# Research Chemical Safety Procedure

The following Research Chemical Safety Procedure shall be adhered to by all research staff and shall be a guide for researchers to know the safe handling of chemicals within the Lambton College Research and Innovation department.

When purchasing a chemical the researcher is responsible for the safety of the chemical including receiving, transportation, storage, updating chemical inventory database and disposal. When using any chemical the researcher utilizing must ensure they are following all applicable regulations, SDS requirements, standard operating procedures, Lambton College procedures and policies.

**Designated Substances Procedure**

There shall be no purchase, use or any form of handling of designated substances unless approved by the manager responsible following Lambton College Designated Substance Procedure. Additionally, please review the *O. Reg. 490/09: regulations on designated substances under the Occupational Health and Safety Act, R.S.O. 1990, c. O.1.*

**Restricted Chemicals Procedure**

Regulations governing the manufacture, use, purchase, transportation, disposal, etc. of restricted chemicals shall first be reviewed by researchers to understand the regulations that restrict the chemical before putting the purchase through. *e.g. The Canadian Environmental Protection Act, 1999 (CEPA)* that contains regulations restricting some specific chemicals.

**Proprietary Chemicals Procedure**

Proprietary chemicals shall be permitted to be purchased, brought on site, or used, on condition that a thorough safety review is conducted to ensure there are no safety concerns, and approval has been granted by the supervising manager. Where a hazard is identified or more information is required with a proprietary chemical researchers will work with supervising manager and Operations Manager to gain required information from vendor. **N.B. Responsible researcher shall ensure that when storing proprietary chemicals on site, regulatory legislation requirements such as Building Codes, Fire Codes, Occupational Health and Safety (OH&S) Act & Regulations, Workplace Hazardous Materials Information System (WHMIS), and Transportation of Dangerous Goods (TDG) are followed.**

**Purchase Procedures**

* There shall be no purchase of designated substances or restricted chemicals without assessment and approval by responsible manager and the College’s Health and Safety according to Lambton College Designated Substance procedure.
* Purchase of chemicals shall be done solely by researcher responsible with required approvals. **N.B.** **Student researchers are not permitted to purchase chemicals.**
* The SDS must be reviewed prior to purchasing any chemical to understand hazards, regulatory requirements, PPE, transportation, storage and disposal requirements,
* Researchers must request an official copy of the SDS prior to product coming on campus. Hazardous chemical SDS are to be kept in an SDS binder found in the storage lab location of the chemical as well as chemical inventory database (E-binder). For non-hazardous chemicals a soft copy of the SDS must be recorded in chemical inventory database (E-binder).
* An appropriate chemical safety storage space must be available and sought before purchasing any chemical.
* A purchase justification form shall be completed prior to purchase for Manager approval.

**Transportation Procedures (Shipping and Receiving Procedures)**

* Any person involved in shipping and receiving chemicals must be TDG certified.
* Shipping and receiving of chemicals shall be done by TDG certified staff. **N.B. Students and other staff may assist under trained employees direction.**
* Any person transporting chemicals using the elevator must not travel with chemicals floor to floor in elevator but shall make use of the buddy system having one staff by elevator door on each floor.
* Transportation of chemicals must be done using appropriate secondary containments and carts where feasible and if required.
* Transportation of working solutions or reagents from and within laboratory spaces may be done by students provided they’ve received proper training.
* Shipping chemicals from on-site campus to off-campus shall be done by certified TDG persons adhering to the TDG regulatory guidelines.

**Storage Procedures**

Storage of chemicals shall be done according to regulatory requirements to ensure maximum storage limits are not exceeded.

* Prior to storage, newly received chemicals shall be inspected physically to ensure no tampering such as cracks on lids or bottles, ensuring that the supplier label and content match the information on the SDS. **N.B.** **Another label disclosing the full name of the researcher responsible, the date the chemical was received, the date the chemical was opened, and expiry date shall be placed on the chemical bottle.**
* Newly received chemical products shall be immediately stored in an appropriate chemical safety storage space/cabinet according to chemical class and compatibility. **N.B.** **Good knowledge and understanding is required to properly store the chemical according to class and compatibility. In the event where a researcher needs help to properly store a chemical, the Research Safety Coordinator shall be consulted for advice.**
* The chemical inventory database (E-binder) shall be updated with relevant information about the received chemical and its physical storage location. **N.B.** **This shall be done by the researcher responsible for the chemical.**
* **For hazardous chemicals a physical copy of the SDS shall be kept in an SDS binder in the storage lab location of the chemical by researcher. The soft copy version shall be kept in chemical inventory database (E-binder).**
* Prepared stock and working solutions shall be stored in appropriate chemical safety storage space/cabinet according to chemical class and compatibility. **N.B.** **The bottle/container of the stock/working solution must be checked for compatibility.**
* Stock and working solution bottles must have an appropriate WHMIS workplace label with an exact storage expiry/shelf-life date. **N.B. The WHMIS workplace label should have the full chemical name, concentration, Lot. Number, date prepared, GHS hazard pictograms, PPE required, full name of student responsible, and full name of researcher responsible.**
* When a chemical gets used up or expires, the researcher responsible shall ensure that the expired chemical or empty chemical bottle is physically removed from the storage space, disposal procedures carefully followed, and both the chemical database inventory (E-binder) as well as physical binder are duly updated. **N.B.** The Research Safety Coordinator supports waste disposal process for department and should be informed of the disposal.

**Chemical Use Procedures**

The use of chemicals shall be done in accordance with regulatory requirements, adherence to SDS, good general safety knowledge about the chemical, and adherence to any safety information recommended by the Research Safety Coordinator.

* First and foremost, the SDS shall be reviewed prior to use of any chemical. **N.B. Never use any chemical without reviewing the SDS.**
* Where applicable, proper procedure and SOP shall be followed when using any chemical.
* Safety controls and PPE requirements stated on the SDS together with other safety recommendations made by the Research Safety Coordinator shall be adhered to before, during and after chemical use.
* When a chemical gets used up or expires, the researcher responsible shall follow appropriate disposal procedures are carefully followed, and the chemical database inventory (E-binder)/physical binder are duly updated. **N.B. The Research Safety Coordinator must be informed of the disposal.**
* Do not use any chemical without gaining proper knowledge and understanding of the chemical’s nature.
* Chemicals should be reviewed for expiry and safe useful life of the chemical. Chemicals must be assessed for expiry date and disposed of passed given expiry date.

**Chemical Waste Storage & Disposal Procedures**

Chemical waste shall be stored and disposed of according to regulatory requirements, the College’s Health & Safety procedures, adherence to SDS and recommendations made by the Research Safety Coordinator.

* Chemicals and chemical waste should only be disposed of according to appropriate regulations, policies and SDS guidance. Guidance on disposal of chemicals may be provided by Research Health and Safety Coordinator and Lambton College Health & Safety.
* Compatible waste bottles shall be used to store generated chemical waste.
* Waste bottles shall be labelled with an appropriate waste label. **N.B. Labels as applicable should have the class of waste, the composition of the waste, the full chemical name of the individual chemical components in the waste mixture, concentration, date waste was generated, GHS hazard pictograms, PPE required, full name of student responsible, and full name of researcher responsible.**
* It shall be the responsibility of researcher to ensure that all chemical waste generated from their project is stored appropriately in compatible containers, labelled, kept in an appropriate waste cabinet, and all proper disposal procedures are duly followed.
* Chemical waste shall be stored in waste chemical storage space/cabinets according to class and compatibility. **N.B. Good knowledge and understanding is required to properly store chemical waste according to class and compatibility.**
* The Research Safety Coordinator shall oversee sorting chemical waste that must be stored in waste cabinets located in the chemical waste storage room. **N.B. The Research Safety Coordinator must be informed prior to storing chemical waste in cabinets located in the chemical waste storage room.**
* The chemical waste inventory shall be organized and updated by the Research Safety Coordinator.
* The Research Safety Coordinator shall liaise with College Health & Safety for the pickup of chemical waste. **N.B.** **The pickup shall be done by a waste company authorized by the College’s Health & Safety.**
* Chemical bottles which are empty of the chemical product shall be assessed for waste and disposal. **N.B.** **Depending on the nature of the chemical, the empty bottle may be safely disposed of into the garbage or be treated as contaminated chemical waste bottles that need to be picked up by the waste company. This shall be administered by the Research Safety Coordinator.**

**Some Additional Specific Chemical Safety Procedures**

1. Peroxide formers

* Peroxide formers are a class of compounds that can form shock-sensitive explosive peroxide crystals. **N.B. Not all peroxide formers will appear on the SDS, hence, a good knowledge and understanding of chemicals is required to identify them. Now, peroxide formation falls under “Hazard not otherwise classified” (HNOC) on SDSs as it is not a hazard defined by GHS guidelines.**
* Peroxide formers can be split into 3 classes: Class A, Class B, and Class C. **N.B.** **Class A peroxide formers have severe peroxide hazards, can autoxidize and form explosive levels even in unopened containers and can form explosive levels of peroxide without concentration. Class B & C peroxide formers form peroxides from concentration and autopolymerization. However, Class C peroxide is not particularly hazardous, but decomposition can initiate explosive polymerization.**
* The purchasing procedures described above applies to the purchase of peroxide forming chemicals. **N.B., If possible, purchase peroxide formers with inhibitors.**
* Peroxide formers shall be stored according to SDS recommendations. However, peroxide formers should be stored in a cool location away from heat and light and must be in sealed airtight containers with tight-fitting nonmetal lids. **N.B.** Class A or B peroxide formers must be stored under nitrogen or argon.
* Do not store peroxide forming chemicals in open, partially empty, or transparent containers.
* Do not use secondary glass containers with screw-cap lids or glass stoppers for extended storage. **N.B.** **Use polyethylene containers, with screw caps or stoppers.**
* Do not store large quantities.
* Quantity should be assessed through Risk Assessment.
* Unopened peroxide forming chemicals shall be stored for a maximum of 12 months’ storage time. **N.B.** When opened, Class A peroxide formers shall not be stored exceeding 3 months, Class B & C peroxide formers shall be stored not exceeding 6 months of storage time.
* Responsible researcher must test monthly for peroxide presence using peroxide test strips. **N.B.** **Test date must be recorded on the containment label and the chemical inventory database.**
* All containers of peroxide forming chemicals must be labelled with date received and date opened. Non-original containers must be labelled with the original container’s dates. **N.B.** **All the other labelling procedures described above applies here too.**
* The chemical inventory database shall be updated with relevant information about the received peroxide forming chemical, and SDSs stored appropriately.

1. Compressed Gases

* Transport, handling, use and storage of compressed gases shall be done in accordance with regulatory legislation requirements and/or technical standards that must be followed. Examples of these legislation includes Building Codes, Fire Codes, Occupational Health and Safety (OH&S) Codes, Workplace Hazardous Materials Information System (WHMIS), and Transportation of Dangerous Goods (TDG).
* To purchase, receive, transport, use, or store compressed gases, researchers must be TDG certified, complete an online Canadian Centre for Occupational Health and Safety (CCOHS) Compressed Gases Training and be given hands-on site training. **N.B. All the other chemical purchase procedures described above apply to the purchase of compressed gases.**
* The chemical inventory database (E-binder) shall be updated with relevant information about the compressed gas received and its physical storage location. **N.B.** **This shall be done by the researcher receiving and storing gas.**
* **Compressed gases shall be stored in rooms/spaces that are designed according to the national building codes (NBC) and according to the requirements of the national fire code (NFC).**
* Compressed gases shall be stored in approved designated areas within the lab space in areas where there’s nearby gas monitors. **N.B. Gas monitors such as O2 monitors, and combustion gas monitors shall be inspected and calibrated.**
* Combustion/flammable gas cylinders must be stored 6 m (20 ft) away from oxygen gas cylinders.
* Toxic, pyrophoric, and cryogenic gases must have approval from responsible Manager before having them on-site. **N.B. Additional training may be required to use/handle these gases.**
* Compressed gas cylinders must be strapped and secured in position.
* Transportation of compressed gas must be strictly done using appropriate carts.
* Signages indicating the presence of compressed gas must be mounted nearby.
* Appropriate tags indicating whether a compressed gas is in use or empty must be attached to the gas cylinder.
* Regular inspection and maintenance of components of gas cylinders must be conducted by upon installation and as required for operation . e.g. Inspection and maintenance of gas cylinders, regulators, pressure relief device, cylinder valve and CGA fitting.

**Personal Protective Equipment (PPE) Procedures**

1. General PPE procedures

* When handling chemicals, PPEs such as lab coats, safety glasses/goggles, gloves, safety boots, etc. shall be worn according to the SDS’s recommendation and SOP.
* Proper donning and doffing of PPEs shall be carefully followed as stated in the Lab Signage, SDS, SOP, through training, and/or advised by the Research Safety Coordinator.
* PPEs must be physically inspected to ensure they’re not damaged or worn out before donning. **N.B.** **Some PPEs such as gloves are not reusable.**
* Reusable PPEs must be maintained regularly.
* Disposal of damaged or chemical contaminated PPEs shall be done in accordance with regulatory requirements, the SDS, and as advised by the Research Safety Coordinator.
* Researchers shall be responsible for the purchase of PPEs required for their specific projects.
* The Research Safety Coordinator shall support purchase of general safety PPEs and other safety related equipment required.

1. Respiratory safety protection procedures

Respiratory safety protection within the research department shall be administered and adhered to in accordance with the *Occupational Health and Safety Act R.R.O. 1990, REGULATION 833 CONTROL OF EXPOSURE TO BIOLOGICAL OR CHEMICAL AGENTS*.

* The Research Operation Manager and the Research Safety Coordinator shall be responsible for administering the respiratory safety protection program. i.e. provision of respirators, technical advice, health screening, training, fit testing, and record keeping.
* The Research Operation Manager and the Research Safety Coordinator shall take every reasonable measure necessary to protect and limit exposure of workers to hazardous respiratory agents. e.g. Ensure exposure limits are not exceeded, measuring airborne concentrations of hazardous agents when needed, ensure that instruments such as gas monitoring devices used are calibrated and maintained in accordance with the manufacturer’s instructions.
* Researchers shall be required to complete the Lambton Bases respiratory fit test (RFT) training as required, before using a respirator, renew as required and take for each new respirator used.
* Researchers shall ensure they are wearing respirators under appropriate conditions, completing inspection of respirators, complying with cleaning recommendations for respirators, maintenance and storage according to manufacturer’s instructions. **N.B**. **Student researchers usage should be limited where operationally feasible. If need for operations student researchers are required meet above standards with support from Research & Innovation department.**
* Researchers utilizing respirators shall:
  + Select appropriate respirators based on the type of hazard
  + Ensure respirators meet CSA standards and are approved by Health Canada.
  + Inspect respirators before and after each use for damage or wear.
  + Clean and disinfect reusable respirators according to the manufacturer's instructions.
  + Replace filters and cartridges as needed
  + Perform a seal check each time a respirator is worn.
  + Replace disposable respirators after each use or as directed by the manufacturer.
  + Store respirators in a clean, dry place away from contaminants.

**Emergency Chemical Safety Procedures**

1. Chemical Spill Response Procedures

A chemical spill refers to the discharge of any chemical from its containment into the surrounding environment (air, land and water). e.g. Gas leaks from a gas cylinder, a broken bottle of chemical in the laboratory, accidental pouring of chemical aliquot from containment, etc.

* In the event of a major chemical spill, evacuate the immediate area while alerting others around to also evacuate.
* In the event of a minor spill, researchers may be permitted to clean up the spill on condition they have proper training and have proper material **N.B.** **Defining severity of spill should be done with collaboration by qualified researchers, Research Safety Coordinator, responsible manager and College Health & Safety.**
* chemical spills must be reported immediately to the Research Safety Coordinator, Research Operations Manager and as required College Health & Safety.
* The nature and extent of spill may require reporting to the MOE Spill Action Center. **N.B. Notifications should be completed by College Health & Safety.**

1. Chemical Incidence Response Procedures

Emergency response measures to be taken in the event of a chemical incident must be in accordance with SDS recommendations, training experience, and technical advice from the Research Safety Coordinator. Additionally, please review the College’s Health and Safety procedures on chemical exposure emergencies.

* In the event of a chemical incidence/exposure, affected/injured researchers must act immediately in good faith, following emergency treatments recommended by the SDS and technical advice from the Research Safety Coordinator.
* All chemical incidents must be immediately reported to the Research Safety Coordinator and Research Operation Manager. The incident will be reported to the Colleges Health & Safety department by filling out an employee incident report using the tool on the Lambton College website.
* Near miss incidents such as spills where there is no exposure, or injury shall be reported using the near miss report form on Jira as well as reported to the Research Safety Coordinator and Research Operation Manager.

1. Emergency safety equipment procedures

* All emergency safety equipment within the Research & Innovation lab spaces shall be routinely checked, stocked and maintained by the Research Safety Coordinator. e.g. eyewash, safety shower, fume hoods, first aid kit, fire blankets, fire extinguishers etc.
* Researchers must immediately report any malfunctioning emergency safety equipment to the Research Safety Coordinator.
* Researchers shall receive training on how to operate/use emergency safety equipment in the event of a chemical incident.

**Training Procedures**

Research staff are required to complete and renew training courses as required by their activity. Below list outlines some of the common training required by staff working with chemicals but additional training may be required.

* Workplace Hazardous Materials Information System (WHMIS) Training
* Transportation of Dangerous Goods (TDG) Training
* Respiratory Fit Test Training (RFT)
* The Canadian Centre for Occupational Health and Safety (CCOHS) Compressed Gases Training
* All Onboarding D2L Training Courses by the College’s Health & Safety
* Research & Innovation’s Onboarding Safety Workshop
* Research & Innovation’s Chemical Safety Training

**Audit**

An On-site chemical safety audit shall be conducted every two years to identify areas that need improvement. A Chemical Inventory shall be conducted annually and full audit biennially.