to heat your solution and vice versa, never heat your lunch in the microwave in your lab. You do not want EtBr in your lunch.

Loose lids
Always loosen lids on containers and bottles before heating them up. Expanding liquid and air can create a buildup of pressure and possibly cause an explosion.

Metal components
Do not place metals or items containing inner metal components into a microwave.

Superheating liquids
All liquids can superheat (reach temperatures above the boiling point without boiling). A bump can cause it to suddenly boil, spill over, and cause severe burns. Always wear insulating gloves when handling the container.

Ultra Violet (UV) Light

Ultraviolet light (UV) is extremely hazardous. The shorter the wavelength, the greater the damage that is done and in a much shorter time. For example, at a couple inches from the transilluminator of a 300 um light source, WorkSafeBC suggests you have about 1 second of exposure in an 8 hour day before your skin or eyes begin getting damaged. With a 360 um transilluminator the time increases to about 5 minutes.

Always take protective measures to ensure your eyes and skin do not get burned. Use UV opaque eyewear or a shield when taking a picture. If you are working on the transilluminator, you will also need to wear gloves and long sleeves to protect your hands and arms.

Exposure to UV light can cause short term blindness, detached lenses, cataracts, and other eye problems. Since it can burn skin, it can also generate skin cancer; so protect yourself.

A face-shield can be tested for UV blockage. If a certain gel is placed on the inside of the shield, then exposed to UV light, it will glow if UV rays penetrate the shield.

Radioactive Biohazards

Working with & Disposing of Radioactive Biohazards

Do not autoclave radioactive biohazards.

For disposal of radioactive biohazards, please contact either the Radiation Safety Office or EHS; an assessment will be made to determine which hazard to deal with first. For long life isotopes, the material may be bleached to remove the biohazard, then left many months for the radiation to decay, and for short life isotopes, it may be best to allow the radiation to decay first, then remove the biohazard with autoclaving.

Contacts

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew Barton</td>
<td>Director, Radiation Safety (SWH 9158.2)</td>
<td>2-3769</td>
</tr>
<tr>
<td>Kate Scheel</td>
<td>Radiation Protection Officer (MTF 265)</td>
<td>2-3633</td>
</tr>
<tr>
<td>Jutta Haunerland</td>
<td>Radiation Safety Technician (B7249)</td>
<td>2-3506</td>
</tr>
<tr>
<td>Mike Neudorf</td>
<td>Biosafety Officer</td>
<td>2-7265</td>
</tr>
</tbody>
</table>
Phenols

Phenol is used extensively at low concentrations in some medications such as Chloroseptic and Blistix lip balm. It is also used in common cleaning reagents such as Lysol. At the low concentration found in these products, phenol is beneficial and basically harmless. At the concentrations used in laboratories, phenol can be very hazardous and care must be taken when using it.

Precautions

- Wear shoes, not sandals.
- Wear a lab coat.
- Wear good gloves (no holes).
- Wear protective eyewear. NOTE: all organic solvents will dissolve soft contact lenses. If you get these chemicals in your eye, the lens will melt onto your eyeballs!
- Use a workspace with plenty of room to move and work without knocking anything over.
- Be prepared in case a spill or splash occurs. Have paper towels, ETOH, water, and hand soap available.

Spill Clean Up

Phenol has anesthetic properties so you may not realize you’ve spilled some on yourself or may think it isn’t as bad as you have been lead to believe. So be aware of what you are doing and don’t be fooled, it will start burning in about 30 seconds.

- Don’t panic.
- Dab up the spill and rinse well with water, then ethanol. Everything can go in the trash or down the drain.
- If you have cleaned the spill area well, you won’t be able to smell any phenol.

Phenol on you

- Don’t panic.
- If you spill it on your clothing, immediately remove the clothing.
- Wash skin gently but well with soap and water. Soap changes the properties of phenol so it is no longer able to permeate your skin. Use hand soap not dish soap we have for lab glassware which is too harsh and can worsen the problem.
- Smell the contaminated area, there should be no phenol scent. If you can still smell it continue to wash to remove the phenol from your skin.
- If you have a large spill on yourself, use the lab shower or eyewash to quickly remove the phenol, and shout for help. Don’t be shy! Accidents happen, don’t make it worse by not taking care of the problem properly.

Ethidium Bromide

Ethidium Bromide Solids and Solutions

Although Ethidium Bromide (EtBr) is not regulated as a hazardous waste, its mutagenic properties may present a human health hazard if it is placed in the trash or poured down the sanitary sewer system. The following procedures should be followed when disposing of EtBr solutions, gels and EtBr contaminated materials.

EtBr Solutions

Do not discard EtBr gels or EtBr solutions containing organic solvents or alcohol down the sewer. Aqueous solutions containing < 10 μg/ml (10 ppm) may be released to the sanitary sewer.

Aqueous solutions containing > 10μg/ml EtBr and EtBr solutions that contain organic solvents or alcohol must be collected in a properly labeled container and may be disposed of via the University’s Chemical Waste Program.

Gels Containing EtBr

Place gels in sturdy plastic bag or container. Use a Chemical Waste label, identify as “Ethidium Bromide gel”, and fill out a eReq through Science Stores for waste pickup.

http://www.sfu.ca/science-stores/disposal.htm

Gloves and Contaminated Debris

Gloves and paper towels that are visibly contaminated with EtBr should be placed in a bag or container. Label the container to identify the material and and fill out a eReq through Science Stores for waste pickup.

http://www.sfu.ca/science-stores/disposal.htm

Spills

Spills of dilute EtBr liquid (about 0.5 ug/ml) can be wiped up with paper towels, and then cleaned with ethanol. Everything can be thrown into the regular trash.

Spills of higher concentration liquids can be cleaned the same way as the dilute solutions but the cleaning materials must be be disposed of via the University’s Chemical Waste Program. After wiping up all the liquid, sprinkle activated charcoal onto the area and let it sit overnight to absorb any remaining EtBr from the surface.

Other dyes

When disposing of dyes such as SybrGreen and Gel Red, please use the proper handling and disposal procedures. If you have any questions or are unsure of the procedure please ask your supervisor or contact the EHS department.
Biosafety Permit Application

Welcome
This page is a guide to the process of applying for an SFU biosafety permit. Any questions during or following the application may be directed to Tajinder Aujla in Environmental Health and Safety, Simon Fraser University, 8888 University Drive, Burnaby, British Columbia, Canada, V5A 1S6 (Tel. 778-782-8633, Fax. 778-782-5678, email: taa19@sfu.ca).

I only have 30 minutes?
To protect your security, the webform only allows 30 minutes to enter your information. At any time, you can scroll to the end of the form and submit the information you have and then come back to the form later to complete a final version. Like email, the webform remains in your webform outbox.

When to apply for a permit
A permit may be applied for prior to applying for grants. A teaching permit must be applied for prior to the start of the course. Depending on the project, a Principle Investigator (PI) may also require permits for ethics, animal care, and radiation.

Who can apply
Only the PI may sign an application form. Each project requires a separate permit but may include more than one location. Projects between two or more PI’s require the permit application to be signed by the PI who has the authority to institute changes in the lab. The faculty member (lecturer) or lab instructor may sign the teaching permit application form.

A project (joint or otherwise) in which the research is conducted at another institution will require a copy of that institution’s biosafety permit only and no SFU biosafety permit will be necessary.

Definition of biohazard
Biohazards are defined as biological agents and materials which are potentially hazardous to humans, animals and other forms of life. They include known pathogens and infectious agents including bacteria and their plasmids and phages, viruses, fungi, mycoplasmas and parasites, cell lines, animal remains, and laboratory animals including insects which might harbor such infectious agents, and primate body fluids. Also included are potentially biohazardous organisms used in procedures such as recombinant DNA and genetic manipulations, and transgenic plant research.

Application Process
Two SFU webforms provide internet access to the Biosafety Permit Application forms. There is a separate webform for the Research Permit Application and the Teaching Permit Application. Please complete all applicable sections of the webform. Once you submit the electronic form, it will be sent to the Department of Environmental Health and Safety for an initial assessment and then forwarded to the Biosafety Committee. A copy of the permit and cover letter will be sent to the PI. If the Biosafety Committee deems that a permit is not required, the PI will be notified. You may be contacted at any stage for further information.

PI Responsibilities
The PI is responsible for ensuring that all work involving biological hazards is conducted in accordance with applicable guidelines:

• Laboratory Biosafety Guidelines, 3rd Ed. 2004; Public Health Agency of Canada http://www.phac-aspc.gc.ca/ols-bsl/lab-bdm/index.html


• An SFU Checklist is provided for your convenience based on your containment level and pathogen type, which can be found on the EHS website.

http://www.sfu.ca/ehs/research/biosafety/Inspection/inspection_checklists.html

Permit Duration
Unless noted on the permit, research and teaching permits are valid for four years.

Permit Changes
Any changes to the permit information must be sent to the EHS department.
### Biosafety Permit Application

#### Biosafety Application for Research

**Penalty type:**
- ☐ Research
- ☐ Teaching
- ☐ Action required
- ☐ New
- ☐ Renewal

#### PERSONNEL

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<tr>
<th>Last Name</th>
<th>First Name</th>
<th>Title</th>
<th>Lab</th>
<th>Office</th>
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#### Lab Safety Training Manual

Please provide the principal investigator information (name of the PI must be an SFU faculty member):

<table>
<thead>
<tr>
<th>Name</th>
<th>Title or position</th>
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#### Biosafety Application for Research

**Eyes:**
- ☐ Yes
- ☐ No

**Optometry:**
- ☐ Yes
- ☐ No

**Contact lenses:**
- ☐ Yes
- ☐ No

**Scleral lenses:**
- ☐ Yes
- ☐ No

**Contact lens cases:**
- ☐ Yes
- ☐ No

**Scleral lens cases:**
- ☐ Yes
- ☐ No

Please list all personnel working under your responsibility with the registered coordinator:

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<th>Name</th>
<th>Title or position</th>
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#### BIOSAFETY EQUIPMENT

Please list all biohazard equipment to be used (such as biohazard cabinets, monitor flow meters, and centrifuges) and provide the contact information:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Building</th>
<th>Name or position</th>
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#### BIOSAFETY PERMIT APPLICATION

Please provide the biosafety permit application number (the PI must be an SFU faculty member):

<table>
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<th>Application Number</th>
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**Will the PI be an emergency contact?**
- ☐ Yes
- ☐ No

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<th>Title or position</th>
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**Additional Information:**

- ☐ Yes
- ☐ No

Please indicate the grant number for any grants associated with this project:

<table>
<thead>
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<th>☐ Yes</th>
<th>☐ No</th>
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**Additional Information:**

<table>
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<tr>
<th>Grant Number</th>
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<th>☐ No</th>
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**Other Relevant Information:**

Please provide any additional information you feel is relevant to this application or indicate information for which there was no relevance.

#### Biosafety Application for Research

**Title of Research Program:**

<table>
<thead>
<tr>
<th>Title</th>
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<th>☐ No</th>
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</thead>
</table>

**Applicant's Name:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
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Biosafety Committee Terms of Reference

Biosafety Program Inspection Protocol

1. Purpose
To ensure the safety of students, faculty, staff, the community and the environment when using biohazardous materials under the auspices of Simon Fraser University, and to facilitate research, teaching and testing in compliance with the applicable regulations and standards outlined below.

2. Definitions

**Biological Materials**

a. “Biohazardous Materials” are defined as biological agents and materials that are potentially hazardous to humans, animals and other forms of life. They include known pathogens and infectious agents including bacteria and their plasmids and phages, viruses, fungi, mycoplasmas, and parasites; cell lines, animal remains, and laboratory animals (including insects) which might harbor such infectious agents, primate body fluids and plant materials. Also included are nucleic acids used in procedures such as recombinant DNA and genetic manipulations;

b. “Human materials” are defined as human blood, blood products, blood components, body fluids, tissues or organs;

c. “Animal materials” are defined as animal blood, blood products, blood components, body fluids, tissue or organs;

d. “Plant materials” are defined as plant pathogens, transgenic plants, plant toxins and exotic plants;

e. “Recombinant DNA” are defined as molecules constructed by joining natural or synthetic DNA or RNA segments to DNA or RNA molecules, able to replicate in a living cell.

**Biosafety Containment Levels**

Biosafety containment levels are described in general terms. Health Canada Laboratory Biosafety Guidelines apply except in cases where the research is funded by institutions which require containment practices that conform to those specified by the US CDC.

f. “CL1” applies to a basic microbiology laboratory, where work may be done on an open bench top;

g. “CL2” applies to a laboratory that handles agents requiring containment level 2. The primary exposure routes associated with organisms requiring level 2 containment are ingestion, inoculation, and mucous membranes. Although these agents are less commonly transmitted by airborne routes, the generation of aerosols must be avoided through use of biosafety cabinets, sealed rotor centrifuges as well as appropriate personal protective equipment;

h. “CL3” applies to a laboratory that handles agents requiring containment level 3. These agents may be transmitted by the airborne route, often have a low infectious dose to produce effects and can cause life threatening disease. Containment level 3 emphasizes additional primary and secondary barriers to minimize the release of infectious organisms into the immediate laboratory and the environment, such as HEPA filtration of exhausted laboratory air and controlled laboratory access.

**Regulators**

i. “PHAC” Public Health Agency of Canada;

j. “CFIA” Canadian Food Inspection Agency;

k. “NIH” National Institutes of Health;

l. “TDG” Transportation of Dangerous Goods

m. “WorkSafeBC” WorkSafeBC, Occupational Health and Safety Regulation;

n. Metro Vancouver.

**Administrative Requirement**

o. “Biosafety Permit” is defined as the document certifying approval by the Biosafety Committee for use of biohazardous materials under specified conditions. Biosafety Permits are granted to SFU faculty or adjunct faculty members proposing to carry out research or teaching involving biohazardous material.
Personnel

p. "Principal Investigator (PI)" is defined as the SFU faculty member (or acceptable equivalent as defined in other SFU policies) in charge of a research or teaching project;

q. "Biosafety Officer" shall be appointed by the Vice President, Research, shall be qualified to assume responsibility for the SFU Biosafety Program, and give technical advice on projects and laboratory facilities involving biohazards;

r. "Certified User" is defined as the individual whose name appears on the approved Biosafety Permit;

s. "Laboratory Workers" are defined as all employees, students and visitors conducting research or educational activities under the auspices of SFU in SFU laboratories involving "biohazardous materials" as defined above.

3. Scope

This policy applies to all research, teaching and testing involving biohazardous material that is undertaken under the auspices of SFU and/or using the resources of SFU. All projects must have an SFU faculty member (or equivalent as defined in 2p above) as PI. Where the SFU Biosafety Committee grants "in principle" approval for research involving biohazards at another institution, a copy of that institution’s permit, for the research, must be filed at SFU.

4. Standards

The University adopts standards compliant with:

a. the Memorandum of Understanding between the three Canadian federal granting agencies and Institutions that receive their awards;

b. the policies and procedures of SFU and the SFU Biosafety Committee;

c. all relevant federal and provincial regulations (Public Health Agency of Canada, Canadian Food Inspection Agency);

d. the National Institutes of Health;

e. WorkSafeBC; and

f. Transportation of Dangerous Goods

5. Policy

a. Authority

The SFU Biosafety Committee has the authority, on behalf of the Vice-President, Research, to:

i. stop immediately any use of biohazardous material which deviates from the approval outlined in the Biosafety Permit or is deemed to be in non-compliance with the applicable standards as in part 4.

b. Responsibility

i. The day-to-day requirement to comply with safe use of biohazardous materials in research and teaching under the auspices of SFU is the responsibility of the PI.

ii. All lab workers using biohazardous materials in research or teaching must have the necessary expertise and appropriate training in accordance with the policies of SFU and Standards outlined in part 4. The Biosafety Officer in consultation with the SFU Biosafety Committee will decide upon the appropriate methods of achieving the appropriate expertise and training levels.

iii. The acquisition of all biohazardous materials (by purchase, culture or transfer from another source) must be arranged in accordance with protocols approved by the SFU Biosafety Committee.

iv. The disposal of all biohazardous materials must be in accordance with protocols approved by the SFU Biosafety Committee and in compliance with all relevant federal, provincial and Metro Vancouver regulations and guidelines.

v. The Biosafety Officer, in close collaboration with and support of the SFU Biosafety Committee, is responsible for monitoring the compliance of researchers and instructors with SFU policy and the terms of the approval of their projects. If the Biosafety Officer observes or becomes aware that relevant regulations or guidelines are not being followed in any teaching program or research study, she/he advises the Principal Investigator so that prompt remedial action can be taken. In the event that this is not done to her/his satisfaction, the Biosafety Officer will alert and consult with the SFU Biosafety Committee. In circumstances where the Biosafety Officer is of the opinion that the situation presents an immediate significant risk, the Biosafety Officer may take whatever action she/he considers necessary to remedy the situation. The Biosafety Officer keeps the SFU Biosafety Committee Chair and the Vice President, Research fully informed of
such incidents and the reason for the action taken. She/he may also, at her/his discretion, seek the advice of PHAC, CFIA, or other experts as may be appropriate.

vi. The Biosafety Officer maintains up-to-date records of all Biosafety Permits, approved locations, certified users, containment equipment, equipment certifications and personnel training. The Biosafety Officer reports, at least yearly to the Chair of the SFU Biosafety Committee with a summary of such records, and granting agencies as required.

vii. The SFU Biosafety Committee ensures that researchers use appropriate containment facilities for the proposed research involving biohazardous materials.

viii. All proposals involving the use of biohazardous materials in research and teaching require the prior approval of the SFU Biosafety Committee. The detailed responsibilities and powers of the SFU Biosafety Committee are those set out in its Terms of Reference and its Procedures. These are published and may be modified from time to time under the authority of the Vice-President, Research. The current procedures for consideration of Biosafety Permit application for the use of biohazardous materials are attached to this policy.

ix. The Biosafety Officer shall undertake continuing education and training opportunities in biocontainment and security of biohazardous materials.

c. SFU Biosafety Committee membership

The SFU Biosafety Committee members will be appointed by the Vice-President, Research for renewable terms of three to four years. The committee membership should include:

i. five faculty members drawn from key units where faculty members hold biosafety permits. Expertise of the faculty must encompass microbiology, plant or animal pathogens, recombinant DNA, and containment principles;

ii. the Director of the Animal Resources Centre;

iii. one member representing laboratory technical staff;

iv. two members representing community interests and concerns, with appropriate expertise in biosafety, and who have no affiliation with the University.

v. the Biosafety Officer;

vi. a graduate student representative;

vii. the Director of Environmental Health and Safety as non-voting resource member;

viii. the SFU Biosafety committee must have a Vice Chair who can become designated Chair as required; and

ix. a quorum of two thirds of the members should be established for the SFU Biosafety Committee meetings.

d. Standard Operating Procedures (SOPs)
SOPs and other guidelines for compliance inspections, acquisition, use, storage, and disposal of biohazardous materials are developed and published by the Biosafety Officer after having been approved by the SFU Biosafety Committee.

6. Interpretation
Questions of interpretation or application of this policy or its procedures shall be referred to the VP Research, whose decision shall be final.

PROCEDURES
Consideration of Application to Use Biohazardous Materials

The Principal Investigator (PI) submits a completed form entitled “Application for a Biosafety Permit for Research or Teaching” to the Biosafety Officer at least eight weeks before the planned commencement of the project. In certain cases, such as teaching protocols, the Biosafety Officer may agree to a different time scale. In all cases sufficient time must be allowed for the review of the procedures to be employed in the project. It is recommended that the application be reviewed by the Biosafety Officer prior to submission to the SFU Biosafety Committee. The application form is available from the Biosafety Officer or from EHS, and SFU Research Services web site. The PI must review their research permit applications annually and renew their biosafety permits every four years. In the case of teaching protocols, the permits must be renewed every semester. Any changes to the application must be submitted as an amendment and approved before implementation. Major changes may warrant submission of a new application.

a. As part of the application, the PIs assign the risk group for each organism they propose to work with. Information on risk groups can be obtained by contacting the Biosafety Officer or Safety Advisors in Environmental Health and Safety.

b. Upon receipt by the Biosafety Officer, she/he reviews the application for consistency with the SFU Biosafety Committee
Terms of Reference, assigns a permit number and considers the following:

i. the determination of whether the proposed handling of biohazardous materials conforms to the standards specified in this Policy; and

ii. the availability of required containment facilities and containment equipment.

c. For CL 1 and 2 projects:

i. After review by the Biosafety Officer, the application is forwarded to the Chair of the SFU Biosafety Committee for review and decision. If a decision cannot be made, the permit application is forwarded to the SFU Biosafety Committee for the final decision.

ii. The SFU Biosafety Committee is informed of all decisions made by the Chair at the next SFU Biosafety Committee meeting.

d. For CL 3 projects and for projects described under section c(i) above that were not approved by the Chair:

i. After a review is made by the Biosafety Officer, the application is sent to all SFU Biosafety Committee members for review. A decision by majority vote is made by the SFU Biosafety Committee at their next committee meeting. The Chair does not normally vote except to create or break a tie.

ii. For all CL 3 projects, or any protocols of concern to the SFU Biosafety Committee, a presentation by the PI is required at the SFU Biosafety Committee meeting at which the application is considered.

e. For Biosafety Permit renewals:

i. The application is forwarded to the Biosafety Officer and if necessary to the Biosafety Committee Chair.

ii. The SFU Biosafety Committee is informed of all renewals made by the Biosafety Officer or Chair at the next SFU Biosafety Committee meeting.

f. The Chair of the SFU Biosafety Committee informs the PI of the SFU Biosafety Committee decision in writing.

g. If the project is approved, the Biosafety Permit information will be made available to the Office of Research Services. The Environmental Health and Safety Department retain signed copies of all approved applications and permits.

h. If the project is not approved, the PI is asked for more information, and may be required to submit a revised project proposal for review by members of the SFU Biosafety Committee.

i. If these actions fail to lead to approval of the project, the Chair of the SFU Biosafety Committee provides the PI with a written statement of reason for non-approval of the project.

j. The PI may ask for a hearing before the SFU Biosafety Committee to appeal the decision. In the event the appeal is not successful, the PI may appeal to the Vice President, Research who may appoint an appeal committee. The decision of that committee, if ratified by the Vice President, Research, would be final. Health Canada may be called upon for information purposes; however, appeals cannot be directed to Health Canada.

BIOSAFETY COMMITTEE TERMS OF REFERENCE

The Simon Fraser University Biosafety Committee is authorized to oversee the University’s Biosafety Program, provide policy direction and recommend changes to the Vice President, Research for all teaching, research and testing activities involving the use of biohazardous materials. The Committee reviews biosafety permit applications for teaching, research and testing, issues permits, and monitors activities involving the use of biohazardous materials to confirm compliance with the standards outlined in the Biosafety Policy R20.02. These standards include Public Health Agency of Canada (PHAC), Canadian Food Inspection Agency (CFIA) National Institutes of Health (NIH), Occupational Health and Safety Regulation of BC (WorkSafeBC), SFU Policies and SFU Biosafety Committee (SFUBC) Procedures.

Mandate

Administrative:

- Issues and renews Biosafety Permits for the use of all biohazardous materials and specifies appropriate procedural and physical laboratory containment requirements, and as required, implementation of health surveillance program;

- Reviews and, as required, amends containment level one, two and three permits issued by the Biosafety Committee Chair;

- Reviews and, as required, amends permit renewals issued by the Biosafety Officer;

- Advises the Vice President, Research of any perceived need for additional resources to establish, maintain, or improve the Biosafety Program.
Compliance & Conformance:

- Suspends Biosafety Permits in cases of non-compliance or in cases of emergencies involving loss or potential loss of containment;
- Monitors certification and re-certification of containment level 3 laboratories;
- Monitors movement of biohazardous materials within the University and for compliance with Transportation of Dangerous Goods Regulations when shipping or receiving biohazardous materials;
- Reviews summary results of external and internal inspections and recommends appropriate action;
- Reviews reports of incidents involving biohazardous materials and ensures appropriate action is taken to prevent reoccurrence.

Lab Containment & Security:

- Investigates and ensures remediation of containment failure;
- Ensures appropriate access control of containment level 2 and 3 laboratories and secure storage of potentially biohazardous materials.

Advisement:

- Advises on policies and protocols relating to the Biosafety Program to promote safe and environmentally appropriate practices, in support of compliance with regulatory and University requirements;
- On a three-year cycle, undertakes a formal review of the Biosafety Policy;
- Reviews research and teaching proposals involving the procurement, use, storage, transfer, and disposal of biohazardous materials to assess risk, containment requirements, proposed procedures, training and expertise of personnel;
- In consultation with the University Biosafety Officer, reviews, recommends and acts as an expert resource for biosafety education and training programs for University employees and researchers, and monitors training activity.

Reporting:

- Reports to the appropriate regulatory body substantial problems or violations of guidelines, and significant accidents or illnesses;
- Provides an annual report of its activities in the previous year and compliance status to the Vice President, Research each April.

Membership

All members are appointed by the Vice President, Research for a three-year renewable term. When deemed necessary for specific expertise, ad hoc consultants will be brought in.

The committee membership shall be as outlined in the Biosafety Policy R20.02:

- Five faculty drawn from key units where faculty members hold biosafety permits. Expertise of the committee must encompass microbiology, plant or animal pathogens, recombinant DNA, and containment principles;
- The Director of the Animal Resources Centre;
- One member representing laboratory technical staff;
- Two members representing community interests and concerns with appropriate expertise in biosafety, and who have no affiliation with the University;
- Biosafety Officer; and
- Graduate Student Representative.

Non-Voting resource members:

- Director of Environmental Health and Safety (EHS).

Chair

The chair shall be nominated and elected by the members for a three-year term.

The chair will also be responsible for encouraging all committee members to attend an orientation session, organized by the Biosafety Officer, on the duties of the committee and protocol of biosafety review.

Quorum

For voting purposes, two thirds of voting members must be present.

Voting Privileges

The Chair does not normally vote, except to create or break a tie. All other duly appointed members have voting privileges. Resource persons, as listed, are non-voting members of the committee.
Secretariat
EHS shall provide an individual to act as secretary. The secretary shall be responsible for:

- Recording minutes of the meetings and related correspondence;
- Issuing notices of meetings after consultation with the chair;
- Circulating meeting minutes to the members and Vice President Research; and
- Maintaining all biosafety committee documentation.

Meetings
The committee shall meet at least semestery. To deal with any critical issues, the chair may call special meetings.

BIOSAFETY PROGRAM INSPECTION PROTOCOL

Regulations
Regulations pertaining to biohazard safety include 1) those from Canadian Federal Agencies, 2) those from agencies that provide funding, 3) WorkSafeBC, 4) transport regulations including vehicle, marine, and aircraft, 5) University requirements, and 6) codes of best practice.

PI (Principal Investigator) Inspection Responsibilities

- Completes the biosafety checklist each month and posts a copy. Although the PI may delegate responsibilities, the PI remains accountable for all activities occurring in his/her laboratory and common rooms.
- Reports significant problems, illnesses suspected of originating from biohazard work, incidents, or instances of non-compliance / non-conformance.
- PI may delegate inspection responsibilities to other lab personnel.
- The Biosafety Officer is available for consultation and guidance.

Simon Fraser University Biosafety Committee Responsibilities

- The Simon Fraser University Biosafety Committee (hereafter referred to as the committee) will investigate and report on incidents relating to biosafety brought to its attention whenever it is believed or suspected that any breach of compliance or conformance or other safety hazard may have occurred or is occurring.
- Committee members and Environmental Health and Safety employees who are trained in biosafety to the satisfaction of the committee may enter any containment level 1 or 2 laboratory or its related premises under the jurisdiction of SFU, at any time, to examine items related to biosafety operational procedures or physical containment. Inspection of containment level 3 facilities will be pre-arranged with laboratory personnel.
- The committee may decide to not grant a biosafety permit where previous indications of non-compliance / non-conformance either at SFU or other institutions indicates an unacceptable risk.
- The committee is responsible for conducting and/or delegating inspections.
- Inspections will be regularly conducted and of such frequency so as to provide an assurance to the University that all labs are reasonably believed to be in compliance and conformance at least once every year.

EHS Responsibilities

- Promote and monitor compliance with policies, regulations and procedures for safe use, handling, monitoring, storage, transport, and disposal of biohazardous materials.
- Advise the Vice-President, Research and the committee on matters related to non-compliance / non-conformance.
- Be available for consultation on problems.
- Ensure proper maintenance of records.
- Investigate reports of biosafety non-compliance / non-conformance in consultation with the committee.

1st Formal Inspection

- Inspections will identify items requiring attention and a written list of these items will be made available to the PI.
- Items that were rectified during the inspection will be noted.
- Items that cannot be rectified immediately will necessitate a 2nd inspection.

2nd Formal Inspection

Will be conducted to determine whether the items requiring rectification were addressed in a timely fashion. A summary of the inspection results will be made available to the PI and to the committee. The committee, upon reviewing the 2nd inspection results, may:
• file a report in EHS and notify the PI that the laboratory or area is in compliance / conformance; or

• issue a notice to the PI requesting a written response to indicate either 1) how compliance / conformance will be attained and / or 2) why the PI believes the laboratory and personnel are in full compliance / conformance.

**Review of Written Response**

If the committee has requested a written response, the committee will review that response and:

• if the committee concurs that the laboratory or area is in compliance / conformance, the committee will so notify the PI and Environmental Health and Safety;

• if the committee believes that the written proposed actions will suitably address the non-compliance / non-conformance, the committee will so notify the PI, and schedule a 3rd inspection for verification; or

• if the committee believes that the laboratory or its personnel will remain in a state of non-compliance / non-conformance, the committee will engage in communication with the PI until such time as the committee deems that a 3rd inspection or alternate action (such as permit suspension) is appropriate. If the permit is suspended, the committee will notify the Vice President, Research and the granting agencies.

**3rd Formal Inspection**

Will be conducted under the conditions noted above. A summary of results will be made available to the PI and to the committee. The committee upon reviewing the 3rd inspection results may:

• file a report in EHS and notify the PI that the laboratory or area is in compliance / conformance; or

• if the committee believes that the laboratory or its personnel remain in a state of non-compliance / non-conformance, notify the PI and engage in communication with the PI until such time as the committee deems that alternate action is appropriate.

**Consultation Outcome**

• file a report in EHS and notify the PI that the laboratory or area is in compliance / conformance; or

• notify the Vice President, Research, the PI and granting agencies that the permit is suspended.

**SFU Permit Suspension**

If the committee has deemed it necessary to suspend an SFU biosafety permit, the committee will request records of non-compliance / non-conformance be held on a PI’s record for four years.

**Immediate Dangers**

If an immediate danger to people or the environment is observed, the committee may immediately suspend the SFU biosafety permit for that work and require the cessation of that work. The committee will notify the Vice President, Research and Environmental Health and Safety of the suspension.

**Interpretation**

Questions of interpretation or application of inspection procedures shall be referred to the committee.

**Appeals**

Decisions of the committee may be appealed to the Vice President, Research.
**Human Pathogen Import**

**Importing “Human” Pathogens from Outside Canada**

1. Permits are not required for Risk Group 1 materials. If the material is deemed to be non-pathogenic, a courtesy notice may be obtained from the Public Health Agency Canada (PHAC) to facilitate customs clearance.

2. If a permit is required from PHAC*, please go to the PHAC website at http://www.phac-aspc.gc.ca/ols-bsl/pathogen/index.html and scroll to the bottom of the page where you can download the “Application for Permit to Import Human Pathogens”.

3. Complete the PHAC “CL2 Checklist” located on the same webpage noted above, and have it reviewed and signed by the SFU Biosafety Officer.

4. Fax the two forms “Application for Permit to Import Human Pathogens” and “CL2 Checklist” to PHAC at (613) 941-0596. There are no fees for this service.

5. PHAC will process your request and mail the permit to you. If you would also like the permit faxed to you, write “please also fax permit”. PHAC will notify you of any required changes to your permit request.

6. Send a copy of your import permit to the Biosafety Officer, Mike Neudorf at mneudorf@sfu.ca.

7. Since the supplier of the pathogen will require a copy of your import permit, fax or mail them a copy of the permit. Keep the original for your records.

If you have questions or concerns, you are welcome to contact EHS.

* If the organism affects both humans AND animals, then an animal pathogen importation permit from the Canadian Food Inspection Agency (CFIA) will also be required.

**Animal Pathogen Import**

**Importing “Animal” Pathogens from Outside Canada**

1. Permits are not required for Risk Group 1 materials. If the material is deemed to be non-pathogenic, a courtesy notice may be obtained from the Canadian Food Inspection Agency (CFIA) to facilitate customs clearance.

2. If a permit is required from the CFIA* (a division of Agriculture Canada), please go to the CFIA website at http://www.inspection.gc.ca/english/for/mpppe.shtml#C5083 and scroll to form number 5083 where you can download the “Application for Permit to Import”.

3. Complete the three-page “Facility Certification for the Importation of Animal Pathogens” located on the same webpage noted above, and have it reviewed and signed by the SFU Biosafety Officer.

4. Select the appropriate checklist and complete it. Complete only one of either the “Inspection Checklist – Animal Pathogen Containment Level 2 Laboratories” or “Inspection Checklist – Animal Pathogen Containment Level 2 Animal Facilities (for work with small animals)”. Have the checklist reviewed and signed by the Biosafety Officer. This item may not be required if previously completed for the specific room within the previous two years.

5. Fax the three forms “Application for Permit to Import”, “Facility Certification for the Importation of Animal Pathogens”, and either the “Inspection Checklist – Animal Pathogen Containment Level 2 Laboratories” or “Inspection Checklist – Animal Pathogen Containment Level 2 Animal Facilities (for work with small animals)” to the CFIA at 613-228-6129.

6. CFIA will process your request and mail the permit to you. If you would also like the permit faxed to you, write “please also fax permit”. CFIA will notify you of any required changes to your permit request.

7. Send a copy of your import permit to the Biosafety Officer, Mike Neudorf at mneudorf@sfu.ca.

8. Since the supplier of the pathogen will require a copy of your import permit, fax or mail them a copy of the permit. Keep the original for your records.

If you have questions or concerns, you are welcome to contact EHS.

* If the organism affects both humans AND animals, then a human pathogen importation permit from Public Health Agency Canada may also be required.
Plant Importation

Importing “Plant Material” from Outside Canada

1. Determine whether or not a permit is required for your plant or insect material by contacting the Canadian Food Inspection Agency (CFIA) Import Service Centre at the Vancouver International Airport at 604-666-7042, or by checking the CFIA website at www.inspection.gc.ca. You may be referred to the Ottawa office at 613-225-2342.

2. If a permit is required from the CFIA* (a division of Agriculture Canada), please go to the CFIA website at http://www.inspection.gc.ca/english/for/pdf/c5256e.pdf and scroll to form number 5256 where you can download the “Application for Permit to Import Plants and Other Things Under the Plant Protection Act”.

3. Fax the the forms to the CFIA at 613-228-6129.

4. CFIA will process your request and mail the permit to you. If you would also like the permit faxed to you, write “please also fax permit”. CFIA will notify you of any required changes to your permit request.

5. Send a copy of your import permit to the Biosafety Officer, Mike Neudorf at mneudorf@sfu.ca.

6. Since the supplier of the plant material will require a copy of your import permit, fax or mail them a copy of the permit. Keep the original for your records.

Please note this applies to importing non-sterile soil as well.

If you have questions or require assistance in importing documentation or applications, please contact the Biosafety Officer, Mike Neudorf at mneudorf@sfu.ca.

* If the material is also considered to be a human or animal pathogen or toxin, then additional import permits may be required. Please check with the Public Health Agency Canada (PHAC) or the Canadian Food Inspection Agency (CFIA).
# BSL 1&2, Physical Requirements

Requirements for Bio Safety Level 1&2 laboratories as per annual inspection.

**H= PHAC  A= CFIA**  
**M=Mandatory  R=Recommended**

<table>
<thead>
<tr>
<th>Containment Level</th>
<th>Laboratory Location and Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hlth Can Ref # Agr Can Ref #</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>M H</td>
</tr>
<tr>
<td></td>
<td>Separated from public areas by door. 4.1-1</td>
</tr>
<tr>
<td>M</td>
<td>M H/A</td>
</tr>
<tr>
<td></td>
<td>Doors to the containment laboratory lockable (this does not apply to areas within the containment laboratory). Doors are kept closed. 4.1-2 3.1</td>
</tr>
<tr>
<td>M</td>
<td>M H/A</td>
</tr>
<tr>
<td></td>
<td>Access limited to authorized personnel. 4.1-3</td>
</tr>
<tr>
<td>M</td>
<td>M H/A</td>
</tr>
<tr>
<td></td>
<td>Laboratory room doors to have appropriate signage (e.g. biohazard sign, containment level, contact information, entry requirements). 4.1-4</td>
</tr>
<tr>
<td>R</td>
<td>R H/A</td>
</tr>
<tr>
<td></td>
<td>Office areas to be located outside of containment laboratory. Paperwork stations for data collection can be within containment laboratory provided they are located away from laboratory work areas. 4.1-7 3.1</td>
</tr>
<tr>
<td>M</td>
<td>M A</td>
</tr>
<tr>
<td></td>
<td>Dedicated clerical work stations permitted within the laboratory work areas away from hazardous materials. 3.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Containment Level</th>
<th>Surface (i.e. floors, walls, ceilings, sealants) Finishes and Casework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hlth Can Ref # Agr Can Ref #</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>R H</td>
</tr>
<tr>
<td></td>
<td>Doors, frames, casework, and bench tops to be nonabsorptive (i.e. the use of organic materials should be avoided). 4.2-1</td>
</tr>
<tr>
<td>M</td>
<td>M H</td>
</tr>
<tr>
<td></td>
<td>Working surfaces of bench tops to be non-absorptive. 4.2-2</td>
</tr>
<tr>
<td>R</td>
<td>R H</td>
</tr>
<tr>
<td></td>
<td>Surfaces to be scratch, stain, moisture, chemical, and heat resistant in accordance with laboratory function. Interior coatings to be gas and chemical resistant in accordance with laboratory function (e.g., will withstand chemical disinfection, fumigation). 4.2-3 4.2-6</td>
</tr>
<tr>
<td>R</td>
<td>R H</td>
</tr>
<tr>
<td></td>
<td>Surfaces to provide impact resistance in accordance with laboratory function. 4.2-4</td>
</tr>
<tr>
<td>R</td>
<td>R H</td>
</tr>
<tr>
<td></td>
<td>Interior surfaces to be continuous and compatible with adjacent and overlapping materials (i.e. to maintain adhesion and a continuous perimeter); wall and floor welded seams are acceptable in level 3 laboratories. 4.2-5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Containment Level</th>
<th>Heating, Ventilation and Air Conditioning (HVAC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hlth Can Ref # Agr Can Ref #</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>M A</td>
</tr>
<tr>
<td></td>
<td>Indoor directional airflow to be provided; nonrecirculated air should be supplied to level 2 laboratories (note: this does not apply to the recirculation of air through equipment such as biological safety cabinets. Smoke testing should be done periodically). 4.3-1 3.1</td>
</tr>
<tr>
<td>R</td>
<td>R A</td>
</tr>
<tr>
<td></td>
<td>Exhaust from the laboratories to provide a minimum of 10 air changes per hour under normal operations. 4.3-1 3.1</td>
</tr>
<tr>
<td>M</td>
<td>M A</td>
</tr>
<tr>
<td></td>
<td>HVAC air distribution design to minimize dead air spaces within the laboratory; supply and exhaust diffusers to be located to provide convection patterns that ensure airflow away from lab entrance; diffuser selection to provide minimal throw velocities, i.e. &lt;15 m/m at 1m; supply and exhaust diffusers to be located with biological safety cabinets and fume hood locations taken into consideration. 4.3-1 3.1</td>
</tr>
</tbody>
</table>
### Containment Perimeter

<table>
<thead>
<tr>
<th>Containment Level</th>
<th>Containment Perimeter</th>
<th>Hlth Can Ref #</th>
<th>Agr Can Ref #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Windows, if they can be opened, to be protected by fly screens.</td>
<td></td>
<td>4.4-8</td>
</tr>
<tr>
<td>M M H</td>
<td>Window design to be integrated with the heating/ventilation/air-conditioning (HVAC) system to avoid condensation, wetting and/or frost build-up.</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>M A</td>
<td>Windows to provide required level of security.</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>M A</td>
<td>Containment perimeter (eg. doors and windows) to be kept closed in order to provide required containment of air systems.</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>M A</td>
<td>Door openings to allow passage of required equipment (i.e. may be greater than standard width and height in accordance with equipment size)</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>R M H/ A</td>
<td>Autoclave or other acceptable means of waste treatment/disposal to be provided in the lab zone.</td>
<td></td>
<td>4.4-1</td>
</tr>
<tr>
<td>M A</td>
<td>Autoclave to be equipped with a cycle log recorder (ie to record time, temperature, and pressure)</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>M A</td>
<td>Laboratory zone to be proofed against entry or exit of vermin or insects.</td>
<td></td>
<td>3.1</td>
</tr>
</tbody>
</table>

### Laboratory Services (i.e. water, drains, gas, electricity, and safety equipment)

<table>
<thead>
<tr>
<th>Laboratory Services (i.e. water, drains, gas, electricity, and safety equipment)</th>
<th>Containment Level</th>
<th>Hlth Can Ref #</th>
<th>Agr Can Ref #</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-hooks to be provided for laboratory coats at laboratory exit; street and laboratory clothing areas to be separated.</td>
<td>M M H/ A</td>
<td></td>
<td>4.5-1</td>
</tr>
<tr>
<td>Handwashing sinks to be located near the point of exit from the laboratory or in anteroom.</td>
<td>M M H</td>
<td></td>
<td>4.5-2</td>
</tr>
<tr>
<td>Handwashing sinks to be provided with “hands-free” capability.</td>
<td>R H</td>
<td></td>
<td>4.5-3</td>
</tr>
<tr>
<td>BSCs and other primary containment devices to be provided. Examples for use include procedures with the potential for producing aerosols and those involving high concentrations, large volumes or particular types of agents.</td>
<td>R H</td>
<td></td>
<td>4.5-5</td>
</tr>
<tr>
<td>Emergency eyewash facilities and emergency shower equipment to be provided in the lab area in accordance with applicable regulations (i.e., ANSI Z358.1-1998 (3)).</td>
<td>M H/ A</td>
<td></td>
<td>4.5-6 3.1</td>
</tr>
<tr>
<td>Light ballasts should be on a separate distribution layout from normal or emergency power to minimize harmonic current problems for sensitive lab equipment; High Intensity Discharge (HID) lamps with lengthy re-strike times should be avoided where there is no alternate quick strike light source.</td>
<td>M A</td>
<td></td>
<td>4.5-7 3.1</td>
</tr>
<tr>
<td>Circuit-breakers and controls to be appropriately labelled</td>
<td>M A</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>Life-safety systems, lighting, biological safety cabinets and other essential equipment to be supported by normal power.</td>
<td>M A</td>
<td></td>
<td>3.1</td>
</tr>
<tr>
<td>Exposed laboratory services piping with stand-offs to allow access for maintenance and cleaning.</td>
<td>M A</td>
<td></td>
<td>3.1</td>
</tr>
</tbody>
</table>
Material Transfer Agreements

What is an MTA?
Material Transfer Agreements (MTA's) are legal documents (or agreements) used for SFU to assume responsibility for the use of material that is transferred to the campus from another research institution or supply house.

When do I need one?
An MTA is required when another institution requests it prior to sending material to SFU, or when a research material is being sent from SFU.

Who signs them?
These legal documents can only be signed by the Director of Research Services on behalf of the University. Do not sign them yourself. Research Services can also provide you with material transfer agreement templates and can review agreements sent to you from a colleague elsewhere. A copy of the signed agreement will be sent to you for your records.

What do I need to do?
SFU faculty should ensure they have completed the MTA Application available from Research Services which is available on their website.

Biohazard Transport

Transport Between Labs
This includes any transport on campus in corridors, stairways, and elevators.

Primary container: The primary container must be sealed, leak-proof, and puncture resistant.

Secondary container (see picture below): The secondary container must contain enough absorbent material to completely retain all of the contents of the primary container(s). It must be leak proof, puncture resistant, and capable of being securely closed. Please label this container with a biohazard symbol when in use.

Transport to/from SFU
Transportation of Dangerous Goods regulations likely apply. Please contact EHS or your department’s TDG representative. This may include transport by road, ferry, or aircraft and may include field samples or the transfer of material from other institutions.
ARC Policies & Procedures

Overview and context of the ARC (Animal Resource Centre)

Some research conducted at SFU involves animals. These studies can be observational (e.g. diversity of birds in different types of forests, feeding behaviour of snow geese) or invasive where blood samples may be extracted from an animal through a catheter (permanent tube) implanted in an animal. Most of this research is conducted in our centralized Animal Resource Centre.

Species used in research include rats and mice, rabbits, hamsters, fish and also wild species of birds and mammals. These animals are managed under strict standards that ensure their health and humane treatment. These standards are specified by a federal agency, Canadian Council of Animal Care, as well as, the university’s own policies that are administered by the Director of Animal Care and the University Animal Care Committee (UACC).

Standards of animal care are strictly enforced and adherence to standards is monitored.

If your project uses animals (essentially vertebrates) then your faculty supervisor must apply to use animals for the project.

The application form and instructions are available on the web. The form is completed and signed by the faculty member (Principal Investigator) and sent to the Director of the ARC. Then you wait until the form is processed by the Director and the University Animal Care Committee.

Depending on the nature of your project and the level of invasiveness (category A-E), the application is assessed by the Director and Chair of the UACC or by the Director and whole UACC. This process takes time; the UACC generally meets monthly.

After a project has been approved the ordering of animals can occur. This has to be done through the Animal Resource Centre.

Project monitoring: approval is given for 1 year and then you need annual renewals for 3 more years.

Amendments have to be approved (by written form) for changes in protocol (procedures), change in personnel, additional animals required, additional species, or strains of a species. Please contact us if you have any questions about changes in protocol and the amendment procedure.

Working with Animals

Safety while working with animals

Handling live animals

During routine studies you will likely have to:
- Transfer animals
- Conduct procedures
- Take blood samples
- Perform euthanasia

Rats and mice are lifted by the base of the tail.
Rabbits are held by the scruff of the neck and supported underneath. Let their head tuck in under your arm - this keeps them calm while moving them.

To reduce the likelihood of being bitten or scratched, the following precautions are recommended:
1. Frequent handling to condition the animal;
2. Handle the animals properly;
3. Ensure your finger is not available;
4. Offer something other than your finger.

We try to maintain socialization of animals by keeping them together. We provide environmental enrichment so that the animal is more relaxed and less likely to bite.

Talk in a soft voice, when approaching the cage and handling animals. This alerts the animal that you are present and tends to calm them.

When you first begin working with your animals you will be shown how to handle them. Please do not be afraid to ask for help or repeated demonstration of handling procedures. We want to ensure that all animals are handled correctly at all times for their well-being and yours.

Blood sampling and other procedures are often performed by our certified technicians. This will vary slightly from project to project. Approved surgery procedures are only performed by trained individuals. If you are going to be learning how to do surgery then someone trained in the procedure must be present at all times. Initially, Dr. Sanders will supervise such training sessions and will decide whether an individual possesses the necessary skills to be learning the procedures in question. In order to remain compliant with CCAC there must be minimal stress and discomfort to all animals at all times. This policy is strictly adhered to with no exceptions.
Training
An online training module is available for students, staff and faculty who will be participating in animal based research. Please contact Mary Dearden in Animal Care Services if you believe you require this training.

Instruments and equipment
Working with fish requires attention to hazards associated with operating electrical equipment in close proximity to tanks. Please ensure that the area around your tank is free of such hazards. In some instances appropriate protective clothing may be required.

Bites and scratches
If you are bitten or badly scratched, you should report the incident to your supervisor. If this occurs at the ARC, you will be asked to log the incident in our logbook and will have to fill out an accident report form. If the injury is serious, you should seek medical attention from Health Services or your family physician. They may suggest a tetanus vaccination.

Diseases and Zoonosis
Diseases can be spread in many ways including the following: through open skin wounds, inhalation of aerosolized spores, bacteria, viruses, ingestion due to poor hygiene practices, and by contact with urine or saliva (bite wounds). Remember to always wash your hands after working with animals, avoid contact with feces and urine where possible, and cover open wounds. A zoonotic disease is one that is transmitted from human to animal and vice versa. The animals we work with these days are very "clean" with rare occurrences of disease being transmitted to us. Of more concern is the potential for a human to transmit disease to the "clean" animals or to be a carrier between the research animals and their own pets. If you are working with a species that is the same as or similar to your own animals you should ask about measures you can take to decrease the risk of transmitting disease between the two.

Allergies
When working around animals there is always the potential to develop allergies. For those with existing allergies you should take precautions to limit your exposure to animals you know you are allergic to and consider taking the necessary medications before contacting the animals if your work requires you to be in contact with them.

Final comment
The safe approach is to always ask when you don't know. Safer for you, kinder to the animal.
Laboratory Safety Training

Course D:

Spill Response Session
Spill Response Procedures

Information

1. Advise lab occupants of the spill and evacuate the area.

2. Notify your supervisor and/or lab coordinator of the spill. Provide details such as quantity spilled and chemical name.

Risk Assessment

3. Conduct an initial risk assessment to determine if: (i) building evacuation is required. If yes, pull the fire alarm and contact Campus Security at 2-4500.

(ii) external resources are required to contain and clean-up the spill. If not, continue with step 4.

Clean-Up

4. Ensure the spill area has adequate ventilation to clear gases or vapours generated during the neutralization process. If there is a potential for gases to concentrate in the area, or if odours are overpowering, leave, mark the door, and contact security at 2-4500.

5. Wear appropriate personal safety equipment such as safety glasses, and gloves.

6. Select the appropriate neutralizer or vapour inhibitor.
   - Spill-X-A for acid spills
   - Spill-X-C for caustic spills
   - Spill-X-S for solvent spills.

7. Apply the powder around the edge of the liquid.

8. Sprinkle the powder toward the centre. With a plastic dustpan and brush, push the powder toward the centre until all liquid is absorbed. If necessary, add more neutralizing powder.

9. If cleaning up a solvent, proceed to step 13.

10. For acids and caustics, use a spatula to place a small quantity of mixture into a beaker of water.

11. Stir the mixture and test with pH paper. The pH should be between 3 and 10.

Disposal

12. When neutralization is achieved, scoop the mixture with a dustpan into a disposal bag.

13. Rinse the spill area with water and wipe up.

14. If uncertain about disposal, contact your supervisor or Environmental Health and Safety.

15. Disposal will vary depending on the liquid neutralized. After neutralization, some liquids produce a mixture which can go to landfill. Other liquids retain toxic properties and must be handled as special waste. For example, chromic acid can be neutralized but not detoxified.

Documentation


17. If an employee visited a physician, or was absent beyond the day of the incident (due to the incident), then the supervisor must complete a WorkSafeBC Form 7.
Laboratory Safety Training

Course F:
Fire Safety Session
Fire Procedures GP 22

FIRE SAFETY

Preamble

Simon Fraser University has a legal obligation to conform to the regulations issued under authority of the Fire Services Act, BC Fire Code, as adopted by the City of Burnaby for Burnaby campus, the City of Vancouver for SFU Vancouver, the City of Surrey for SFU Surrey and the City of Kamloops for SFU Kamloops, regarding the provision, inspection, testing and maintenance of fire safety equipment and the development and maintenance of comprehensive fire response procedures.

1.0 Purpose

1.1 This Policy establishes the requirement for a Fire Safety Program at Simon Fraser University and defines responsibility for implementation of the Program. The objective of the Program is to ensure that:

a. maintenance procedures and tests are carried out to verify that fire safety and detection equipment operate correctly;

b. Building Fire Safety Plans contain all information specified by local Fire Departments; and

c. occupants are trained in response procedures.

2.0 Scope

2.1 This policy applies to all campuses and buildings of SFU.

3.0 Policy

3.1 Fire Safety & Fire Detection Equipment

3.1.1 Appropriate fire safety and detection equipment must be installed in all buildings according to the BC Fire Code and other applicable regulatory requirements.

3.1.2 SFU building maintenance and operations departments shall develop and maintain a comprehensive program for SFU-owned buildings, including complete documentation to ensure that all fire safety and detection equipment is regularly inspected and tested, and response procedures are practiced. Buildings leased or rented by SFU shall be maintained according to contractual obligations.

3.2 Fire Safety Plans

3.2.1 A Fire Safety Plan template has been developed by Environmental Health & Safety (EHS) to provide the basis for detailed customization for SFU owned buildings. The customization of building Fire Safety Plans is coordinated by EHS.

3.2.2 The customized Fire Safety Plan is designed to give uniform, but building-specific information to:

- Fire Departments;
- Occupants regarding procedures in case of fire;
- Occupants regarding a safe and orderly evacuation when the fire alarm sounds;
- Fire evacuation personnel; and
- Campus Security.

3.2.3 The Fire Safety Plans address responsibility for monitoring fire detection devices and outline response protocols at each site. Where Fire Safety Plans are commissioned as part of new construction or major renovations or, in the case of leased spaces, are developed by the building owner, the plans must meet BC Fire Code regulations.

3.3 Fire Evacuation Personnel

3.3.1 Evacuation Personnel include Building Evacuation Coordinators (BEC), Fire Wardens and back-ups for each role. They are selected from among building occupants on a volunteer basis and EHS ensures that a full complement is in place, in each building, on all campuses. Duties and training of fire evacuation personnel varies based on local arrangements and the specified role. The Fire Safety Plans specify the duties for each role.

3.4 Fire Drills

3.4.1 Fire drills are held on a regular basis and never less often than once a year.

3.5 Training and Drill Documentation

3.5.1 EHS maintains all documentation relating to the appointment of fire evacuation personnel, training of fire evacuation personnel and fire drills.

3.5.2 Documentation must include:

- the number of fire drills held;
- debriefing session notes;
- training sessions;
• fire incidents;
• fire prevention activities; and
• a current list of Fire Evacuation Personnel by building and location.

APPENDICES

Appendix A
This policy should be read in conjunction with the following University Policies:

GP 17 – University Occupational Health and Safety
GP 31 – Emergency Management of Physical and Other Disasters

The following Appendices provide site-specific details on the Fire Safety Program at individual SFU campuses.

Appendix B – SFU Burnaby
Appendix C – SFU Vancouver
Appendix D – SFU Surrey
Appendix E – SFU Kamloops

Appendix B: Fire Safety - SFU Burnaby

Fire Safety Plan

EHS is responsible for customizing the Fire Safety Plan template for each building in collaboration with Facilities Services, building occupants, and local Safety Committees.

Fire Evacuation Personnel

Evacuation personnel are appointed by department heads and trained in fire safety and evacuation procedures by EHS. Fire evacuation personnel consist of a Building Evacuation Coordinator (BEC) and back-up and Fire Wardens with back-ups.

Fire Drills

Fire drills are coordinated by the EHS in collaboration with building occupants, fire evacuation personnel, Burnaby Fire Department, Campus Security and Facilities Services in accordance with fire drill procedures documented in the Fire Safety Plans.

Building Evacuation Coordinator Duties

• Oversees the building evacuation, collects information from Fire Wardens at the annunciator panel and relays this information to responding Campus Security personnel
• Reviews the Fire Safety Plan to ensure it is accurate;

Fire Wardens

Fire Wardens are responsible for immediately evacuating their areas as soon as the fire alarm sounds, directing occupants via the nearest safe exits to designated assembly area(s) and reporting status to the Building Evacuation Coordinator at the annunciator panel. As required, they are re-deployed to access routes to prevent re-entry.

Equipment Maintenance and Testing

Facilities Services is responsible for maintenance and testing fire safety equipment. Their maintenance plan outlines the required maintenance and testing procedures, responsibility for the procedures, and documentation requirements.

Appendix C: Fire Safety - SFU Vancouver

At SFU Vancouver, compliance with the Fire Services Act, BC Fire Code, as adopted by the City of Vancouver, University policies/procedures and, where applicable, the Landlord’s fire safety requirements is shared by Operations Department, EHS and, where applicable, the landlord.

1) Harbour Centre Building

Fire Safety Plan

The building owner (Landlord) at Harbour Centre has established a Fire Safety Plan that meets jurisdictional requirements and has been approved by the Fire Prevention Division of the Fire and Rescue Services of the City of Vancouver. The Operations Department of SFU, Vancouver maintains the program in Simon Fraser University occupied space.

Fire Evacuation Personnel

Fire Safety Personnel consist of the Fire Safety Director, the Deputy Fire Safety Director, The Evacuation Control Officer, Floor Wardens and Security Personnel. The Fire Safety Director and Deputy Fire Safety Director are appointed from the Operations Department personnel by the Executive Director of the Vancouver Campus.

The Fire Safety Director or Deputy appoints the Evacuation Control Officer (ECO). The Floor Wardens are appointed from amongst Simon Fraser University employees on a volunteer basis in conjunction with the Department Heads. During times that the University is closed and largely unoccupied, the duties of Evacuation Control Officer and Floor Wardens...
are carried out by Security personnel.

The Deputy Fire Safety Director is responsible to ensure the Fire Safety Plan is reviewed annually to confirm accuracy, recruit floor wardens where positions have become vacant, ensure that all wardens have received the appropriate training and equipment such as vest, cap, and report forms.

Duties of Fire Evacuation Personnel are per the approved Fire Plan provided by the Landlord, Harbour Centre Complex.

**Equipment Maintenance and Testing**

The Landlord is responsible for maintenance and testing of fire safety equipment as per their established procedures. Where Simon Fraser University has installed additional fire extinguishers the annual maintenance and testing is arranged by the Operations Department.

**Fire Drills**

Fire Drills are coordinated with the Landlord and Simon Fraser University Fire Evacuation Personnel by the Deputy Fire Safety Director (Operations Department).

**Building Evacuation Control Officer (ECO) Duties**

The Evacuation Control Officer at the time of a fire alarm is responsible to see that floor wardens report evacuation status during evacuation. The Evacuation Control Officer then goes directly to the designated meeting spot to advice evacuees.

**Security**

Security is available to assist the Emergency Responders once they are in Simon Fraser University space. During the times when there are limited fire personnel, security may play a greater role in building evacuation. Security also has a liaison role with the landlord regarding evacuation of the building and re-entry.

2) Segal Graduate School of Business

**Fire Safety Plan**

The Operations Department at SFU Vancouver is responsible for administering the Fire Safety plan.

**Fire Evacuation Personnel**

Fire Safety Personnel consist of the Fire Safety Director, the Deputy Fire Safety Director, The Evacuation Control Officer (ECO), Floor Wardens and Security Personnel. The Fire Safety Director and Deputy Fire Safety Director are appointed from the Operations Department personnel by the Executive Director of the Vancouver Campus. The Fire Safety Director or Deputy appoints the Evacuation Control Officer (ECO). The Floor Wardens are appointed from amongst Simon Fraser University employees on a volunteer basis in conjunction with the Department Heads. During times that the building is closed and largely unoccupied, the duties of Evacuation Control Officer (ECO) and Floor Wardens are carried out by Security personnel.

The Deputy Fire Safety Director is responsible to ensure that the Fire Safety Plan is reviewed annually to confirm accuracy, recruit floor wardens where positions have become vacant, ensure that all wardens have received the appropriate training and equipment such as vest, cap, and report forms.

Duties of Fire Evacuation Personnel are per the approved Fire Plan.

**Equipment Maintenance and Testing**

Maintenance and annual testing of the fire safety equipment is the responsibility of the Operations Department as per the procedures outlined in the Fire Safety Plan.

**Fire Drills**

Fire drills are coordinated by the Fire Safety Director and Deputy Fire Safety Director (Operations Department) in conjunction with the Fire Evacuation Personnel and the Building Department Managers.

**Building Evacuation Control Officer (ECO) Duties**

The Evacuation Control Officer at the time of a fire alarm is responsible to see that the evacuation is conducted in accordance with the Fire Safety Plan. The Evacuation Control Officer (ECO) ensures that the evacuation begins and then goes directly to the designated meeting spot to advice evacuees.

**Security**

Security is available to assist the Emergency Responders. During the times when there are limited fire personnel, security may play a greater role in building evacuation. Security also has a liaison role with the engineers regarding evacuation of the building and re-entry.

3) Morris J. Wosk Centre for Dialogue

**Fire Safety Plan**

The Operations Department at Simon Fraser University, Vancouver is responsible for administering the Fire Safety Plan.

**Fire Evacuation Personnel**

Fire Safety Personnel consist of the Fire Safety Director, the Deputy Fire Safety Director, The Evacuation Control Officer, Floor Wardens and Security Personnel. The Fire Safety Director and Deputy Fire Safety Director are appointed from the Operations Department personnel by the Executive Director of the Vancouver Campus. The Fire Safety Director or Deputy appoints the Evacuation Control Officer (ECO). The Floor Wardens are appointed from amongst Simon Fraser University employees
or Deputy appoints the Evacuation Control Officer (ECO). The Floor Wardens are appointed from amongst Simon Fraser University employees on a volunteer basis in conjunction with the Department Heads. During times that the University is closed and largely unoccupied, the duties of Evacuation Control Officer (ECO) and Floor Wardens are carried out by Security personnel.

Duties of Fire Evacuation Personnel are per the approved Fire Plan.

**Equipment Maintenance and Testing**

Simon Fraser University, Vancouver’s Operations Department is responsible for the maintenance and testing of fire safety equipment as per the regulatory requirements as outlined in the Fire Safety Plan.

**Fire Drills**

Fire Drills are coordinated by the Fire Safety Director or Deputy FSD (Operations Department) and conducted in accordance with regulatory requirements as outlined in the Fire Safety Plan.

**Building Evacuation Control Officer (ECO) Duties**

The Evacuation Control Officer at the time of a fire alarm is responsible to see that the evacuation is conducted in accordance with the Fire Safety Plan. The Evacuation Control Officer (ECO) ensures that the evacuation begins and then goes directly to the designated meeting spot so that evacuees know where to congregate.

**Security**

Security is available to assist the Emergency Responders. During the times when there are limited fire personnel, security may play a greater role in building evacuation. Security also has a liaison role with the engineers regarding evacuation of the building and re-entry.

**4) School for the Contemporary Arts – 611 Alexander Centre**

**Fire Safety Plan**

The building owner (landlord) at Alexander Centre has established a Fire Safety Plan that meets jurisdictional requirements and has been approved by the Fire Prevention Division of the Fire and Rescue Services of the City of Vancouver. The Operations Department of Simon Fraser University, Vancouver maintains the program in Simon Fraser University occupied space, as per landlord’s requirements.

**Fire Evacuation Personnel**

Fire Safety Personnel, within Simon Fraser University space, consists of a Fire Warden and Assistant Fire Warden. The Fire Warden and Assistant Fire Warden are appointed from amongst Simon Fraser University employees at the School for the Contemporary Arts on a volunteer basis and in conjunction with the department head and landlord.

**Fire Safety Director or Deputy**

The Fire Safety Director or Deputy (Operations Department) is responsible for coordinating fire drills and other fire safety activities as per the approved Fire Plan.

**Fire Warden Duties**

The Fire Warden at the time of a fire alarm is responsible to see that upon the sounding of the fire alarm the evacuation begins immediately, directing occupants to the designated meeting spot. Once the majority of occupants have left, a quick sweep of the space, if safe to do so, is done to ensure that everyone has left.

The Fire Warden reports status to responding agencies.

**Appendix D: Fire Safety - SFU Surrey**

**SFU Surrey**

At SFU Surrey, compliance with the Fire Services Act, BC Fire Code, as adopted by the City of Surrey, University policies/procedures and where applicable the Property Manager’s fire safety requirements, is shared by Facilities Services, EHS and the Property Manager for Central City.

**Fire Safety Plan**

A Fire Safety Plan, part of the overall Emergency Evacuation Plan, has been established for the entire complex by the building owner. All sections, owned or non-owned by SFU, fall under this Plan. The building owner/manager is responsible for ensuring that all Fire Safety Personnel are trained in all aspects of fire prevention, fire control, earthquake, bomb threats and emergency evacuation procedures.

**Fire Safety Personnel**

Fire Safety Personnel consist of the Fire Safety Director (Incident Commander), the Deputy Fire Safety Director and Floor Wardens. The Fire Safety Director and the Deputy Fire Safety Director are appointed in writing by the building owner/manager. Floor Wardens for floors occupied by SFU are selected on a volunteer basis from among employees working in the immediate area. For identification, SFU Floor Wardens are issued marked safety vests and helmets.

The Facilities Manager ensures there is a full complement of Floor Wardens and that Floor Wardens attend annual training sessions conducted by the building owner/manager. Additional duties are to:
Obtain and issue equipment, such as fire warden vests, hats, etc.

Ensure that Fire Safety Personnel carry out their responsibilities and duties as described in the Fire Safety Plan

Eliminate fire hazards reported by Fire Safety Personnel

Fire Drills

The building owner/manager is responsible for ensuring that fire drills are held on a yearly basis.

Equipment Maintenance and Testing

The Property Manager at Central City is responsible for maintenance and testing of base building fire safety systems as per code requirements. Where Simon Fraser University has installed additional fire extinguishers, the annual maintenance and testing is arranged by the Facilities Services department. Additionally, monthly inspections of fire extinguishers are performed through Facilities Services in accordance with code requirements.

Appendix E: Fire Safety - SFU Kamloops

SFU Kamloops

At SFU Kamloops, compliance with the Fire Services Act, BC Fire Code, as adopted by the City of Kamloops, University policies/procedures, is shared by Facilities Services, EHS and the Manager of SFU First Nations Studies (FNS) responsible for SFU Kamloops.

Maintenance

Facilities Services (Burnaby) is responsible for ensuring that maintenance and testing of fire safety equipment is carried out. A maintenance plan outlines the required maintenance and testing procedures, the responsibility for these procedures, and documentation requirements.

Fire Safety Plan

A Fire Safety Plan has been developed by EHS (Burnaby) for the Kamloops site in collaboration with Facilities Services, building occupants, and the Manager Administrative Services (Kamloops).

Fire Evacuation Personnel

Fire evacuation personnel consist of the fire wardens. The fire wardens are selected by the Department Head on a volunteer basis. Fire wardens report fire hazards to the Manager Administrative Services.

Manager, Administrative Services SFU Kamloops

Reviews the Fire Safety Plan to ensure it is accurate;

Notifies the department head when fire wardens leave and replacements are required;

Ensures that fire wardens have received appropriate training and equipment, such as fire warden vests, clipboards and report forms.

Fire Drills

Fire drills are coordinated by EHS in collaboration with the Manager Administrative Services, fire evacuation personnel, building occupants, and the Kamloops Fire department.
Fire Emergency & Evacuation

When you Discover a Fire

1. Activate the “PULL” station
2. Dial 2-4500 if safe to do so
3. Extinguish the fire - only if it is small, and you are trained to do so
4. Remove anyone in immediate danger
5. Close windows/doors to prevent the fire from spreading
6. Evacuate via the nearest emergency exit - do not use the elevator!
7. Proceed to assembly area

When you Hear the Alarm

1. Stop activities
2. Close windows/doors
3. Evacuate via the nearest emergency exit DO NOT USE THE ELEVATOR!
4. Proceed to assembly area

Do not re-enter the building unless the “all clear” signal has been given by the fire department or security personnel.

Fire Evacuation Teaching Staff

Instructors and teaching staff must give direction to students during an emergency evacuation.

Always identify the following before entering a classroom

- Location of the Fire Alarm
- Location of the Fire extinguishing equipment
- Exit routes
- Refuge areas
- Assembly area(s)

When a fire breaks out in the classroom

- Activate the alarm
- Initiate the evacuation
- Attempt to extinguish the fire only if: the fire is small or contained and you are trained in the use of a fire extinguisher.

In all other cases continue with instructions below upon hearing the fire alarm

- Initiate evacuation
- Direct students to the designated assembly area
- Direct or assist students with disabilities to the refuge area
- Close the door after the classroom has been evacuated
- Inform the Building Evacuation Coordinator (who can be found at the annunciator panel) of the disabled students in refuge areas
- Proceed to the assembly area

Disabled Persons

If you are not on the ground floor and are unable to exit to outside, proceed to a refuge area. Once you have arrived at the refuge area, you will need to wait for the Fire Department who is equipped and trained to get you down the stairs.
Fire Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>Combustibles (Paper, cloth, wood, trash)</td>
</tr>
<tr>
<td>Class B</td>
<td>Flammable Liquids (Gasoline, paint, oil, solvents)</td>
</tr>
<tr>
<td>Class C</td>
<td>Electrical (Wiring, circuit boards, computers)</td>
</tr>
<tr>
<td>Class D</td>
<td>Combustible metals (Potassium, Sodium, Magnesium)</td>
</tr>
</tbody>
</table>

Fire Extinguisher Types

<table>
<thead>
<tr>
<th>Firehoses (use 1.5 inch only)</th>
<th>A FIRES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Chemical Extinguishers</td>
<td>A &amp; B &amp; C FIRES</td>
<td>C</td>
</tr>
<tr>
<td>CO₂ FIRE EXTINGUISHERS</td>
<td>B &amp; C Fires</td>
<td>BC</td>
</tr>
<tr>
<td>Graphite Powder</td>
<td>D Fires</td>
<td>D</td>
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</tbody>
</table>

Using Fire Extinguishers

Use a portable fire extinguisher only when trained to do so and only on small fires. For example: A garbage can on fire or a fire, which has not yet spread beyond the immediate area.

If you even have to think whether the fire is too big to be extinguished with a portable fire extinguisher, the fire is most likely too big!

Rules when using a portable fire extinguisher

Sound the alarm at a pull station first.

Make sure you can use the extinguisher!

ALWAYS keep your back towards an unobstructed exit and stand at least six feet away from the fire and follow the four-step PASS procedure (See below).

A fire extinguisher only lasts for approximately 10 to 15 seconds. Never risk your safety.

PASS Procedure

P Pull the Pin

A Aim the extinguisher nozzle at the base of the flames

S Squeeze trigger while holding the extinguisher upright

S Sweep the extinguisher from side to side, covering the area of the fire with the extinguishing agent.