TRENT UNIVERSITY

Science Safety Program

Core Principles

TrentEmployee

7/2/2013

This document outlines the core principles of a good safety program and how it applies to the Science Safety Program.

1.0 Emergency Contacts and Immediate Response Measures

Important Numbers:

Campus Security: Internal phone: dial extension 1333 or 9 705 748-1333 (Emergencies Only)
External: (705) 748-1011 ext 1333

Fire and Ambulance: Internal and external phone dial 911 or via Campus Security

Building Civic Emergency Addresses:

- Chemical Sciences Building: 2099 East Bank Dr.
- Environmental Sciences Center: 2089 East Bank Dr.
- Science Complex (including Physics): 2101 East Bank Dr.
- DNA Blocks A and B Life and Health Sciences Center Blocks C and D: 2140 East Bank Dr.

Fire:

Try to extinguish the fire if you can do so without putting yourself or others at undue risk. Call for emergency response. Call 1333.

If another person's clothing catches on fire:
Assist them in the **Stop, Drop and Roll**.

Assist in smothering the flames by covering them in a fire blanket, clothing or other appropriate item.

Medical Emergency:

Minor Injuries: (does not include large bleeding, broken bones, loss of consciousness) Treat injury, contact campus security ext 1333, file incident report.

Major Injuries: Perform emergency first aid, contact campus security ext. 1333, if life threatening call 911.

Chemical Spills:

Use the Four C 's approach Communicate, Contain, Cleanup, Complete:

> **Communicate** to other lab personnel that you have a chemical spill, contact your supervisor and if necessary Security at 1333 when safe to do so.
>
> Without putting yourself or others at undue risk, **Contain** the spill by covering with the appropriate material.

Without putting yourself or others at undue risk**, Clean** up the spill using the appropriate procedures and PPE.

Complete an incident report outlining the details of the event and action taken.

Phone Alerts: If an emergency message comes on university phones (i.e., text on display or audio) Read/Listen carefully and follow the instructions.

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2.0 Glossary

Act – means the Ontario Occupational Health and Safety Act unless specified otherwise.

Audit- *a systematic review or investigation, usually by an independent person or body, of a program*

competent person – means a person who,

is qualified because of knowledge, training and experience to organize the work and its performance;

is familiar with the Act and the regulations that apply to the work; and

has knowledge of any potential or actual danger to health or safety in the workplace. (ONTARIO OH&S ACT SECTION 1(1))

due diligence – taking *all* precautions reasonable in the circumstance to protect the health and safety of the worker.

Hazard*: A condition, device or substance that can directly cause injury to people or damage to property.*

Hazardous material: *Any chemical or biological material which can directly cause injury to people or damage to property or the environment*

incident – an event or occurence that may or may not result in injury to people and/or damage to the environment, equipment, property and/or material.

injury – an event that results in physical harm to a person(s).

inspection – *a careful examination or assessment, not necessarily independent*

laboratory – for the purposes of this manual, a laboratory is considered to be any space where scientific research, experimentation or analysis is conducted.

laboratory personnel – any employee, student or visitor conducting scientific research, experimentation or analysis within a laboratory.

near miss – an event that under slightly different circumstances could have resulted in physical harm to an individual or damage to the environment, equipment, property and/or material.

research laboratory – a laboratory designed primarily for research.

supervisor – a person who has charge of a workplace or authority over a worker. (ONTARIO OH&S ACT SECTION 1(1)) . (See page 6 Roles and Responsibilities for clarification)

teaching laboratory – a laboratory designed with an instructional function related to a University course for students.

Unplanned Incident: *an incident where the outcome was not expected nor predicted*

Worker: means a person who performs work or supplies services for monetary compensation.

3.0 Preface

Sciences Health and Safety Program:

Much of our society's structure is based on technological and scientific advances made in the last two centuries and it is likely that we will continue to be dependent on scientific advances as we move into the future. Science is, however, inherently risky as we are often involved in working with materials which we have incomplete knowledge, about their short and long term effects on health, about potential reactions with other materials, about the impact on the environment and we utilize methods which in and of themselves may, if care is not taken, result in both subtle or catastrophic effects. In addition we need to recognize that universities are complex organizations with complicated reporting structures and responsibilities. Finally, we need to recognize that the criminal code was altered by the passing of Bill C-45 (Westray Bill). The code now says "217.1 Every one who undertakes, or has the authority, to direct how another person does work or performs a task is under a legal duty to take reasonable steps to prevent bodily harm to that person, or any other person, arising from that work or task." Bill C-45 also added Sections 22.1 and 22.2 to the Criminal Code imposing criminal liability on organizations and its representatives for negligence (22.1) and other offences (22.2).

There is a wide range of knowledge, experience and training ranging from faculty to students who work in labs and this invariably leads to misunderstandings and miscommunication. Having said this, the expectation of the public is that Science is done safely and that the people working in the field are highly trained and competent. Subsequent governments have also made it clear that injuries and accidents in the workplace are not acceptable. As employers and employees we need to recognize that we are employed in a highly regulated area of work.
The challenge in this is to attempt to find "A middle pathway between the extremes of stultifying regulation and a reckless rush to "get the job done" in the lab" [1]
Not an un-daunting task.

[1] Bird, Frank E. Jr., George L. Germain and M. Douglas Clark. 2007. in Practical Loss Control Leadership. 3rd ed. Det. Norske Veritas (USA) inc., Duluth, Georgia.

The approach outlined in this document for a Science Health and Safety Program is consistent with proven Health and Safety Strategies (CSA Z 1000-06 Occupation Health and Safety Management) as well as currently recommended laboratory practices.

The Science Health and Safety Program at Trent University has been designed to try to ensure that the unique risks and hazards inherent in laboratory science (teaching and research) are adequately mitigated.

The objectives of the program are:

1. Protect people, property and the environment from health and safety hazards which may be present in a science setting.

2. Provide general guidelines and basic rules considered as the minimum for the safe operation of a laboratory at Trent University.

3. Clarify who is a supervisor and who is a worker and their respective responsibilities

4. Highlight sections of the Occupational Health and Safety Act of Ontario which affect the safe operation of a laboratory.

5. Provide a standard of good laboratory safety practices which also allows the University to meet the requirements of the Act.

6. Provide a standard of good field work safety practices which also allows the university to meet the requirements of the Act.

7. Help to define what precautions are considered "reasonable precautions" in scientific activities.

This particular document represents the foundation for the program and is a guide to the program but does not constitute in and of itself, as the entire program. It is, rather, the base document from which other training, guides, and information flow. This document along with other information provided give supervisors a plan and tools for creating safety programs within their own operations.

4.0 Core Elements of the Science Safety Program

Good occupational health and safety programs have the following characteristics.

- Clear and understandable Roles and Responsibilities and clear lines of reporting.
- Includes good communication of the program and its requirements
- Offers a variety of training for the identified hazards.
- Uses documentation to ensure consistent and clear communications and maintains records

- Has incident reporting which can be used to review incident causes and mitigate for the future
- Uses inspections and audits as measures of the effectiveness of a program
- Emphasizes and provides tools for Hazard Identification, Risk Assessment and implements controls to mitigate risk.
- On a regular basis it is reviewed to ensure effectiveness and relevance.

4.1. Roles and Responsibilities

In a properly functioning Health and Safety Program everyone plays an important role in ensuring everyone's safety. Nonetheless the Occupational Health and Safety Act of Ontario does outline specific "responsibilities" and "accountabilities" for Workers, Supervisors, and Employers.

Workers : A worker is anyone who is performing work or supplies services for monetary compensation. Workers could also be anyone of the categories listed below (supervisor and employer) depending on the circumstances.

The Act (Sec. 28 (1)) states that **"A worker shall, a) work in compliance with the provisions of this Act and the regulations, b) use or wear the equipment, protective devices or clothing that the worker's employer requires to be used or worn; c) report to his or her employer or supervisor the absence of or defect in any equipment or protective device of which the worker is aware and which may endanger himself, herself or another worker; and c) report to his or her employer or supervisor any contravention of the Act or the regulations or the existence of any hazard of which he or she knows**.

In addition Sec 28 (2) states "**No worker shall, a) remove or make ineffective any protective device required by the regulations or by his or her employer, without providing an adequate temporary protective device and when the need for removing or making ineffective the protective device has ceased, the protective device shall be replaced immediately; b) use or operate any equipment, machine, device or thing or work in a manner that may endanger himself, herself, or any other worker; or c) engage in any prank, contest, feat of strength, unnecessary running or rough and boisterous conduct.**

Supervisor: One of the obligations of the "Employer" is to ensure that "competent supervisors" are in place to oversee all work at the University. As per the definition above (glossary) a supervisor is someone who has charge of a workplace or authority over a worker. This definition means that, depending on the circumstance anybody could be a supervisor, irrespective of membership in a Collective Bargaining Unit. At the university this could be the President, Vice-Presidents, Deans, Chairs, Faculty, Staff, Post-doctoral fellows. However, it does not include students unless they are being paid for that specific work, in which case then they too, could be a supervisor.

The Act (Sec. 27, (1)) states that "**A supervisor shall ensure that a worker, a) works in the manner and with the protective devices , measures and procedures required by this Act and the regulations; and b) uses or wears the equipment, protective devices or clothing that the workers employer requires to be used.**

In addition Sec. 27. (2) states that "**Without limiting the duty imposed by subsection (1) a supervisor shall, a) advise a worker of the existence of any potential or actual danger to the health or safety of the worker of which the supervisor is aware; b) where so prescribed, provide a worker with written instructions as to the measures and procedures to be taken for protection of the worker; and c) take every precaution reasonable in the circumstances for the protection of a worker.**

In legal terms the word "shall" is not an option.

Employer: Generally, Trent University is the Employer. Section 25 and 26 of the Act outlines the responsibilities of the Employer.

4.1.1 Clearly defining the Roles and Responsibilities in Research and Teaching in the Sciences and Reporting Lines

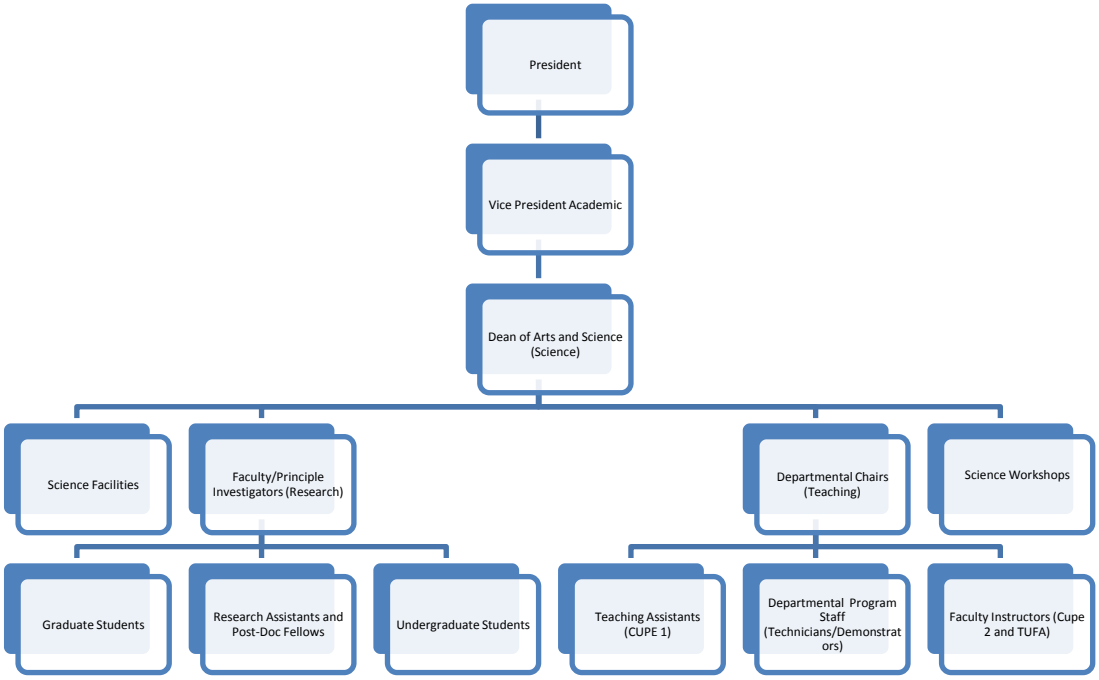
Research:
Research at the university in the sciences can take place in a variety of settings (lab, animal care facility, out in the field) and in a wide range of variables. Most often however, when we discuss research lab safety the supervisory role is through the Faculty/Principle Investigator and the students or research assistants are classified as the workers.

Teaching:
In the case of Science teaching labs, a supervisor shall be appointed by the department for each course. Personnel involved in running the lab should make themselves aware of who has been appointed the supervisor.

One of the key concepts of the OH and S Act, and good heath and safety practice is always to ensure that whoever is designated as the supervisor is a competent person. By competent, the act refers to a person who is a) qualified because of knowledge, training and experience to organize the work and its performance, b) is familiar with this Act and the regulations that apply to the work, and c) has knowledge of any potential or actual danger to health and safety.

Having said all of this and legal obligations aside for a moment, the prime objective of this program is to ensure that no one, irrespective of position at the university is injured in the course of their work and study, and toprevent damage to university facilities and the environment.

Figure 1. Reporting line for Health and Safety within the Sciences.



For the purposes of Health and Safety, the Reporting Structure diagrammed above should assist you in determining who you should contact and to discuss Health and Safety Issues. For example, Graduate Students doing work in a research lab or in the field (in other words working on their "studies") would discuss health and safety issues relating to that work with their Faculty Supervisor. If the Graduate Student is also a Teaching Assistant for a course then they would discuss Health and Safety issues with the Department or Program Chair.

4.2. Training Requirements

It is the responsibility of supervisors to ensure that in addition to the mandatory university training (Health and Safety Orientation and Workplace Violence and Harassment training)that a*ll* laboratory personnel have received sufficient introduction and training on specific equipment, procedures and materials in the laboratory where they will be working (job specific training)

All training is to be documented and a template for a training record has been developed to assist Supervisors with this. It is attached at the end of this document and will be covered further under Communication and Documentation.

In addition to job specific training, the supervisor is responsible for ensuring that new personnel are oriented and made aware of emergency and safety procedures including, but not limited to, emergency evacuation routes, emergency or safety procedures specific to the laboratory as well as departmental safety policies and procedures and applicable policies and procedures included in this program and the Trent University Health and

Safety Policy. Supervisors are to ensure that all new laboratory personnel have successfully completed the courses specified by the supervisor

It is the responsibility of the supervisor to ensure that all training of laboratory personnel is documented and maintained throughout the employment of the worker or until graduation of a student.

At a minimum a person working in a lab would require (in addition to the university requirements)

Workplace Hazardous Materials Information System
Lab Safety Orientation.

Training modules may be given in a formal class setting, online, or as take home programs. The Risk Management Website will maintain an up to date list of courses available and how to access them at **www.trentu.ca/HealthandSafety.** In addition, email notices of upcoming training sessions specifically involving the sciences or for science personnel will be sent out. Depending on the type of work to be done, additional training (eg. Fall restraint or machine guarding) may be required. If you are unsure please contact either Science Facilities or the Risk Management Office for further information.

4.3. Documentation

While documentation is often considered by some to be "useless paperwork" there is a very important reason why things should be recorded. Having "it" written down avoids confusion among people as to specific policies and procedures which in turn prevents unplanned incidents and demonstrates due diligence on the part of Employer, Supervisor and the Employee.

Supervisors should ensure that they keep all owners manuals and instruction manuals for all equipment they purchase.

Orientation and Training records are important in ensuring that personnel have been properly trained and have been given the information or been instructed in the technique properly. (see Appendix 1 for a Training Record template, also available as a download).

Documenting Inspections and Audits creates a history that can be referred to at later dates to help improve performance and compliance and can assist in quality control.

Any formal meeting should have notes or meetings taken which clearly indicate the topics discussed and record specific instructions.

Any work that a supervisor would consider as a medium to high risk (see section 4.7) should have its practices and procedures written down. A Standard Operating Procedure (SOP) is a good way of ensuring that the procedures are recorded and followed by your

laboratory personnel for those activities that are considered to be of a greater hazard then normal. In fact, ISO 9001 (which is the Quality Assurance and Quality Control Standard accepted by most industrial and many research institutions) requires that all procedures be documented with SOP's and that the use of these SOP's is a normal operating practice.

4.4. Communication

Communication is one of the most important factors of good laboratory safety programs. Ensuring that everyone understands the various expectations, responsibilities and obligations through a useful and open dialogue is key to any successful venture. Supervisors and workers must be able to communicate effectively and be open to the conversation. Discussions about Health and Safety should never take a back seat to productivity or considered to be a hindrance to the work, but should be part and parcel of the whole package.

Specific procedures, policies and even rules must be openly communicated and the repercussions of not following them should be made clear. Discussions about health and safety hazards should be open and free and everyone should be encouraged to raise the topic. Proper communication can take the form of emails, postings, recorded meetings and written policies and procedures.

Ensure that you (if a worker) or your people (if a supervisor) are aware of and understand policies for things like working alone, working after hours, working with hazardous materials, appropriate lab clothing etc…

4.5. Incident Reporting

The reporting of unplanned incidents is important in Health and Safety Programs. Knowing the circumstances involved in incidents allows us to plan better and learn from mistakes to prevent the incident from reoccurring. It is not about retribution or punishment but rather investigating the occurrence to determine the base cause and eliminate or mitigate the cause to avoid the situation in the first place. Any situation that occurs where a person is injured, damage to facilities occurs, chemical spills and even needle sticks and small cuts must be reported to the university. To accomplish this all incidents must be reported to Security who will ensure that the facts of the situation are gathered and documented. In addition the Supervisor of the area should also be notified immediately of the incident. This may be followed up by the Risk Management office or Science Facilities with additional enquiries and if warranted with changes to policies or procedures that will mitigate the risk of the incident occurring again. This is particularly important for near miss incidents. Near miss incidents are those incidents where "something went wrong" but a negative outcome was just avoided. These should also be reported to either the risk management office or Science Facilities for follow up. Attached to this document and on the Web page is an Incident report form (Appendix 2). It is also available for download.

Summary of Reporting Procedures
Incident but no injury, no damage to facilities or equipment.(known as a near miss)
1. Report to your Supervisor immediately.
2.. Supervisor to complete incident report form (appendix 2) and forward to Science Facilities or Risk Management Office

Incident with injury or damage to facilities or equipment/release to evironment:

1. Once safe to do so and situation is under control, inform Security. If injury requires emergency first-aid call Security immediately. (Follow the Emergency Response Procedures outlined above for actions during the incident). They will attend the situation and dispatch the First Response team (if available) or a staff member with First Aid Training or ambulance if required.
2. Following the event (within an hour or so if possible), contact the Risk Management office and your supervisor.

4.6 Inspections and Audits

As part of any Health and Safety Program, inspections and audits are used a) measure the effectiveness of policy and procedures, b) measure compliance with established procedures and rules and c) anticipate possible future issues which may require action.

4.6.1 Internal Inspections:

Supervisors should inspect their areas on a regular basis to ensure that practices and procedures are being followed and that facilities and services are functioning appropriately. A sample laboratory inspection checklist has been created to assist. It is a generic form and can be altered by the supervisor to suit the specific situation. There are a variety of standards for the frequency of inspections by a supervisor but we would recommend no less than annually but biennially would be preferable. Supervisors should record the results (hence the template checklist) and keep the records of the inspections. If problems are found then that should be recorded as well as the actions taken to rectify the situation. (Appendix 3). Of course frequent informal inspections by the supervisor are encouraged.

4.6.2 Joint Health and Safety Committee (JHSC) inspection

Members of the JHSC (one representing Management and one representing Employees) accompanied by the building manager typically the SFM will also inspect all laboratory areas at least annually. Their report is forwarded to the Environmental Health and Safety Officer. The results of the inspection are sent to the supervisors of the area and require a

written response within 21 working days. Responses may include the resolution, an alternative, a plan of action or if applicable an explanation as to why the situation is not an Health and Safety Issue.

4.6.3 External Inspections

The Ministry of Labour has the authority under the Act to inspect any area of a workplace with or without advanced notice. Several other agencies such as the Canadian Nuclear Safety Commission also have that authority. Generally they will, if they deem necessary, issue "Orders". Often these orders come with specific instructions and the regulation it is related to as well as a firm date by which the situation must be rectified and require a written report from the appropriate University Administrator.

4.6.4 Audits

The university may periodically conduct audits as an assessment of the overall effectiveness of the Science Safety Program, possibly in response to a serious incident or a series of incidents suggesting a weakness in the safety program. Audits are a more detailed examination of a situation than an inspection and are used to evaluate programs as opposed to physical spaces. Audits will generally be conducted by University personnel and will include the EH and S Officer as well as Science Facilities and perhaps members of the JHSC.
Audits may also be performed by outside agencies from time to time (eg WorkWell Audits by the WSIB).

4.7. Hazard Identification and Risk Assessment

One of the core principles of a properly designed and well functioning health and safety program are the concepts of Hazard Identification and Risk Assessment.

Hazard identification is one of the key principles in a Health and Safety Program. The ability to ;

Recognize the hazards that exist.
Assess the hazard
Control the hazard

4.7.1 Recognize

Every effort should be made to anticipate hazards during the design stage of work in order to identify the hazards that need to be managed. One systematic way of recognizing hazards for any task is to evaluate the:

People
Equipment
Materials
Environment
Process

involved in any task to see where things might go wrong.

Eg. When designing a methodology for a chemical test you should look at the people involved (competent, highly skilled, student, unskilled), the equipment to be used (new / old, interlocks working, tendency to breakdown, weaknesses), Materials involved in process (chemicals and their associated hazards), the environment (lab/field, classroom, other), and the process itself (digesting in hot acid is there another method which will accomplish the same goal which might be safer or a safer way of doing the work). For assistance with identifying hazardous materials and their characteristics from MSDS sheets please read the "Hazardous Materials Identification" document.

4.7.2 Assess

Once you recognize where things can go wrong it is easier to assess the degree of risk and negative consequences using tools such as:

Review of the experiment or process and the planned safety precautions;

Detailed inspection and/or testing of the hazard;

Physical observation by trained individuals;

Investigations of near misses;

Conducting interviews with workers;

Reviewing records such as regulations, best practices, operating manuals, methods, injury reports or minutes of Joint Health and Safety Committee meetings.

Those hazards identified as most serious need to be controlled first.

How to assess Hazards:

One of the key things that keep an H and S program from becoming overly burdensome is to ensure that you as a supervisor are addressing the real risks in your operation. Spending a lot of time and resources on low risk events is both frustrating and doesn't usually have a net benefit. So how one assesses a hazard and the risk of an event is very important in determining the priority. As mentioned above those hazards assessed with the highest risk need to be given the highest priority and controlled first.

Risk is a function of the probability of an incident occurring and the severity of the negative consequences. It is often performed by using a matrix where the probability is

assigned a number on a vertical scale (1-4 for example with 1 being the lowest probability) and the severity is assigned a number on a horizontal scale (1-4 with one being the least severe). Depending on where the function of the two scales fall within the matrix, gives us somewhat of an objective sense of the risk involved.

For example. The risk of a fire in a lab which contains flammable chemicals might have a matrix that looks like this:
Probability of a fire: 3 (based on historical data, fuel readily available)
Severity of damage or injury: 4 total loss of lab and severe injury to occupants

4 (high prob. Low severity)	8	12	16. (high prob. High severity)
3	6	9.	12. X fire in Flammable chemical lab
2	4	6.	8.
1 (low prob. Low severity)	2 XX fire in non flammable chemical lab	3	4 (high severity, low prob.)

Whereas a risk of fire in a lab which does not have flammable chemicals might be:
Probability = 1 (no fuel available)
Severity = 2

As the function moves into the upper right hand corner (higher probability, higher severity of negative outcome) the priority of controlling the hazard increases.

Probabilities of an event occurring should be determined by historical data, and should also be part of procedural assessment. Severity should be categorized as a worst case scenario. Its not perfect but a hazard matrix can help to prioritize competing issues and ensure that limited resources are allocated in a risk based fashion as opposed to a convenient one. There is a lot of information available on hazard assessment matrices as this tool is universally accepted as an standard tool for risk assessment. However where there are specific regulations regarding a task or material, those regulations supersede any risk analysis.

4.7.3 Controlling the Hazard

Once the assessment of the hazard has been completed, control measures are to be implemented as appropriate to the situation. Below are control strategies, listed in order of effectiveness. The best controls are those that are mistake-proof, effective and independent of the worker, e.g. safety interlocks on centrifuges that prevent the lid from being opened until the rotor has stopped spinning. Management of hazards will often involve a combination of the following strategies.

Elimination/Substitution
(e.g. use of digital or red alcohol rather than mercury thermometers)

Engineering Controls
(e.g. fume hoods, safety interlocks on centrifuges)

Administrative Controls
(e.g. Training and the creation of standard operating procedures for specific tasks)

Practices and Procedures

Personal Protective Equipment
(e.g. safety glasses)

4.7.3.1 Elimination and Substitution

Elimination or substitution of a hazard is by far the preferable method of mitigating an identified hazard. For example to eliminate the hazard of mercury exposure we substituted alcohol thermometers for mercury thermometers where applicable. New technologies and methods of doing things also tend to eliminate hazards. When reviewing procedures and hazardous materials one should always examine whether or not the use of the material or the method can be altered to eliminate the problem or if substitution with a less hazardous material will work. However, we recognize that this is not always possible nor practicable.

4.7.3.2 Engineering Controls

Engineering Controls are defined as Physical Barriers to a hazard. They can include something as simple as a closed, sealed vial, to something as complicated as a fumehood or a balanced system of air handling units. The primary purpose of an engineering

control is to eliminate or isolate the contact of a substance or thing (i.e., sound) with a person or to contain a substance or thing. This type control is usually user independent but is not necessarily undefeatable. The intent of engineering controls is reduce or eliminate the "individual" factor as much as is practicable. Examples of good engineering controls include, Fumehoods, glove boxes, Biosafety Cabinets, Sound attenuated boxes (for ultrasonics) interlocks on centrifuges. However, used improperly or for purposes outside that for which they were designed, they will not function properly and may in fact increase the risk of an injury or incident.

For example, a fumehood is designed to work with the sash at the lowest height practicable, if the sash is raised to a height beyond the hoods capability to maintain the appropriate air flow across the opening, the fumehood will fail to contain properly and thus the risk of exposure to potentially harmful material is dramatically increased. Engineering controls must always be used according to the manufacturer's instructions.

4.7.3.3 Administrative Controls

Administrative Controls involve the use Policies, Training, Hazard Identification, Risk Assessment, Signage and Labelling and Record Keeping. While these kind of things are often referred by some as the bureaucracy, the absence of any one of these results in a poorly functioning Health and Safety program.

Policies: Are written documents that define what where when and why things should be done in a specific way.

Training: Training can be both formal (classroom, online) and informal (one on one) but needs to be documented.

Hazard identification: Hazard identification is the process by which potential hazards or hazardous situations are identified (see earlier in this chapter).

Risk Assessment: Risk assessment is a formal review of the hazard and a determination of its probability of occurring and severity of the event. Usually done in a matrix form it helps people to prioritize risky procedures to mitigate the potential for negative outcomes. Those outcomes with the greatest severity should be given the highest priority.

Signage and Labellling: Signage and labelling is a method of informing personnel that an area or an object is potentially hazardous.

4.7.3.4 Practices and Procedures

Practices and procedures in labs describe how things should be done and what things should not be done. These are often in the form of recipe like instructions or rules for the lab. For procedures that are of a medium risk and above hazard these would take the

form of Standard Operating Procedures (SOP). As mentioned elsewhere SOP's are formal "how to" documentation.

Know and understand the hazards, safe handling and operating procedures of the materials, equipment and methods being used. Review MSDSs, equipment manuals and standard operating procedures as applicable.

Avoid the use of personal audio devices and cell phones as these may disrupt concentration as well as prevent recognition of an emergency alarm, call for help etc.

Consult your supervisor before proceeding with any aspect of your experimentation that you are unsure of (e.g. safe handling of material, operation of equipment, experimental technique). While we try not to be too prescriptive there are some General Lab Rules that apply to all labs. They are as follows:

4.7.3.5 Basic Lab Rules:

- **Mouth pipetting is strictly prohibited.**
- **Avoid storage of personal belongings (e.g. bags, coats etc.) in the lab except in designated areas free of hazardous materials.**
- **No food, drink or smoking in labs with hazardous materials.**
- **No open toed footwear in labs with hazardous materials.**
- **Never "sniff-test" a chemical.**
- **Running, horseplay and practical jokes are prohibited.**
- **Report incidents and near misses promptly to your supervisor.**

These should be posted in each lab and strictly enforced by the supervisor.

Housekeeping

Good housekeeping practices are essential in every workplace; however they become especially important in the laboratory environment where spills from broken reagent containers, sample bottles, reaction vessels, etc., can create unnecessary exposures to potentially hazardous substances. Laboratory personnel are responsible for ensuring that their work spaces are kept as clean as the work allows. Laboratory supervisors are responsible for ensuring the overall cleanliness of the lab. The following housekeeping points will help lead to a neat, organized, efficient and, most importantly, safe work environment.

Ensure that:

- dirty glassware is cleaned on a regular basis and is not allowed to accumulate in sinks, on benches or in surrounding areas;

- reagents are stored appropriately when not in use;
- old or unused samples and reagents are disposed of in a timely manner;
- storage of materials or equipment does not obstruct aisles, fire extinguishers, safety showers, eye wash stations or other emergency equipment;
- items are kept away from the edge of bench tops so they cannot easily be knocked off;
- stored items, do not project beyond the front of shelf or counter limits;
- storage of large, awkward, heavy or breakable items on high shelves is avoided;
- experiments are cleaned up upon completion and that all work is tidied accordingly at the end of each day;
- apparatus used infrequently is stored appropriately when not in use;
- equipment no longer used is recycled or appropriately disposed;
- electrical cords, hoses, and air lines are secured.

Food storage and consumption
Storage and consumption of food and/or drink (including water) within the research, teaching or service laboratories is strictly prohibited. The use of laboratory equipment including, but not limited to, glassware, refrigerators, freezers, microwaves and other ovens etc., to store or prepare food is strictly prohibited. Ice from laboratory ice makers is not to be consumed.

Smoking
Smoking is strictly prohibited in all University buildings including laboratories and in or near all chemical or waste storage areas. Tobacco products are not to be brought into the laboratory unless they are part of the research.

Personal Hygiene
To prevent unforeseen accidents or exposures, the following points are to be followed to ensure that particular attention is paid to personal hygiene while working in the laboratory.

- Tie back or otherwise secure long hair. This is important to prevent exposures from hazardous materials as well as to prevent the hair from becoming entangled in a moving part of equipment. This is also good practice to prevent contamination of research samples.
- Neck ties are to be removed or secured (preferably behind a lab coat).
- Avoid touching your face or hair while wearing gloves.
- Hands are to be washed thoroughly after removal of gloves and/or after working with hazardous materials.
- Application of cosmetics or lip balm in the lab is prohibited.
- The wearing of gloves outside of the lab is prohibited.

Working Alone

It is not advisable to conduct laboratory work alone. These situations present additional hazards to personnel as they may find themselves isolated and without help in the event of an emergency.

In the event that a true working alone situation is warranted and following a hazard review of the work to be done as well as a review of hazards in the laboratory itself, the supervisor may allow specific projects or tasks to be performed while working alone. The supervisor is to be made aware of dates, times and locations of all working alone situations. When working alone, laboratory personnel are encouraged to make arrangements to have someone check-in with them regularly either in person or by phone.

The following circumstances are **examples** of situations where working alone situations are prohibited:

Work involving acutely toxic substances (e.g. sodium cyanide);
Work involving dangerously reactive substances (e.g. peroxides, pyrophorics or water reactives, perchloric acid);

Hot work (i.e. work involving an open flame in a lab where flammable substances are present); and

Work involving hydrofluoric acid.

Unattended Procedures

Certain instrumentation configurations are designed to routinely operate unattended, e.g. liquid and gas chromatographs equipped with autosamplers, centrifuges, autoclaves etc. However non-routine, unattended laboratory procedures should be minimized. If a procedure is to be left unattended, prior review of the hazards with consideration of the materials and procedures being used is to be completed. Only procedures that are deemed to be safe if left unattended are allowed to continue without personnel present in the laboratory. The following are requirements for non-routine unattended laboratory procedures.

Unattended procedures are to be visited periodically and a sign posted outlining the procedure being used with the contact information of the person responsible for the work. The sign is to indicate the start date and time along with the expected completion date and time of the work.

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

Unattended heating is only to be done using heating equipment that reliably maintains stable temperatures. If heating is being performed, flammable materials are to be removed from the area. This includes flammable hazardous wastes.

Experiments should be miniaturized if possible.

Sash doors are to be closed on all fume hoods.

It is highly recommended that unattended procedures be labelled with 24 hr contact information.

Visitors in the laboratory

Due to the potential hazards present in laboratory settings, to protect the integrity of the research being performed and for security of the equipment and supplies contained within, visitors to laboratories should be escorted. Supervisors are responsible for considering and approving exceptions to this as appropriate. Careful consideration of the hazards is to be done prior to opening up a laboratory for the purposes of an open house. Should a laboratory be opened to the public, a representative of the laboratory should be present at all times.

Note that documented permission from a parent or guardian and departmental approval may be required for entrance of a minor into a laboratory, e.g. the "Take your kids to work" program.

Standard Operating Procedures

Standard Operating Procedures (SOPs) are specific written procedures for tasks and activities that ensure quality control and safe handling procedures by outlining specific methods in which tasks are performed by personnel. The use of SOP's in a lab situation can ensure that "short-cuts" which may result in more dangerous situations are not taken by lab personnel when performing tasks with hazardous material. The creation and use of SOP's for work done in hazardous situations or for work done using hazardous material or methods is **strongly recommended** and in some cases may be mandated in legislation and regulations. SOP's are very simple to devise and should incorporate detailed information on how tasks are performed, who is allowed to perform the procedure or handle the equipment/material, the specific hazards involved and the emergency procedures to be followed should something go awry.

4.7.3.5 Personal Protective Equipment

Personal protective equipment (PPE) is to be used according to the hazards presented in the specific laboratory as determined by the laboratory supervisor. Laboratory areas should be clearly labelled as to the personal protective equipment required, to ensure clear communication to any individual entering the area. Personal protective equipment is

not to be used in place of engineering controls such as fume hoods, but is to be used diligently to provide supplemental protection.

Personal Protective Equipment is to be provided for employees when it is required and employees shall wear PPE when required to do so by their supervisor or any other regulation or requirement.

5.0 Summary

The Science Safety Program has been designed to follow todays acceptable standards for Occupational Health and Safety Programs. By ensuring each step of the program is followed the probability of a injured employee or severe damage occurring decreases. As with all programs, additional information is available in regards to specific areas of Science safety and will be made available through the Science Health and Safety Program Website. In addition to the existing training programs other programs will be produced as the need arises. Lab Personnel are welcome to make any suggestions for improvement to the Science Safety Program and any related information. Health and Safety Programs are not meant to be static but rather evolving programs, but adherence to the principles outlined in this document should give Supervisors and Employees a plan through which to pursue excellence in science research in a safe and productive manner.

Appendix 1. Lab Safety Training Record. Example. (available at www.trentu.ca/scienceservices/safety/safety_downloads)

After consultation with your supervisor, determine which of the following formal training modules you must complete. Note: The first three are mandatory. This record will be maintained by your supervisor, and shall be updated to reflect the dates you have received training. Check the boxes where training is required. Unless indicated otherwise, the training programs are available through the Science Safety Program Training course on Blackboard. See *www.trentu.ca/scienceservices*/safety/safety_training

		Training Module	Date training completed (d/m/yr)	Training provided by (print name):	Signature of trainer (or copy of certificate)	Signature of employee
☒ Yes		Science Safety Program Core Principles –mandatory Document available at www.trentu.ca/scienceservices/safety/safety_downloads				
☒ Yes		WHMIS training- mandatory				
☒ Yes		Lab Safety Orientation- mandatory				
☐ Yes	☐ No	Radiation safety training				
☐ Yes	☐ No	Laser safety training				
☐ Yes	☐ No	Transportation of Dangerous Goods (TDG) training				
☐ Yes	☐ No	Compressed gas cylinder training				
☐ Yes	☐ No	Fume hood safety training				
☐ Yes	☐ No	How to safely dispense liquid Nitrogen (contact Angela Sikma)				
☐ Yes	☐ No	Chemical use, storage,spill & waste guide				
☐ Yes	☐ No	Disposal of lab waste (chemical, biological, electronics, broken glass & lab sharps, recycling) www.trentu.ca/scienceservices/facilities_waste				
☐ Yes	☐ No	Use of personal protective equipment weblink				
☐ Yes	☐ No	Biosafety Training				

After discussion with your Supervisor, identify additional potential hazards that you may encounter within the lab. Additional safety training should be completed at the discretion of your supervisor. Examples might include; autoclave, muffle furnace, vacuum equipment, UV lights, biosafety cabinet, power tools, instrumentation (e.g. AA , ICP, autosamplers, thermal cyclers, centrifuge) etc. Complete all columns. Attach an additional page if necessary.

Equipment/Procedural listing of additional safety training required	Date safety training completed (d/m/yr)	Training provided by (print name)	Signature of Trainer	Signature of employee

Name of Employee (please print)

Name of Supervisor (please print)

EMPLOYEE HEALTH & SAFETY ORIENTATION FORM

Trent University is committed to promoting health and safety in the work place by endeavouring to prevent accidents, injuries and occupational illnesses. To ensure the health and safety of its work force, Trent University must provide safe equipment, competent supervision and adequate safety education for employees. Every person who works at Trent University has an important role to play in maintaining the University's high standards of safety. All employees must do their part to prevent accidents. They must exercise safe work practices, participate in safety training, identify and report workplace hazards and comply with safety standards as set out by any and all relevant legislation and Trent University Health and Safety Policies and Procedures.

Worker's Rights and Responsibilities under the *Occupational Health and Safety Act*

Rights:

- To know about workplace health and safety hazards
- To participate in making recommendations on health and safety issues
- To refuse work if believed to endanger health or safety

Responsibilities:

- To work in compliance with the *Occupational Health and Safety Act*
- To wear protective equipment, devices and clothing required by the employer
- To report to a Manager any defective equipment, hazard or violation of the *Act*
- To work in a manner that does not endanger the worker or others
- Not engage in horseplay or boisterous conduct

Trent University Health and Safety Orientation Checklist

- ❒ Health & Safety Policy & Standards (http://www.trentu.ca/healthandsafety/policy.php)
- ❒ Emergency Response Procedures (http://www.trentu.ca/security/emergencyresponse.php)
- ❒ Trent University Environmental Health & Safety Handbook (http://www.trentu.ca/healthandsafety/documents/hshandbook.pdf)
- ❒ Joint Health and Safety Committee (http://www.trentu.ca/healthandsafety/committee.php)
- ❒ Health & Safety Workshops and Training (http://www.trentu.ca/healthandsafety/training.php)
- ❒ Campus Violence & Harassment Policy (http://www.trentu.ca/riskmanagement/policies.php)
- ❒ Location and Content of the Health and Safety Bulletin Boards – *Occupational Health and Safety Act* and Guide, Employees trained in First Aid/CPR, WSIB 'What to do if you are Injured at Work' poster, etc. (www.trentu.ca/healthandsafety)
- ❒ Complete the Workplace Violence & Harassment and Health and Safety Orientation training package and quiz https://webct.trentu.ca/webct/logon/5286304341001 (please email bblackburn@trentu.ca if you have difficulty accessing the training package)
- ❒ If you will be working in a teaching or research lab please complete page 2 & 3 of this document

I have been provided access to these documents and have reviewed them in their entirety. I have been given an opportunity to ask questions and/or identify any concerns I may have with respect to the content of these documents and/or my own personal health and safety. I understand my rights and responsibilities as set out by the Occupational Health and Safety Act.

Department

Employee's Name (please print) | Supervisor's signature | Date

Supervisor's Name (please print) Employee's signature Date

Supervisors are required to ensure this form is completed, signed and submitted to the Environmental Health and Safety Officer, Risk Management Department, Room 108 Blackburn Hall, **within one month of the employee's date of hire**. *Contact the Environmental Health and Safety Officer to arrange any specialized health and safety training that may be required.*

Lab Safety Training Record

After consultation with your supervisor, determine which of the following (if any) training modules you must complete. This record will be maintained by your supervisor, and shall be updated to reflect the dates you have received training. ***If YES is checked, training is required.***

		Training Module	Date training completed (d/m/yr)	Training provided by (print name):	Signature of trainer (or copy of certificate)	Signature of employee
☐ Yes	☐ No	Lab safety manual –***this is required reading*** weblink				
☐ Yes	☐ No	WHMIS training weblink				
☐ Yes	☐ No	Biosafety training weblink				
☐ Yes	☐ No	Radiation safety training weblink				
☐ Yes	☐ No	Laser safety training weblink				
☐ Yes	☐ No	Transportation of Dangerous Goods (TDG) training weblink				
☐ Yes	☐ No	Compressed gas cylinder training weblink				
☐ Yes	☐ No	Fume hood safety training weblink				
☐ Yes	☐ No	How to safely dispense liquid Nitrogen weblink				
☐ Yes	☐ No	Chemical use, storage & waste procedures weblink				
☐ Yes	☐ No	Disposal of lab waste (chemical, biological, electronics, broken glass & lab sharps, recycling) weblink				
☐ Yes	☐ No	Use of personal protective equipment weblink				
☐ Yes	☐ No	Location and use of safety equipment in the lab (e.g. safety shower, eye wash, fire extinguisher, emergency exit procedures, what to do in event of a power outage)				

- After discussion with your Supervisor, identify potential hazards that you may encounter within the lab.
- Additional safety training should be completed at the discretion of your supervisor.
- Examples might include; autoclave, muffle furnace, vacuum equipment, UV lights, biosafety cabinet, power tools, lab instrumentation (e.g. AA , ICP, autosamplers, centrifuge, thermal cyclers), etc.
- Complete all columns. Attach an additional page if necessary.

Equipment listing where additional safety training is required	Date safety training completed (d/m/yr)	Training provided by (print name)	Signature of trainer	Signature of employee

_____ _____

Name of Employee (please print) Name of Supervisor (please print)

Appendix 2 Supervisor's incident Report

Trent University
Supervisor's Incident Investigation Report Form

(The Regulations for Industrial Establishments under the Occupational Health and Safety Act of Ontario, Section5, Notice of Accidents, requires that additional information must be reported in addition to that provided on the WSIB form. Supervisors are required to conduct a thorough investigation of incidents resulting in injuries or illness. This form is to be completed by the supervisor in addition to the WSIB Form 7 (should one be required). This form must be sent to the Environmental Health and Safety Officer within 2 days of the incident.)

Name:	**Date of Incident:**
Job Title:	**Location of Incident:**
Department:	**Supervisor:**
Phone:	**Phone:**
WSIB Form 7 Completed: ❒ Y ❒ N	

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

Check one or more factors that may have contributed to the incident/injury:		
Task Related:	❒Hazardous procedure used	❒Inadequate Personal Protective Equipment
	❒Improper position or posture	❒Incorrect, defective or unavailable tools
Material/Equip:	❒Inadequate guarding	❒Inadequate labeling
	❒Unsafe design or construction	❒Inadequate lockout/tagout
Environment:	❒Poor weather conditions	❒Inadequate lighting/ventilation
	❒Poor housekeeping	❒Poor workstation layout
Personal:	❒Inexperience of person	❒Lack of training
	❒Unusual stress	❒Operating without authority
Organization:	❒Inadequate maintenance	❒Lack of safety procedures
	❒Lack of safety inspection	❒Inadequate supervision
Other: (explain)		

Science Health and Safety Laboratory Inspection Checklist

Date of Inspection:	Building Name:	Room Number:
Inspected by:	Name of Laboratory Manager: (Normally the Department Chair for Teachi Principal Investigator or designated Laboratory Manager in Research Labo	

Item #	Hazard	Yes	No	N/A	Recommended Action	Action by:	Action C
1	Gas cylinders have been secured.						
2	Inter-reactive chemicals (eg. acids, bases, corrosives, oxidizers, flammables, sulfides, cyanides) are stored separately.						
3	Poisons are kept in a locked cabinet.						
4	Flammable solvents are stored in a flammable solvent cabinet.						
5	Flammable solvent cabinets are located at least 1.5 m (5 feet) from the exits.						
6	Explosionproof refrigerators are used for volatile and flammable liquids.						
7	Explosionproof and non-explosionproof refrigerators are clearly identified.						
8	The lab is free of food and food utensils.						
9	Shelves are not crowded.						
10	Shelves are secure and strong enough.						
11	Materials are not piled too high or insecurely.						
12	Large bottles and those containing hazardous or reactive materials are stored below eye level.						
13	Chemical safety containers are						

	available.						
14	The MSDS library is complete and up-to-date.						
15	All containers are labelled and legible.						
16	A chemical spill kit is available and has been inspected within the past 3 months.						
17	An eye wash station is available and accessible.						
18	The eye wash station has been inspected within last 3 months.						
19	A deluge shower is available and accessible.						
20	The deluge shower has been inspected within the last 6 months.						
21	Fume hoods have been inspected within the last 6 months.						
22	Safety shields (for work with flammable or explosive chemicals and glassware subject to heat shock or vacuum) are available.						
23	Emergency telephone numbers are posted in a conspicuous location.						
24	A first aid kit is available and has been inspected in the past 3 months.						
25	Suitable personal protective equipment is available.						
26	Electrical equipment is in good repair.						
27	Explosionproof electrical equipment (used in areas exposed to flammable vapours) is available.						
28	All electrical outlets are outside						

	of the fume hoods.						
29	Extension cords are not overloaded and used only when someone is present.						
30	Fume hoods are uncluttered.						
31	Benchtop work areas are uncluttered.						
32	Aisles are unobstructed.						
33	Floors are in good repair.						
34	A suitable fire extinguisher is available and has been inspected within the past month.						
35	Exits are unobstructed.						
36	Ultraviolet and other light sources are appropriately shielded.						
37	A rigid container is used for the disposal of needles and other sharps.						
38	Dewar flasks are taped.						
39	A copy of the WSIB's In Case of Injury at Work has been posted in a conspicuous location.						
40	Mechanical equipment is properly guarded.						
41	Other (specify):						
42	Other (specify):						
43	Other (specify):						
44	Other (specify):						
45	Other (specify):						