HAMILTON COLLEGE
ENVIRONMENTAL HEALTH & SAFETY PROCEDURES

CHEMICAL HYGIENE PLAN 2014-2015

Purpose

Federal Occupational Safety & Health Administration (OSHA) regulations require employers who operate laboratories, where personnel may be exposed to various health and physical hazards, to develop and implement a written Chemical Hygiene Plan (CHP) to minimize the risks of such exposures. This plan is intended to provide the Hamilton College community with the guidance necessary to comply with OSHA requirements.

Authority

These procedures are based upon requirements of federal law, generally recognized best EHS management practices, and/or criteria established by the National Institute of Occupational Safety and Health (NIOSH).

Objectives

- To protect the health and welfare of Hamilton College employees, and the greater Hamilton College community;
- To provide employees with the necessary information and guidance concerning laboratory activities, by addressing the unique exposure conditions under which laboratory work is performed;
- To protect laboratory workers from adverse health effects that may result from their work in laboratories, regardless of what substances are used; and
- To comply with Title 29, Part 1910.1450 of the Code of Federal Regulations (CFR), otherwise known as the Laboratory Safety Standard (LSS)—click HERE to go directly to the standard.

Applicability

This plan applies to all Hamilton College employees, including faculty, staff and administrators, work-study students and research personnel, where the following laboratory conditions exist:

- Chemical manipulations are carried out on a "laboratory-scale".
- Multiple chemical procedures or chemicals are used.
- The procedures involved are not part of a production process, nor in any way simulate a production process.
- "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Exemptions

While students in an academic laboratory are not technically considered laboratory employees, the rules/requirements/procedures outlined herein shall be an integral part of the academic learning and research environment at Hamilton to provide for the protection of all laboratory personnel.

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SECTION 1
RESPONSIBILITIES

1. Laboratory Supervisors

A laboratory supervisor is anyone facilitating, authorizing and overseeing any type of lab work, including faculty, administrators, and staff members who are considered authorized or qualified persons in other sections of this plan. No one is exempt from the appropriate safety precautions. Lab supervisors must serve as good role models for their technical staff and students by observing all safety rules and recommendations, wearing protective equipment, and being enthusiastic about safety. Lab supervisors are normally presumed to be the subject matter experts for the experiments and research activities they introduce into laboratory settings, and are primarily responsible for the implementation of the CHP. Further, lab supervisors shall:

- Inform and train all lab workers of the hazards and their control measures as required by this CHP;
- Ensure that untrained workers (or students) are not permitted to work alone or unsupervised with hazardous chemicals or certain pieces of equipment;
- Implement and enforce rules and standards concerning health and safety for labs under their jurisdiction;
- Ensure the availability, and enforce the use, of the appropriate personal protective equipment;
- Remain cognizant of chemicals stored and used in labs, and their associated hazards;
- Conduct internal inspections of their laboratories with the departmental Chemical Hygiene Officer to identify and address health and safety concerns; and
- Request the allocation of funds for health and safety improvements as needed or identified.

1. Department Chairpersons

Each science department chairperson shall:

- Support the implementation of the CHP throughout his/her department;
- Assist the departmental Chemical Hygiene Officer in maintaining awareness and compliance with the CHP;
- Work to remedy any laboratory deficiencies associated with formal or informal EHS audits; and
- Allocate appropriate resources/funding for laboratory related health and safety equipment, as needed.

2. Departmental Chemical Hygiene Officers

The Departmental Chemical Hygiene Officers (DCHOs) shall:

- Ensure that the elements of the CHP are implemented into their respective departments;
- Coordinate all technical matters concerning the appropriate storage, handling and disposal of hazardous chemicals, with the assistance of the Director of EP&S;
- Provide and/or coordinate all department-specific laboratory safety training for those individuals utilizing laboratory facilities within their department;
- Coordinate all technical matters concerning personal protective equipment and laboratory safety equipment within their department, with the assistance of the Director of EP&S;
- Conduct internal inspections of the laboratories within their department, with the assistance of laboratory supervisors and faculty members; and
- Maintain a department-specific MSDS library for all chemicals utilized in their laboratories.

3. Laboratory Workers

Laboratory workers (otherwise referred to a restricted personnel in other sections of this plan) and students shall:

- Follow all health and safety standards and rules;
- Report all hazardous conditions to laboratory supervisors;
- Wear or use any prescribed personal protective equipment;
- Report any job-related injuries or illnesses to the laboratory supervisor;
- Refrain from the operation of any equipment or instrumentation without proper instruction and/or authorization;

- Remain aware of the hazards of the chemicals in the lab and how to handle hazardous chemicals safely; and
- Request information and training when unsure how to handle a hazardous chemical, or safely utilize laboratory instrumentation.

4. <u>Director of Environmental Protection & Safety</u>

The Director of EP&S shall:

- Routinely review the CHP and make modifications as required;
- Provide technical assistance to Departmental Chemical Hygiene Officers, laboratory supervisors and workers concerning appropriate storage, handling and disposal of hazardous chemicals;
- Provide general laboratory safety training for Chemical Hygiene Officers, laboratory supervisors, faculty members and lab workers as needed;
- Conduct exposure assessments and laboratory audits as needed;
- Provide technical assistance concerning personal protective equipment and laboratory safety equipment; and
- Maintain a comprehensive MSDS library across all laboratory units at the college.

5. <u>Science Stockroom & Facility Coordinator</u>

The Science Stockroom & Facility Coordinator shall:

- Assist Science faculty and DCHO's with the timely procurement, storage and dispensing of necessary chemical and/or dry goods materials to support ongoing teaching/research activities;
- Secure all chemical supplies within the confines of the stockroom until they have been dispensed or delivered to an authorized user;
- Work with the Director of EPS&S and the DCHO's to routinely survey facility lab activities;
- Work with the Physical Plant to address facility deficiencies as needed.

SECTION 2
TAYLOR SCIENCE CENTER & LABORATORY ACCESS/SECURITY PROVISIONS

The Taylor Science Center is home to the Biology, Chemistry, Computer Science, Geoarchaeology, Geoscience, Physics and Psychology departments, and its lecture spaces are used for a number of other academic and social purposes by the Hamilton College community. Accordingly, the somewhat interrelated facility/laboratory access and security provisions that follow are necessary to ensure the safe and efficient use of the Science Center in support of Hamilton's mission.

General Space Access Considerations
The Science Center is generally accessible to the entire College community between the hours of 6:00 am and 11:00 pm, by way of its main doors being unlocked. Between the hours of 11:00 pm and 6:00 am, the Science Center's main doors will be access controlled via the "Card Access" system, whereby employees who regularly reside in Science may use their Hill Card to gain access to the facility. Student access to the Science Center during the times when access is controlled (11:00 pm to 6:00 am) will be discussed below. The ITS and Auxiliary Services departments manage the Hill Card program, and should be contacted to facilitate card access.

With the exception of the Science Stockroom and the various maintenance spaces in Science, access to the facility's departmental spaces (including offices, teaching/research labs, social spaces and storage rooms) is generally managed as follows:

- Academic departments control and manage (with the assistance of the Physical Plant) the dispersal of access codes to those lab/other doors with keypad locks.
- The Science Stockroom & Facility Coordinator (with the assistance of the Physical Plant) controls and manages the dispersal of keys to those lab/other doors with keyed locks, in consultation with the academic departments.

Science Center Security Considerations

- The Science Stockroom, as well as the Hazardous Waste and Biohazardous/Radiological Waste storage rooms (G090 and G091 respectively) are secured in accordance with Section 8 of the Waste Management & Minimization Plan, summarized as follows:
  - Keyed access to G090 and G083 (the "Special Hazards" room within the Stockroom) is strictly limited to the Director of EP&S and the Science Stockroom & Facility Coordinator;
  - Keyed access to G091 is strictly limited to the Director of EP&S, the Science Stockroom & Facility Coordinator, the Radiation Safety Officer, and Biology Department Lab Coordinator;
  - Keyed and keypad code access to all other Science Stockroom chemical and dry goods storage spaces (G077, G078, G080, G081 and G082) is strictly limited to academic department faculty, in consultation with the Science Stockroom & Facility Coordinator. Students are not to be given keys to access the Science Stockroom.
- For all other teaching and research lab spaces (where occupational or environmental hazards are stored or in use), the essential obligation is that such spaces shall be secured against unauthorized entry, so as to prevent theft, releases/spills, sabotage or security breaches. To achieve this requirement, the following shall apply:
  - Teaching lab (and any/all adjacent prep spaces) security shall be provided through locked doors, and are only to be unlocked and accessible during the teaching periods when such spaces are actively in use.
  - Research lab security shall also be provided through locked doors, as well as restricted access to those trained and authorized to use the lab. Further, while it is inadvisable to ever unlock a research lab door, certain exceptions are permissible during the summer research timeframe, when the majority of the work in any given lab involves a number of trained and authorized research personnel.

Laboratory Use Procedures

- Laboratory spaces with recognized occupational or environmental hazards (i.e. chemicals, biologicals, dangerous equipment, animals, etc.) are inherently dangerous spaces by their very nature, and as such are considered controlled work environments that must abide by the following procedure.
- Pertinent Definitions:
    - Authorized personnel—faculty/principal investigators or administrators with supervisory or management control over activities in a certain lab (i.e. faculty members or administrators in their assigned research/teaching/prep labs).
    - Qualified personnel—faculty/administrators/staff given rights to work in certain lab areas that they do not primarily manage (i.e. a faculty member using another faculty member's research/teaching lab)—this could include limited supervisory responsibilities.
    - Restricted personnel—students who execute work under the supervision of authorized or qualified personnel, and are either paid in some capacity (work-study, teaching assistants, research students), or are performing senior-thesis lab activities. In either case, these students may be given additional privileges to access lab areas based upon criteria established by authorized/qualified personnel who can attest to the student's capabilities to work safely and responsibly in a lab setting.
    - Students—any student conducting lab work in a capacity where they are not paid, or they are not conducting senior thesis lab activities.
- Academic departments may use their EHS Handbooks to define which labs, if any, are not a wholly hazardous work setting by their set up and use (i.e. teaching labs with limited, isolated, or no inherent hazards).
- College labs are only to be used for sanctioned or recognized experiments in the furtherance of teaching/research activities, and are not to be used for any activity outside of the purview of the College (privately funded or production-type work).
- All authorized, qualified and restricted personnel must be trained in accordance with this Chemical Hygiene Plan before they may work in a lab, or supervise other personnel in the lab where applicable.
- While working alone in a lab is always discouraged, authorized and qualified personnel may work in a lab alone and unsupervised as long as they are properly trained. Qualified personnel are restricted from engaging in lab activities that are not approved by the lab's principal authorized personnel, who is/are ultimately responsible for all activities in his/her lab.
- Restricted personnel may work in College labs with recognized occupational or environmental hazards as long as they do so under the "supervisory direction of authorized personnel"—meaning authorized (or in some cases qualified) personnel are either physically in the lab to directly oversee the work, or are within a reasonable distance of the lab work (like in a nearby lab or an office on the same floor). In the event authorized/qualified personnel are not able to perform such direct supervisory functions, restricted personnel either must vacate the lab, or the supervisory functions may be assigned to alternate authorized/qualified personnel. To facilitate the latter, the following must occur:
    - The alternate authorized/qualified personnel must be knowledgeable with the activity/task they are being asked to supervise;
    - They must be on-site, willing to assist, and acknowledge the additional supervisory responsibilities; and
    - The supervisory change must be communicated to the restricted personnel.
- Restricted personnel may work unsupervised in a lab setting only if they are engaged in observational or other non-hazardous activities that do not involve active work with recognized occupational or environmental hazards. It is expressly up to the authorized lab supervisor to determine the approved non-hazardous activities. Additionally, restricted personnel working in such a capacity must work under the buddy-system, or by another means that will achieve the same goal (using remote camera technologies, frequent contact with Campus Safety, building monitor, etc.).
- **Special Notes:**
    - Authorized personnel who wish to grant additional lab access privileges to restricted personnel (i.e. enabling student Hill Cards to grant access to Science between the hours of 11:00 pm and 6:00 am) must do two things:

1. They must contact Auxiliary Services to enable the Hill Card for the individual restricted persons granted additional access privileges.
2. They must post the form found in Appendix M on the inside of the lab door the restricted personnel are expected to regularly occupy.

   - As a general rule, restricted personnel should not be accessing Science labs purely for the purposes of studying. Choose another less hazardous (non-lab, non-Science) space for such purposes.

- Students (in addition to any other visitors or unapproved personnel not directly affiliated with the College) are forbidden from working alone and/or unsupervised in a hazardous lab setting.

SECTION 3
STANDARD OPERATING PROCEDURES

Standard Operating Procedures (SOP's) typically represent a minimum set of safety guidelines for work in Hamilton College laboratories (or related workspaces in the Science Center). This section is broken up into three groups:

- Universal Lab Safety SOP's;
- Detailed Lab Safety SOP's; and
- Departmental EHS Handbooks and Other SOP Types

1. Universal Laboratory Safety SOP's

General Considerations

- Respect and understand the inherent safety and health hazards (including chemical, biological and radiological) associated with the lab environment at all times. Even if you are not actively conducting lab work, others may be.
- Adhere to the prescribed laboratory equipment safety instructions at all times so as to avoid physical hazards, and use equipment only for its intended purpose.
- Become thoroughly acquainted with the location and use of lab safety equipment such as safety showers, fire blankets, eyewash fountains, fire extinguishers, first aid kits and emergency exits.
- Know the safety rules and procedures that apply to the work being done, and determine the potential hazards and precautions before undertaking any operation.
- Be alert to any unsafe conditions and work practices, and if present, call attention to them immediately, such that appropriate action can be taken to remedy the condition or practice.
- Horseplay, practical jokes, or other behavior which might confuse, startle, or distract other workers in the laboratory is forbidden.
- Since the use of portable music devices with headphones tend to isolate one from their environment (including recognition of emergency alarm conditions or verbal instructions), such devices are not permissible during laboratory activities.
- Be sure to heed information provided regarding hazard labeling and other signage for unusual hazards (such as radiation, lasers, use of carcinogens/highly toxic chemicals), and conduct proper labeling practices to ensure you inform others of the hazards you are working with.

Safe Work Practices

- Personal hygiene—hands should be washed frequently during the use of lab facilities, before leaving the lab, after contact with any hazardous material, and before eating, drinking or smoking.
- Glove use/etiquette—protective gloves worn inside the lab should not be worn outside of it so as to minimize cross-contamination of objects expected to be "clean" (i.e. door handles, telephones, etc.). For similar reasons, personnel should routinely remove contaminated gloves in the lab if they must contact items that will be removed from it (i.e. lab notebooks, laptops, etc.).
- Chemical transportation—when moving/transporting chemical (or like biological) materials from the main Science Stockroom to individual labs, or from one lab to another using main hallways or elevators, personnel should make use of carts or totes to minimize the chance of a spill.
- Foodstuffs—do not prepare, store or consume foodstuffs or beverages inside laboratories or otherwise undesignated areas, and do not store consumable foodstuffs or beverages inside lab refrigerators.
- Pipetting—mouth pipetting or otherwise using the mouth to siphon is strictly prohibited.
- Cosmetics—cosmetics should not be applied within laboratories.

Chemical Storage

- Chemical storage in teaching/research/prep labs should be minimized to the greatest extent possible, and should be sufficient to supply the labs for on-going or up-coming experimentation or demonstrations only (see Appendix A below).
- The storage of flammable or corrosive chemicals in teaching/research/prep labs should never surpass the capacities provided by staged lab cabinetry and hoods, and no more than 5 gallons of flammable liquids "in use" may be located outside of a hood or cabinet at any time.
- Under no circumstances should flammable chemicals be stored in stored in standard refrigerators or freezers. Only properly rated "flammable storage refrigerators" may be used for such purposes.
- Chemical storage in bulk supplies, or the storage of chemical species which are used on a very infrequent/intermittent basis, should make use of the main Science Stockroom.
- The Science Stockroom serves as a place to store consumable chemicals and goods, and segregates chemicals by both hazard class and accessibility:
    - Flammable/combustible liquids (except ethanol), water reactives, flammable solids—full faculty access;
    - Common organics/inorganics, corrosives, oxidizers—full faculty access;
    - Gases (flammable, non-flammable, inert, empty cylinders)—full faculty access;
    - Special hazards (acutely toxic/hazardous chemicals, refrigerated/frozen chemicals, syringes)—restricted area, limited access only.

Housekeeping

- Laboratory work areas should be maintained in a clean and neat manner at all times.
- Work areas should be kept clean and free from obstructions, and aisle ways should be kept free of chairs, boxes, equipment, and waste receptacles.
- Lab benches and floors should be cleaned regularly and kept free of clutter.
- Access to emergency equipment, exits, control panels, etc. must be kept clear at all times.
- Spilled chemicals shall be cleaned up immediately and disposed of properly.

Fume Hood Usage

- Just like any lab workstation, hoods must be maintained in a clean and neat manner.
- The use of ventilated hood benchtop space to store chemicals (>10 containers) is inadvisable as hoods used for these purpose are less effective engineering controls for personnel safety.
- Hood sashes are to be closed except when personnel are actively using the hood.
- Electrical cords are not to be used under the sash—they should make use of the side penetrations to the hood.
- See Section 5 of this CHP for additional information.

Unattended Operations

Reactions that are left to run unattended overnight or at other times are inherently dangerous, and can be problematic in the event of electric/gas/water service interruptions. Unattended operations should be:

- Checked at some predetermined regular interval.
- Established such that vital equipment (power stirrers, hot plates, heating mantles, and water condensers) will not run unattended without fail-safe provisions.
- Set up with the appropriate signs posted, indicating that a laboratory operation is in progress.
- If continuous running water is needed, precautions should be taken to ensure that hoses are adequately clamped, and that only those hoods that have been modified with notched cup sinks and caulked edges (to minimize the effects of leaking water upon other labs or the facility itself) are used.

Other Safety/Emergency Equipment

- Teaching labs typically will have the following:

  - An ABC dry chemical fire extinguisher, fire blanket, stocked first aid kit, emergency shower and eyewash/drench hose, spill kit, emergency call box, emergency gas valve shut offs, and emergency power shut offs..
- Research and prep labs using wet chemistry will have the following:
  - A stocked first aid kit, emergency shower and eyewash/drench hose, and spill kit.
- Other labs with physical/equipment hazards only will have the type and variety of safety equipment/devices necessary to safeguard the workstation, i.e. adequate ventilation for mechanical grinding equipment, required curtains/signage to control laser beams, etc.

Personal Protective Equipment (PPE)

As a general rule, individual lab supervisors (i.e. authorized employees as defined above) are responsible for making the appropriate hazard determination on a lab-by-lab or experiment-by-experiment basis, so as to determine the type, variety and assortment of PPE that lab users must wear while engaged in lab work. Appendix L below will help to facilitate this process. Other general considerations are as follows:

- General attire—high heeled, open-top or flip-flop shoes, or shorts, mini-skirts and tank tops, should be generally discouraged in all lab environments, and are forbidden in labs actively engaging in wet chemistry. Long/loose hair should be constrained, and any dangling or loose jewelry should be removed.
- Eye protection—suitable eye protection using ANSI approved safety glasses or goggles is required at all times for personnel working with hazardous chemicals or equipment, or as otherwise required by laboratory supervisors and/or their departments. While safety glasses may be acceptable for use during minor chemical manipulations or during observational activities, safety goggles are the eye protection devices of choice when personnel use corrosive or other more toxic/poisonous materials, or are exposed to actual chemical splash hazards. Face shields should be worn in addition to approved safety glasses or goggles when conducting experiments which may result in violent chemical reactions or splashes, which might also affect the face/neck.
- Hand protection—the proper selection of suitable hand protection must take into account the properties of the chemical being used, the nature and severity of the potential exposure, the duration of protection required, the physical performance required, and the length of the glove required. See the glove selection charts in Appendix K for additional information.
- Lab coats/splash aprons—in situations where incidental drips/drops/splashes of various hazardous chemicals represent a potential hazard to exposed skin along the arms as well as an individual's personal clothing, the additional protections afforded by lab coats are required. Chemical splash aprons should be used in addition to lab coats whenever regular/routine splash hazards exist.

Compressed Gases/Cylinders

Cylinders of compressed gas present a wide variety of chemical and physical hazards, dependent upon species, application and ventilation requirements. Consider the following:

- Freestanding compressed gas cylinders must be strapped or chained securely to a wall or bench top, and capped when in storage or not in active use.
- Flammable compressed gases must be stored away from heat, oxygen, and ignition sources when not in use.
- Appropriate regulators will be used, and cylinders must never be bled completely empty.
- Identification (Hazcom) labels must never be removed from compressed gas cylinders, even when empty.
- Compressed gas cylinders will be transported using carts specifically designed for this purpose, and can be borrowed from the Science Stockroom.
- Large compressed gas cylinders containing chemicals with an NFPA health hazard of 3 or 4 (or a 2 if there are no physiological warning properties) must only be used and stored in designated gas cabinets. As the Science Center currently does not have gas cabinets of this variety, compressed gas cylinder of this size should neither be procured nor stored.
- Lecture-size compressed gases are strongly discouraged because they are very cost-prohibitive when being disposed of. When they are absolutely required, the following applies:
  - Lecture bottles in use or storage must be secured in a fashion that prevents dropping, by using either a lecture bottle stand or a ring stand.

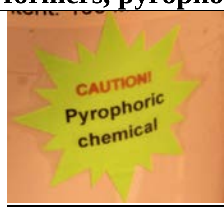
- Individual labs are limited to 5 lecture bottles at any time (whether in use or storage).
- Lecture bottles meeting the following criteria (1—NFPA health hazard rating of 3 or 4; 2— NFPA health hazard rating of 2 if there are no physiological warning properties; or 3—pyrophoric) must be used or stored in a ventilated fume hood at all times.
- When lecture bottles are in storage, they should be segregated from other chemical hazards, including other lecture bottles, as follows:
  - Toxic gases;
  - Flammable gases; and
  - Oxidizing and inert gases.

2. Detailed Laboratory Safety SOP's

The SOP's that follow address lab safety issues in greater detail, including:

- Hazard Communication SOP
- Dangerous Physical Hazard Chemicals (Peroxide Formers, Pyrophorics, Water Reactives) SOP
- Nanoparticles SOP
- Use of Radioactive Materials & Radiation Generating Equipment SOP
- Waste Stream Management SOP
- Sharps Safety SOP
- Animal Dissection SOP
- Live Animal Handling, Surgery and Euthanasia SOP
- Soldering Iron SOP
- Cryogen Safety SOP

- All Science departments that use hazardous chemicals and the Science Stockroom must maintain chemical product inventories that are specific to the lab/room where the chemicals are in use or stored.
- Chemical safety information must be made available to every employee and student using hazardous chemicals via hard copies and/or access to MSDS sheets through the MSDS Online database.
- All labs have the obligation to comply with the OSHA HAZCOM standard, the College's Written Hazard Communication Plan and this CHP as it relates to the management of hazardous chemicals, with the following summary criteria highlighted:
  - Labels on incoming hazardous chemical containers shall not be defaced, and bulk chemicals dispensed into containers 100 mL or greater for distribution will be appropriately marked with a Hazcom label.
  - Containers smaller than 100 mL that cannot effectively be labeled with a standard HAZCOM label, will be marked in some alternative manner so as to clearly identify the container's contents.
  - Small vessels (like vials, beakers, test tubes, beakers, petrie dishes, etc.) that hold chemical samples for ongoing experimentation are not chemical containers "in storage", and as such are exempt from HAZCOM labeling requirements.
- Additional Hazard Communication tactics that are beyond the scope of the HAZCOM standard, but are important lab safety elements at the Taylor Science Center, include the following:

<table>
<tr><td colspan="4">The Science Stockroom will employ additional labeling practices for new/incoming chemical containers of certain hazard classes. While the substance of this program will be described by other sections of this CHP, the table below depicts some images of this program:</td></tr>
<tr><th colspan="3">Green labels for peroxide-formers, pyrophorics and water reactives</th><th>Yellow labels for "stench" chemicals</th></tr>
<tr><td>
</td><td>
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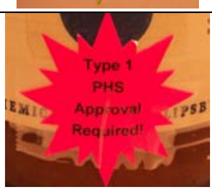
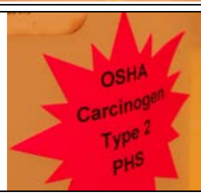
<tr><td>
</td><td>
</td><td colspan="2">Pink labels for Type 1 and 2 PHS Chemicals</td></tr>
</table>

<table>
<tr><td colspan="2">Additional "facility HAZCOM" strategies will be employed to communicate inherent lab risks to all building employees, students, visitors and emergency personnel, as follows:</td></tr>
<tr><th>Facility signage external to all labs with hazardous chemicals, biologicals and/or dangerous equipment</th><th>Laser safety signage on lab doors with Class IIIb or IV lasers in use (in addition to facility signage)</th></tr>
<tr><td>
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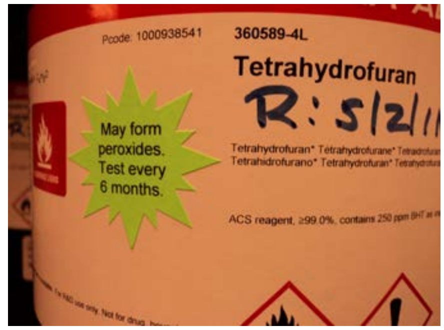
</table>

Certain chemicals are known to be additionally dangerous due to some physical hazard property (i.e. detonation, deflagration, or explosion upon contact with air, water, moisture or friction) associated with both its routine or non-routine storage and use. Especially as it relates to the use of pyrophorics and water reactive chemicals in lab settings, lab supervisors are understood as being the subject matter experts with the proper handling and use of such materials, and must convey upon other lab personnel working with these materials under their supervision the necessary information and training to achieve a safe lab environment.

<u>Peroxide Formers</u>

Peroxide formers are those chemicals that can produce dangerous peroxides upon exposure to air or light as they age. These may detonate with extreme violence when concentrated by evaporation or distillation, when combined with other compounds, or when disturbed by unusual heat, shock or friction.

- Examples of peroxide-forming chemicals include those identified in the table below.
- Containers of peroxide-forming chemicals shall be dated upon receipt by the Science Stockroom, labeled with a high visibility green sticker, and disposed of in accordance with the table below on or before its expiration date.
- Alternatively, peroxide-forming chemicals may be periodically tested with peroxide testing strips, to determine their continued usability status—preferably before they expire.

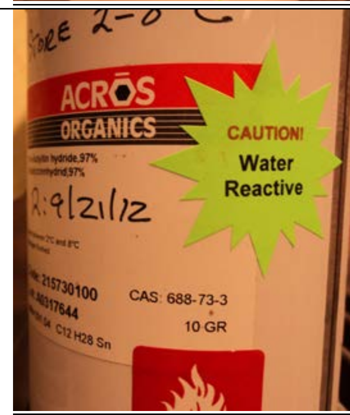


Peroxide-Formers	
List A: Severe Peroxide Hazard on Storage with Exposure to Air—Discard within 3 months	
• diisopropyl ether (isopropyl ether)	• potassium amide
• divinylacetylene (DVA)	• sodium amide
• potassium metal	• vinylidene chloride (1,1-dichloroethylene)
List B: Peroxide Hazard on Concentration; Do Not Distill or Evaporate Without First Testing for the Presence of Peroxides—Discard or test for peroxides within 6 months	
• acetaldehyde diethyl acetal	• ethylene glycol dimethyl ether (glyme)
• cumene (isopropylbenzene)	• ethylene glycol ether acetate
• cyclohexene	• ethylene glycol monoethers (cellusolves)
• cyclopentene	• furan
• decalin (decahydronapthylene)	• methylacetylene
• diacetylene (butadiene)	• methylcyclopentane
• dicyclopentadiene	• methyl isobutyl ketone
• diethyl ether (ether)	• tetrahydrofuran (THF)
• diethylene glycol dimethyl ether (diglyme)	• tetralin (tetrahyronaphthalene)
• dioxane	• vinyl ethers
List C: Hazard of Rapid Polymerization Initiated by Internally Formed Peroxides	
C-1—Normal liquids—Discard or test for peroxides after 6 months	
• chloroprene (2-chloro-1,3-butadiene)	• vinyl acetate
• styrene	• vinylpyridine
C-2—Normal gases—Discard after 12 months	
• butadiene	• vinylacetylene (MVA)
• tetrafluoroethylene (TFE)	• vinyl chloride

Pyrophorics & Water Reactives

Pyrophoric and water reactive chemicals are those that can spontaneously ignite in air or water respectively. Pyrophoric chemicals are often water reactive as well, and so can ignite upon contact with water or humid air/moisture. Extreme care is required during the use, handling and disposal of pyrophorics and water reactives; consider the following:

- Examples of pyrophoric chemicals (including those that are water reactive as well) may be found in the table below.
- Pyrophorics should not be purchased in quantities larger than those intended for small-scale laboratory use, which typically means glass bottles 50-100 mL in volume, with a sealed polypropylene cap and septum to eliminate exposure to air.
- Containers of pyrophorics and water reactives shall be dated upon receipt by the Science Stockroom, labeled with a high visibility green sticker, and disposed of readily.
- The use and handling of pyrophorics should never be performed alone. Even lab supervisors (i.e. authorized or qualified employees) should use pyrophoric chemicals in the presence of a "buddy".
- At no time shall a restricted employee or student use a pyrophoric chemical physically alone.
- Personal protective equipment (PPE) and other control measures are essential when using pyrophoric chemicals. To ensure all control measures are adequately applied, Appendix H is strongly recommended.



- For additional information, please consult the following resources:
  - Sigma-Aldrich Technical Bulletin AL-134—The Handling of Air-Sensitive Reagents
  - UCLA Pyrophorics Safety Video
  - Dartmouth Pyrophorics Safety Video

Pyrophorics & Water Reactives (common examples)	
Alkali metals	Sodium, potassium, rubidium
Finely divided metals	Aluminum, iron, magnesium
Metal/non-metal hydrides	Germane, diborane, sodium hydride, lithium aluminum hydride
Alkylated metal/non-metal hydrides	Diethylaluminum hydride, butyllithium, triethylboron
Metal carbonyls	Dicobalt octacarbonyl, nickel carbonyl
Phosphorous	Yellow or white phosphorous
Gases	Arsine, diborane, phosphine, silane

Nanoparticles SOP

Nanoparticles are particles that have at least one dimension between 1-100 nanometers, are typically classified based on their morphology (e.g., fullerenes, nanotubes, nanowires, and quantum dots), and can be spheres, rods, tubes, or other geometric shapes. In research, nanoparticles may be bound to surfaces or substrates, put into solution or suspension, attached to a polymer, or handled as a dry powder. At present, very limited information is available on the toxicity of many nanoparticles. It is believed that some engineered nanoparticles may present health effects following exposure because of the unique properties associated with the particles which make them able to penetrate deep into lungs and to translocate to other organs. Because of this limited data, it is prudent to assume that nanoparticles may be toxic and to avoid exposure when working with them in the laboratory. The four common routes of exposure to consider when working with these materials are skin absorption, ingestion, inhalation, and injection. Safe work methods to follow when working with nanoparticles include the following:

- Pre-planning: All personnel participating in lab work with nanoscale materials should be briefed on the potential hazards and handling techniques for nanoparticles, and review the applicable MSDS information.
- Wear appropriate PPE/lab attire: Double gloving with nitrile gloves is recommended; safety glasses or safety goggles and a lab coat shall be worn; closed-toed shoes, long pants and tops that provide good coverage shall be worn.
- Use good chemical hygiene practices: Eating and drinking are not allowed in labs where chemicals and nanoparticles are used.
- Minimize airborne release of engineered nanoparticles to the environment: Nanoparticles are to be handled in solutions, or attached to substrates so that dry material is not released. Where this is not possible, nanoscale materials should be handled with engineering controls such as a HEPA-filtered local capture hood or glove box. If neither is available, work should be performed inside a laboratory fume hood.
- Practice good laboratory housekeeping: Areas where nanoparticles are prepared and/or administered should be cleaned and decontaminated immediately following each task. Bench tops, fume hood surfaces, and equipment should be routinely cleaned. The use of bench paper is recommended for preventing the contamination of work surfaces.
- Dispose of sharps properly: Needles used for nanoparticle injection shall be disposed of in approved sharps containers immediately following use.
- Attend to spills immediately: Laboratory personnel must don appropriate PPE prior to attempting to manage any spill involving hazardous agents. Small spills (less than 5 mg or 5 mL of nanoparticle-containing material) should be wet-wiped with towels that are dampened with soapy water. Affected surfaces should be wet-wiped three times, with a clean, damp towel used for each wipe-down. All materials utilized in the clean-up must be disposed of as hazardous waste. Alternatively, the contaminated area can be vacuumed with a HEPA-filtered vacuum. For assistance in cleaning up larger spills, contact Brian Hansen (x4647) or Mary Collis (x4914).
- Manage waste properly: Dispose of and transport waste nanoparticles in solution according to the hazardous waste procedures for the solvent. All waste engineered nanoparticles shall be treated as unwanted hazardous toxic material unless the material is known to be non-hazardous.
- For additional information on nanoparticle safety, consult the following resources:
  - http://www.cdc.gov/niosh/docs/2009-125/pdfs/2009-125.pdf
  - http://www.cmu.edu/ehs/fact-sheets/nanoparticle-safety.pdf
  - http://ehs.ucla.edu/NanoToolkit.pdf

Use of Radioactive Materials and Radiation-Generating Equipment SOP

All personnel using radioactive materials, sources or radiation-generating equipment are expected to be familiar with the radiation safety requirements set forth in the Hamilton College Radiation Safety Manual and to conduct their operations according to them and the College EHS program.

Radioisotopes

- Use of radioactive materials in the department is defined by the terms and conditions specified in the New York State Department of Health License No. 589 issued to Hamilton College. The Hamilton College Radiation Safety Manual should be consulted for details of the Radiation Safety Program.
- Prior to initiating work with radioactive materials, and prior to purchasing radioactive materials, an application must be submitted to the College Radiation Safety Officer (RSO) for review and approval by the College Radiation Safety Committee.
- Students, including student employees, may not use radioactive materials except under direct supervision of a faculty member who is an "authorized user" of radioactive materials.
- Other employees (technicians), sponsored by and with written permission of a faculty "authorized user" to whom they have demonstrated competence to work with radioactive materials, may use radioactive materials only after application is submitted in writing to, and approved by, the Radiation Safety Committee. This application must be initiated by the supervising authorized user.
- Use of radioactive materials is restricted to SC Rooms 2055 and 2056, or as otherwise indicated on the College's license. Areas where radioactive materials are stored or used must be marked by the magenta tri-foil on yellow background.

Radiation-Generating Equipment

- All radiation-generating equipment must be registered with the New York State Department of Health, and signage indicating the presence of a radiation hazard must be placed directly on the equipment itself. Prior to initiating work with radiation-generating equipment and prior to purchasing radiation-generating equipment, an application must be submitted to the College Radiation Safety Officer (RSO) for review and approval by the College Radiation Safety Committee.
- Use of this equipment is determined by the faculty member who has direct control of the equipment. Use of the equipment by students, student employees or other personnel is permitted only by permission of the equipment supervisor and after appropriate training.

Waste Stream Management SOP

Laboratory supervisors are responsible for knowing whether or not the waste streams they generate are regulated, or for making that determination with the assistance of the Director of EPS&S **before** the wastes are generated. The quick procedures below should be used as a reference. For further guidance, consult the Waste Management & Minimization Plan.

Hazardous Waste

- Hazardous wastes are the result of discarded or inherently waste-like by-products of certain characteristically or listed chemical wastes.
- Hazardous waste must be collected in a suitable container that is no greater than 4 Liters in volume, and shall be kept closed except when being filled.
- Hazardous waste containers must be labeled with the appropriate "Hazardous Waste" label, which identifies the chemical contents and concentration (if known) by name, not chemical symbol, in addition to the hazard class, i.e. ignitable, corrosive, oxidizer, etc.
- Labs that routinely generate hazardous waste must have a designated satellite accumulation area (SAA) where containers of hazardous waste are temporarily stored, so as to both isolate and segregate the wastes from other usable hazardous lab chemicals.
- Laboratories may not store more than 55 gallons of hazardous waste, or 1 liter/kilogram of acute hazardous waste, in a SAA at any time. As a good management practice, labs should notify the Director of EPS&S on a regular basis to see that full containers of hazardous waste are routinely moved to the 180 Day Hazardous Waste Storage Facility in room G090 of the Science Building.
- Hazardous waste containers moved to the 180 Day Facility will either be consolidated with other like wastes, or full dated for storage, and will be shipped out within 180 days.
- Under no circumstances shall hazardous wastes be drain disposed, allowed to evaporate in a lab hood, or be treated or otherwise utilized in a methodology constituting disposal.

Biohazardous Waste

- All syringes and hypodermic needles (regardless of contamination), and certain other types of sharps (scalpels, razor blades, cover slips, Pasteur pipettes) in the presence of contamination must be collected in rigid containers with the proper labeling/coloring. Once full, the container must be delivered to the Science Stockroom, to be transferred to the Biohazardous Waste Storage Facility in room G091 of the Science Building for shipment off-site. See SOP below for more information.
- Lab supervisors generating solid/semi-solid biohazardous waste must know in advance of generation whether the agents/cell lines in use are classified as BSL-1 or BSL-2.
- All lab generated BSL-1 and BSL-2 solid/semi-solid biohazardous wastes will be collected and stored primarily in an unlabeled, autoclavable bag, which is then to be stored in a rigid plastic container with the biohazard label/color.
- When a bag of BSL-1 solid/semi-solid waste is full, the lab supervisor is responsible for ensuring it is delivered to the Biology department's autoclave for sterilization. Following sterilization (in accordance with the autoclave SOP found in the Waste Management & Minimization Plan), the treated waste may be transferred to **a gray garbage bag and disposed of as trash.**
- When a bag of BSL-2 solid/semi-solid waste is full, the lab supervisor is again responsible for ensuring it is delivered to the Biology department's autoclave for sterilization. Following sterilization, the waste is no longer regulated biohazardous waste. Nonetheless, since the college is still forbidden from disposing of this waste as solid waste/trash, it must be transferred to a gray garbage bag, and delivered to the Science Stockroom. The waste will then be logged into the Biohazardous Waste Storage Facility (Room G091) for shipment off-site.
- Liquid BSL-1 waste may be discharged to the sanitary sewer without prior treatment. Liquid BSL-2 waste must be autoclaved **or** chemically disinfected before disposal into the sanitary sewer.

- BSL-3/4 materials are prohibited.
- Animal carcasses are only considered to be biohazardous waste if they have been contaminated with infectious substances. If carcasses have been exposed to infectious substances, they must be delivered to the Science Stockroom, and then to the Biohazardous Waste Storage Facility for shipment off-site. If carcasses have not been exposed to infectious substances, lab supervisors must place them in cold storage in the Animal Care Facility, where they will be shipped off-site as unregulated animal waste by the Science Coordinator. See SOP below for further information.

<u>Other Wastes</u>

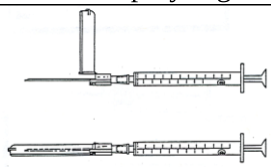
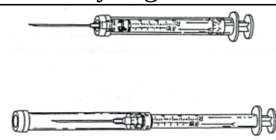
- *Glassware*—All intact and broken glassware, i.e. pipettes, vials, test tubes, beakers, etc., that are uncontaminated in accordance with the hazardous/biohazardous waste requirements, that are capable of causing puncture injuries to custodial personnel must be discarded in the appropriate closable cardboard boxes.
- *Sharps Wastes*—See SOP below.
- *Animals/animal dissection Wastes*—See SOP below.
- *Electronic Wastes*—Computers (and computer related equipment), TV's and a variety of other electronic devices must be collected and managed by recycling as electronic waste through the Director of EP&S and/or Science Stockroom.
- *Vacuum Pump Oil*—Vacuum pump oil should be maintained free from chemical contamination, and so when spent, will be shipped out as non-regulated chemical waste. If vacuum pump oil becomes chemically contaminated, lab supervisors must communicate this to the Director of EP&S, who will make a hazardous waste determination on the oil.
- *Lamps*—While standard incandescent lamps may be discarded as solid waste when they are spent, fluorescent lamps (including compact fluorescent lamps/CFL's) must be collected by the Director of EP&S as universal waste through the Science Stockroom.
- *Batteries*—While standard alkaline batteries may be discarded as trash when expired, rechargeable battery types (lithium-ion, nickel-cadmium/metal hydride, sealed lead, lead-acid) must be collected by the Director of EPS&S as universal waste through the Science Stockroom.
- *Empty Chemical Containers*—Most chemical containers emptied by normal means (pipetting, pouring, aspirating, etc.) are considered legally empty and may be disposed of as solid waste as long as there is less than 3% of the original volume of chemical in the container. Chemical containers that once held a P-listed chemical must be handled through the Science Stockroom for special considerations.
- *Bar Coded Containers*—All bar coded chemical containers must be recycled in the staged blue bins in all labs for reinventorying through the Science Stockroom.

Sharps Safety SOP

A high degree of precaution must always be taken with sharp items used in the lab, including needles/syringes, glass slides and cover slips, Pasteur pipettes, scalpels or razor blades. Two of the most common causes of needle sticks are re-capping needles and improper disposal of needles and other sharps. Needle sticks (and other sharps injuries) carry the risk of exposure to the device's original contents or contamination on its exterior, as well as other secondary infections. Consider the following guidelines for the use of sharps in all lab settings.

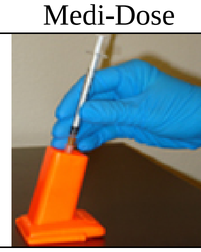
Safe Selection Considerations:

- Needles, syringes and other sharp items should be used only when there is no feasible or practical alternative (such as parenteral injection), and substitute single-use/plastic for glassware where possible.
- Consider using "safe sharps" devices, as in the examples below.

Fixed-Cap Syringes	Retractable Syringes		Retractable Scalpels
			

Storage, Use & Other Safe Work Practices:

- Needles/syringes in bulk supply are to be maintained in the Science Stockroom's restricted storage area (G083). Once needles/syringes have been dispensed, departments are responsible for implementing all appropriate controls to ensure the devices are used and disposed appropriately, and may not be subject to misuse, abuse or theft.
- Never bend, shear or otherwise manipulate needles directly by hand during use.
- Avoid recapping needles/syringes!! If absolutely necessary, recap by the scoop method, or use a device like the Medi-Dose to recap safely. Store "in-use" needles/syringes in rigid containers—never leave them unattended on open benchtops.

Scoop Method			Medi-Dose	"In-Use" Storage
				

Disposal Considerations:

- Needles/syringes (regardless of any biohazard contamination), and certain other types of sharps (scalpels, razor blades, cover slips, Pasteur pipettes) in the presence of biohazard contamination, must be collected in rigid red containers for disposal as Regulated Medical Waste (top images). These containers should also be used for needles/syringes contaminated with drugs or other low-hazard chemicals (like saline solutions during work with animals).
- Needles/syringes used exclusively for the transfer of small volumes of highly hazardous chemicals are technically exempt from RCRA regulations under the "empty container rule" (unless the chemical is P-listed). However, as a best management practice, needle/syringe sharp wastes of this variety will be collected in clear/blue topped rigid containers, pre-labeled as "RCRA empty sharps", and disposed of as hazardous waste (bottom image).

Emergency Considerations:

- In the event of a needle-stick incident, or any other sharps injury involving potential injection hazards, take the following actions:
  - Direct the injured person to immediately wash the affected body part(s), and gather any necessary information on the suspected materials or chemicals that may have been injected (such as an MSDS).
  - Notify Campus Safety at x4000 of the incident, and await their (or HCEMS) arrival. If the injured person is a student, and the lab supervisor determines it is more appropriate to send the student to the Health Center than to wait for Campus Safety or HCEMS to arrive, the supervisor should assure that the student is escorted.
  - While Campus Safety, HCEMS or the Health Center is performing the medical assessment on the injured person, the lab supervisor must complete Section 1 of the "Hamilton College Significant Exposure Incident Report" (contained in this CHP as Appendix J), to specify the nature of any potential injected hazards. In cases involving actual or potential chemical injection, it is highly recommended that the Poison Control Center be contacted right away at 1-800-222-1222.
  - If the internal party performing the medical assessment determines the incident to be "significant", a formal medical evaluation is required, and will be facilitated through Human Resources and/or Campus Safety. Further, the lab supervisor should then complete the "Supervisor's Accident Investigation Report" (contained in this CHP as Appendix I).

Animal Specimen Dissection SOP

Many types of animal specimens are used in Hamilton labs, and they are not normally defined as infectious biohazards. However, animal specimens typically include chemical hazards associated with the fixing and preservation process, prior to specimen dissection. As always, it is the responsibility of the PI or lab supervisor to make the appropriate hazard determinations prior to and during animal specimen dissection activities. And while PPE and other safe work practices during such tasks may be animal and activity specific, the following considerations should serve as general animal specimen dissection guidance.

Personal Protective Equipment (PPE)

- Most preserved animal specimen providers recommend safety glasses, latex or nitrile gloves and lab coats as the preferred PPE ensemble for personnel performing dissection work in lab environments. Decisions to waver from these recommendations may be justified through the lab hazard evaluation process.



Safe Handling & Ventilation Concerns with Fixed/Preserved Specimens

- Most preserved specimens are initially fixed in a formaldehyde/formalin or phenolic solution, and then packaged and shipped to users in lower hazard preservative chemicals, such as ethanol or propylene glycol. To minimize exposure to any residual chemical fixatives, specimens should be rinsed with water prior to dissection work. If there is a substantial amount of residual liquid preservative chemical within the original specimen container, the liquids should be collected and characterized through a waste determination.
- Dissection work does not typically require fume hood ventilation controls, and rather relies upon a “10 air changes per hour” general ventilation rate for the lab proper. The use of particularly odorous animal specimens, or those with more hazardous chemical fixatives, should either be restricted to fume hoods, or general lab ventilation rates should be increased to >10 air changes per hour.

Safe Work Practices

- Dissection specimens should always be secured in a pan or other appropriate surface to minimize slipping during the use of scalpels, razor blades or other sharps, and follow safe sharps practices at all times to minimize laceration and/or injection hazards.
- Never contact/touch preserved specimens with ungloved hands, and always wash your hands following work with preserved specimens (after glove removal).
- Never eat, drink or chew gum in lab environments, or otherwise store consumable foodstuffs therein.

Historic Specimen Storage & Disposal

- Specimens primarily used for historic preservation and/or visualization must be labeled in such a way that the chemical hazard is communicated, like through a Hazcom label. Further, large quantities of such specimens (over 5 gallons cumulatively) must be stored in appropriate cabinetry, like a flammable storage cabinet.
- The disposal of historic specimens is typically based on the chemical preservatives in liquid form (ethanol, formaldehyde), and must be managed through the hazardous waste program.


Anatomical Lab Dissection Storage & Disposal

- Animal specimens stored for short-term durations in lab refrigerators must be tightly sealed to prevent leakage (of liquid or odor), and the refrigerator must be marked appropriately with labels that can be retrieved from the Science Stockroom (as depicted to the left). When specimens are ready for disposal, they must be stored in freezers in tightly sealed bags, and the freezer must similarly be marked with the label to the left.
- Dissected animal specimens intended for disposal are not typically considered to be hazardous waste (see this LINK), and will be managed as solid waste through the Science Stockroom. However, waste determinations may need to be performed on novel specimens fixed or preserved by other means (like in Bouin’s solution). See the EHS department for such a determination.

Live Animal Handling, Surgery & Euthanasia SOP

Many live animals are used in Hamilton labs for various teaching, research and exhibition purposes. The types of live animals generally include:

- Vertebrates, such as mammals (mice/rats), reptiles (turtles, alligators, snakes), amphibians (frogs), and fish.
- Invertebrates, such as cockroaches, crayfish, fruit flies, and mussels.

The use of vertebrate animals (excluding fish) for teaching and research purposes must be managed and approved by the Institutional Animal Care & Use Committee. However there are various occupational hazards posed by the use of live animals in lab settings that are beyond the scope of this committee, including the following:

- General animal husbandry hazards—Caged/intractable animals, cage washing and sanitation, bedding removal/replacement, equipment hazards (like autoclaves and cage washers), heavy lifting (of equipment and animals), slip/trip/fall hazards, dermatitis conditions (associated chemical disinfectant use) and exposure to sharps.
- Other animal-specific handling hazards—Physical hazards (bites, kicks and scratches), animal dander/allergen hazards, and zoonotic hazards (reptilian salmonella).
- Chemical hazards—Associated with the use of anesthetic or euthanizing chemicals, or other introduced chemical or environmental toxins (so as to later evaluate the results of such exposures).

It is the responsibility of the PI or lab supervisor to make the appropriate hazard determinations for live animal handling activities. And while PPE and other safe work practices during such tasks may be animal and activity specific, the following considerations should serve as general live animal handling guidelines.

Personal Protective Equipment (PPE)

- As always, the use of PPE is both animal type and activity specific. However as a general recommendation, those handling or otherwise manipulating live animals should at a minimum wear PPE in the form of latex or nitrile gloves and lab coats. Decisions to waver from these recommendations may be justified through the lab hazard evaluation process.

Safe Work Practices

- Always follow safe animal restraint procedures to minimize bites, kicks or scratches, and understand typical animal behaviors before and during handling/restraint.
- Always follow safe sharps practices to minimize laceration and/or injection hazards.
- Adhere to sound personal hygiene habits with your hands, both before and after handling live animals.
- Never eat, drink or chew gum in lab environments, or otherwise store consumable foodstuffs therein.

Live Animal Waste Handling, Storage & Disposal

- Wastes generated by live animals (including blood, secretia, excretia and carcasses) are not typically considered to be infectious biohazards. As such, liquid animal wastes may normally be disposed of through the sanitary sewer, and solid animal wastes may normally be disposed of through the solid waste stream. Solid animal waste carcasses should be stored for short-term durations in lab refrigerators and tightly sealed to prevent leakage (of liquid or odor). Refrigerators used for such storage must be marked appropriately with labels that can be retrieved from the Science Stockroom (as depicted to the left). When animal carcasses are ready for disposal, they must be stored in freezers in tightly sealed bags, and the freezer must similarly be marked with label accordingly.
- Animals that have been exposed to introduced chemical hazards may need additional waste determinations. See the EHS department for such a determination.

Soldering Iron Safety SOP

The use of soldering irons while performing bench-mounted electronics (or other) soldering in lab environments is often both a chemical and physical hazard in need of control. Note that the conduct of soldering with hand-held propane torches is not addressed by this SOP, and rather should be managed in accordance with the College's written "Hot Work Program", available at this LINK.

Soldering Iron Safety

- Never touch the element or tip of the soldering iron. They are very hot (about 400°C) and will burn.
- Hold wires to be heated with tweezers or clamps.
- Keep the cleaning sponge wet during use.
- Always return the soldering iron to its stand when not in use. Never put it down on your workbench.
- Turn unit off or unplug it when not in use.

Work Safely with Solder, Flux and Cleaners

- Always wear eye protection (safety glasses) and 100% cotton garments to cover your arms and legs as solder can "spit".
- Always wash your hands with soap and water after soldering.
- Read and understand MSDS's for any materials you are working with before beginning work.

Avoid Toxic Fumes

- Always work in a well-ventilated area. The smoke formed is mostly from the flux which can be irritating, a sensitizer and aggravates asthma. Avoid breathing it by keeping your head to the side of, not above, your work.
- If your benchtop area is equipped with a fume extractor, use it at all times.
- Use lead-free solder.

Dangers of Lead Exposure

- If it is essential to use a lead-based solder, recognize that lead fumes can be inhaled or ingested (through contaminated fingers) during soldering activities, and ventilation engineering controls are necessary.
- Lead can have serious chronic health effects, such as reproductive problems, digestive problems, nerve disorders, memory and concentration problems, muscle/ joint pain.
- Since lead is a Type 2 PHS, signage like the image to the right is required to be posted in areas where lead soldering takes place (get from Sci Stockroom).
- If you generate any lead solder waste, it must be collected as hazardous waste in a labeled container.

Fire Safety

- Soldering iron work surfaces must be fire proof or otherwise relatively inflammable.
- Keep work surfaces neat and orderly, and keep all loose combustibles away from your work area. The general rule of thumb is to keep 3 feet of clearance adjacent/above/below your work area free of loose combustibles.
- It is recommended that an ABC fire extinguisher be located in areas where soldering iron work is performed, and that personnel are trained on how to use them. Note that for "hot work" (as defined at the link above), fire extinguisher staging and training is required.

First Aid

- For minor topical (1st degree) skin burns, cool the affected part under cold water for 15 minutes. Do not use creams or ointments for minor topical skin burns—simply cover with a band-aid from laboratory 1st aid kits.
- If the burn covers an area greater than 3 inches across, seek medical attention.
- Be sure to report all injuries to your supervisor, no matter how minor.

Cryogen Safety SOP

Cryogens/cryogenic materials typically include compressed/liquefied gases (like nitrogen or helium) with boiling points below -196°C, or frozen carbon dioxide (dry ice) that rapidly sublimates from a solid to gaseous form at room temperature. Cryogens present many hazards dependent upon the species and application, as follows:

Extreme Cold Hazard

- Cryogenic materials can rapidly freeze human tissue. Even brief exposures that would not affect skin on the face/hands can damage delicate eye tissue.
- Unprotected skin can stick to metal that is cooled by cryogenic liquids and can tear when pulled away.
- Cryogens can cause common materials such as rubber/plastics to become brittle and break under stress.

Liquid Nitrogen

Dry Ice

Asphyxiation Hazard

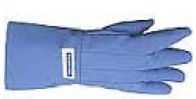
- Cryogenic materials produce large volumes of gas as they vaporize or sublimate, displacing oxygen below the normal 21% level. For example, one volume of liquid nitrogen vaporizes to 694 volumes of nitrogen gas at 20°C (68°F), and 1 pound of dry ice can sublimate to 8.3 cubic feet of CO_2 gas within 1 hour.
- Symptoms of asphyxia can develop when oxygen is below 21%, and death can occur very quickly. As most cryogenic materials are odorless/colorless/tasteless at the gaseous state, the release of too great a volume to the air is life-threatening. Those using/dispensing cryogenic materials must be trained to understand the built-in warning properties of cryogen cylinders as they routinely "boil-off", resulting in ice buildup around cylinder controls. If a cryogen cylinder is "boiling-off" and creating a highly visible fog, leave the area immediately and sound an alarm.

Explosion Due to Rapid Expansion

- Cryogenic liquids cannot be indefinitely maintained in the liquid state. If they are vaporized in a sealed container, they can produce enormous pressures that could rupture the container. For this reason, pressure relief devices are utilized on equipment and storage containers.

General Cryogen Safe Work Methods

- Always wear suitable clothing (close-toed shoes, long pants, long sleeved shirts), and no metal jewelry should be worn on the hands or wrists when working with cryogenic materials.
- Use appropriate storage containers designed for cryogenic materials during handling, storage and use, like dewars/flasks for liquid nitrogen, or small coolers for dry ice.
- Use tongs to immerse or remove objects from cryogenic liquids, or when handling blocks of dry ice.
- Transfer cryogenic liquids slowly and carefully to minimize boiling/splashing (while using PPE specified below).



PPE Considerations

- During larger volume liquid transfer actions (from a cylinder to a dewar, or dewar to a flask), there is a significant splash hazard. Wear safety glasses, face shield, cryogen gloves and a cryogen apron (or lab coat).
- During smaller volume liquid manipulation actions where there is still a minor splash hazard, wear safety goggles, lab coat and cryogen gloves.
- If there is no splash hazard from liquid cryogens and/or no direct handling or contact with dry ice, wear safety glasses, lab coat and nitrile or latex gloves.

3. Departmental EHS Handbooks & Other SOP Types

The Universal and Detailed SOP's noted above provide a solid procedural foundation for safe laboratory use across all Taylor Science Center departments with recognized occupational or environmental lab hazards. However, since it would be nearly impossible for the CHP to address "all" hazards that an employee or student may face in a lab environment, departments are encouraged to compile "EHS Handbooks" to further address and/or implement lab safety control measures at the departmental or individual lab level. Further, departmental EHS handbooks will help to provide the baseline for lab-specific training that supervisors must provide to new employees (and students) when starting their assignment.

Other types of lab safety SOP's outside of the purview of this CHP have been compiled, as follows:

- SOP's to manage safety in several of the Science Center's laboratory or workshop spaces with major equipment/physical hazards, including:
    - The Biology department's Microscopy & Imaging Facility (2039-2045); and
    - The Science Center Workshop (G017-G022).
- SOP's to manage classes of specialized equipment utilized in various locations, including:
    - The Physic department's Laser Safety Plan; and
    - The Biology department's Autoclave SOP.

These SOP's serve as both management documents and training tools for employees and students alike, and typically rely on the blank SOP format found in Appendix B of this CHP. All Taylor Science Center academic departments are encouraged to formalize SOP's for the hazards they introduce into their respective labs, following this or any other format that seeks to achieve an injury and illness free work environment.

SECTION 4
CONTROLLING CHEMICAL EXPOSURES

The basic routes for a chemical to enter the body in a laboratory setting are through inhalation, skin and eye contact, ingestion, and injection. The prevention of entry by one of these routes can be accomplished by adherence to the general or specific SOP's noted above, and by control mechanisms such as engineering controls, personal protective equipment, and administrative controls.

1. Inhalation Hazards

Inhalation of chemicals is the most common route of entry a chemical can take to enter the body. To avoid significant inhalation exposure, engineering controls such as substituting a less volatile or toxic chemical, or substituting a liquid or solid chemical for a gaseous one, is the best means of control. If substitution is not practical, ventilation should be used to lessen the chance of overexposure. The use of well-functioning local exhaust ventilation equipment, such as ventilation hoods, biological safety cabinets, and vented glove boxes, are primary examples of suitable engineering controls that will minimize inhalation exposure to hazardous chemicals. Dilution ventilation may be used to reduce exposure to non-hazardous nuisance odors. For extremely toxic chemicals, such as those classified as poison gases by the State or Federal Department of Transportation (i.e. arsine, phosgene), the use of closed systems, vented gas cabinets, failsafe scrubbing, detection or other stricter controls may be required.

If both substitution and engineering controls are unavailable, the use of personal protective equipment may be required to reduce inhalation exposures. Respiratory protection, from dust masks to a self-contained breathing apparatus, may be utilized to this end. If laboratory employees wear respirators, requirements of the OSHA Respirator Standard (1910.134) must be met. This Standard requires training in the proper use of respirators, medical prequalification to ensure the user is capable of wearing a respirator, and fit testing to ensure that the respirator fits properly. A lab worker or his/her supervisor must contact the Office of EPS&S in the event that respiratory protection is necessary to control exposures to hazardous chemicals.

Finally, administrative controls can be utilized to reduce the risk of overexposure to hazardous chemicals. Some examples of administrative controls include:

- Minimizing the exposure time for individual employees;
- Reducing the quantities/volumes of chemicals used in experiments to as little as practical, or using micro-scale experiments; and
- Restricting access to areas where particularly hazardous experiments are on-going, and placing appropriate signage as a warning to others.

2. Skin and Eye Hazards

To reduce the risk of a chemical entering the body via skin and eye contact, engineering controls include substitution and appropriate ventilation as described above. The more obvious means of preventing skin and eye contact is the wearing of personal protective equipment (PPE) such as eye protection, face shields, gloves, appropriate shoes, lab aprons, lab coats, and other protective equipment as appropriate to the hazard. Suitable eye protection (glasses or goggles) is a determination based upon the likelihood of splash hazards (as noted above). Further, since the chemical resistivity of the different types of protective equipment (most importantly hand protection) varies significantly, the lab supervisor should consult the MSDS or other appropriate references (like Appendix L below) to determine the type of personal protective equipment required.

Administrative controls to reduce skin/eye contact include:

- Enforcement of policies pertaining to skin and eye protection; and
- Discarding or repair of cracked or broken glassware.

3. Ingestion Hazards

Ingestion of chemicals is another route of entry for chemicals to gain access into the body. A laboratory worker can easily ingest chemicals into the body via contaminated hands if they are not washed prior to eating or smoking, or by sticking part of the hand or a writing tool that has been in contaminated hands into the mouth. Some controls for preventing this route of exposure include engineering controls (i.e. use glove box), personal protective equipment such as the wearing of gloves, and administrative controls such as restricting mouth pipetting, encouraging good personal hygiene and designating a well-marked non-chemical area where eating, drinking and the application of cosmetics is permitted.

4. Injection Hazards

Exposure to chemicals by injection is a final route of entry for chemicals to gain access into the body. Injection exposure can inadvertently occur through injury from metal or glass contaminated with chemicals, or from needle-sticks associated with the handling of syringes. Attention to detail and adherence to general standard operating procedures will provide control against accidental injection exposure. Sharps containers shall be used to collect all used needles and syringes, and separate collection containers shall be used to collect broken glass. Syringes and needles that are intended for reuse should be stored in sturdy plastic containers as an engineering control to avoid needle-sticks. See the Sharps Safety SOP for additional information.

SECTION 5
VENTILATION HOOD ENGINEERING CONTROLS

1. Laboratory Ventilation Fume Hoods

The laboratory ventilation fume hood is the primary engineering control for protecting lab personnel from exposure to hazardous chemicals. The hood itself is one component of the system that consists of a working chamber, an exhaust system, proper hood location, make-up air to the hood, a hood monitoring system, hood operating parameters, routine performance surveys, and system maintenance.

***Note**—other hood types that do not directly exhaust contaminated air to the outside (i.e. bio-safety cabinets, HEPA equipped down-draft tables), protect hood users by removing and filtering airborne contamination from the space, and the air is recirculated to the general laboratory atmosphere. Be sure to **NOT** use hazardous chemicals in these types of hoods, and follow manufacturer specific guidelines regarding use parameters and requirements.

2. Ventilation Hood Air Flow

Air flow patterns are affected by many factors, including traffic patterns, room make-up air, doorways, room size, hood location, work practices, objects inside the hood, baffle adjustment, and sash opening. These are considerations for design, installation and use of ventilation hoods. Ideally, the air should flow into the lab from doors, hallways and the room air supply and exit the room through the ventilation hood. There should not be any turbulence at the hood face which could spill contaminated air into the room. All areas of the open hood face should have a velocity sufficient to draw room air and not spill contaminated air from the hood.

3. Hood Classification Guidelines

Standards of performance for ventilation hoods are set forth by ANSI/AIHA Z9.5 and OSHA 29 CFR 1910.145(e)(3)(iii). The average face velocity of optimally performing hoods should be between 80 and 120 feet per minute (fpm) when measured with the sash raised to the 15" mark. Practically speaking, all Science hoods will operate at 100 fpm when the sash is at 15”, but this face velocity will decrease incrementally if the sash is opened past the 15” stopping device. Also, when P-listed acutely toxic materials are being used in a hood, the acceptable face velocity ranges should be between 90 and 120 fpm. These average face velocities and the date of survey will appear on the inspection sticker located on the front or side of each ventilation hood. Ratings are also stated according to the hood performance as follows:

Score	Criterion	Usage
Pass	Average face velocity 80-120 fpm	Normal chemical hood use
Pass	Average face velocity 90-120 fpm	P-listed acutely toxic materials/chemicals
Restrict	Average face velocity 70-89 or 120-159 fpm	Not recommended for use with highly toxic materials
Fail	Not meeting the above standards	Suitable for storage only

4. Ventilation Hood Work Practices

- Any direct handling and/or experimentation with chemical materials in a laboratory environment should attempt to make use of ventilation hood control measures to the greatest extent possible.
- Before work begins, check to be sure the hood fan is operating by observing airflow monitor.
- Check the inspection sticker to determine if the hood has been currently inspected and what performance rating it was given. If observable questions arise about inspection or current hood performance, notify the lab supervisor for assistance.

- If a hood's performance is questionable or malfunctioning, it should be marked in a fashion that takes it temporarily out of service, and the Physical Plant should be notified to arrange for timely repairs.
- Ventilation hoods should be used with the sash positioned at 15", or as otherwise specified on the inspection sticker.
- The sash position should be lowered as needed for additional physical barrier protection against splash hazards, and shall always be closed when the hood is not actively in use.
- All equipment and materials should be located at least 6" from the sash face.
- Large items should be elevated at least 2" from the hood base to ensure airflow to the baffle opening at the rear interior base of the hood.
- Do not use the ventilation as a storage cabinet—excessive storage can obstruct airflow and cause areas of low air velocity at the face opening.
- Do not extend face or head inside the hood.
- Minimize traffic and other sources of cross drafts (i.e. open windows, doors, fans, etc.) that may pull contaminated air from the hood.
- When using electrical equipment in a hood, take extra precautions to prevent spark sources from causing a fire or explosion—all electrical connections should be made outside the hood.
- When permitting other unattended operations to occur, like the use of apparatuses that require continuous flowing water, clamp hoses and select hoods in accordance with the Unattended Operations SOP from above.
- Do not use perchloric acid heated above ambient temperature in a ventilation hood unless it is a specifically designed perchloric acid hood with a wash-down system.
- In the event of an emergency spill, fire or explosion in a hood, the hood user should attempt to close the sash to isolate the emergency (as long as if doing so does not present any additional hazard to the user). The emergency purge control on the hood LCD should be used only in the following situations
    - A dangerous chemical has been spilled or is leaking (like a 1 liter benzene spill, or a leaking cylinder of hydrogen sulfide gas), such that normal fume hood operation is insufficient to protect the hood user; or
    - An experimental apparatus is off-gassing or smoking,
    - The emergency purge control SHOULD NOT (generally speaking) be engaged to control a fire. This might add additional air/fuel to the fire, allowing it to grow out of control. IMMEDIATELY evacuate the lab, notify your lab supervisor, find a fire alarm pull station, and activate it.

SECTION 6
EMPLOYEE INFORMATION AND TRAINING

The Office of EPS&S shall develop a general employee training program to meet the information requirements of the Lab Safety Standard. It is the responsibility of each department to provide its employees training for activities which are unique and/or specific to that department. The Director of EPS&S is available for assistance in the development of these programs.

1. Mandatory Employee Informational Training and Orientation

All college employees working in a laboratory setting shall be trained upon, and informed of the location and availability of, the following:

- 29 CFR Part 1910.1450 "Occupational Exposures to Hazardous Chemicals in Laboratories" (OSHA Lab Standard). Click HERE to see the standard.
- The Hamilton College Chemical Hygiene Plan (CHP).
- Reference materials on chemical safety, including Material Safety Data Sheets (MSDS's).
- Permissible exposure limits (PEL's) for OSHA regulated substances, or if there is no applicable OSHA Standard, the recommended exposure limits (REL's) as per NIOSH, or threshold limit value (TLV's) as per the ACGIH.
- Signs and symptoms associated with exposure to hazardous chemicals found in the lab.

This type of informational training shall be required at the time of an employee's initial assignment, and shall be repeated at least semi-annually thereafter. It will be the responsibility of the employee's department with the assistance of the Office of EP&S to provide this informational training. Appendix C provides an example of how this informational training and orientation will be documented accordingly.

2. Mandatory Laboratory Training

All college employees working in specified laboratories shall be trained upon the following:

- The specific details of the Chemical Hygiene Plan applicable to the individual lab.
- Any other department or lab-specific SOP's developed for such activities.
- Methods and observations that may be used to detect the presence or release of hazardous chemicals, such as air monitoring, continuous monitoring devices, or the visual appearance or odor of hazardous chemicals.
- The physical and chemical hazards of chemicals in the work/lab area.
- The measures employees can take to protect themselves from these hazards, including specific procedures that have been implemented to protect employees from exposure to hazardous chemicals, such as safe work practices, engineering controls, emergency procedures, and personal protective equipment.

This type of laboratory training shall be required before employees and some students (restricted personnel) work with hazardous chemicals in the lab setting. It will be the responsibility of the lab supervisors and Departmental Chemical Hygiene Officers to devise and implement this type of training. Appendix D provides a recommended worker agreement form by which lab supervisors/Departmental Chemical Hygiene Officers may document this training. Additionally, Appendix L provides lab faculty/supervisors with additional guidance regarding hazard evaluations for PPE determinations.

3. Non-Mandatory Lab Training

Although students registered in laboratory courses where hazardous chemicals are used are not required to be trained by the mandatory elements described above, student safety and training should be an integral part of every laboratory course curriculum. Student safety and training programs should be sufficient enough to address the type, variety and nature of the chemical and physical hazards posed by the laboratory course. Department chairs, lab faculty/instructors and DCHO's are charged with devising and implementing such student safety/training programs in accordance with these non-mandatory recommendations, with assistance from the Office of EP&S. Appendix E provides an example of a recommended lab safety agreement form that can be utilized to document this process.

SECTION 7
PRIOR APPROVAL

The use of a select group of chemicals identified below will require prior approval before they are introduced and/or utilized in the laboratory setting. This will ensure that:

- The chemical and physical hazards associated with these chemicals are adequately assessed.
- Sufficient hazard/exposure control strategies and equipment are available to safely utilize those chemicals.
- Certain administrative procedures, such as the generation of hazardous wastes within the specified small quantity generator thresholds, are maintained.

1. Chemicals Requiring Prior Approval

The introduction and/or utilization of chemicals that require prior approval are outlined in both Section 8 and Appendix F below. Prior approval is required for all Type 1 Particularly Hazardous Substances (PHS). PHS's typically include select carcinogens, reproductive toxins, and substances that have a high degree of acute toxicity. Type 1 PHS's include those that are more stringently regulated by state and federal agencies (like the EPA/NYS DEC or the Department of Homeland Security), such that certain quantity restrictions also apply. Type 2 PHS's include chemicals recognized as having a higher hazard, but as there are no quantity restrictions, the prior approval procedure does not apply (though it still may be followed as a best management practice).

2. Prior Approval Procedure

Before any Type 1 PHS is utilized in a laboratory setting, the lab supervisor must complete the Particularly Hazardous Substance Use Approval form contained in Appendix G, using the Appendix H reference key. The completed form will be submitted to the Department Chemical Hygiene Officer and then the Director of EPS&S (or the Science Stockroom & Facility Coordinator) for approval, subsequent actions prior to approval, or denial based upon technical or administrative limitations.

3. Other Prior Approval Considerations

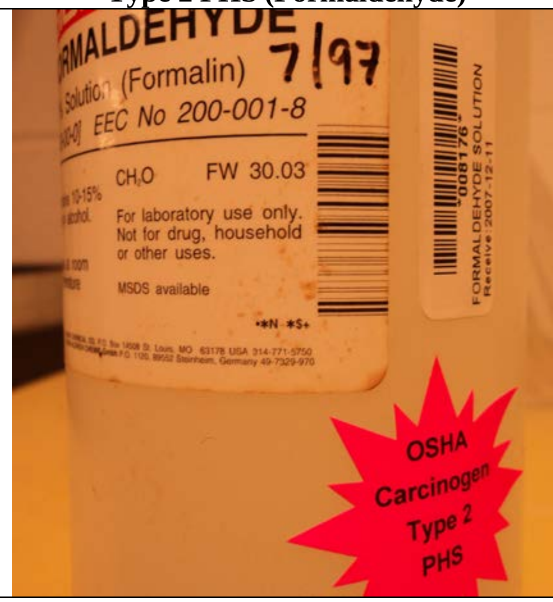
Although outside of the purview of the Chemical Hygiene Plan, certain other activities lab supervisors may wish to engage in require prior approval from College offices other than EPS&S. These activities include:

- The use of live animals—contact the Animal Care & Use Committee (Doug Weldon).
- The use of human subjects—contact the Institutional Review Board for Research with Human Participants (Doug Weldon).
- The use of radiation generating equipment or radio-isotopes—contact the Radiation Safety Committee (Pearl Gapp).

SECTION 8
PARTICULARLY HAZARDOUS SUBSTANCES

In addition to the general chemical safety guidelines mentioned throughout this plan, special precautions are needed when using either Type 1 or Type 2 Particularly Hazardous Substances (PHS's) during laboratory teaching or research activities. PHS chemicals and information sources noted in Appendix F contain the minimum, though not exhaustive, list of chemicals that must abide by this PHS procedure. PHS chemicals generally include those that are select carcinogens, reproductive toxins, or chemicals with a high degree of acute toxicity. Lab supervisors using hazardous chemicals not on this list, but determined as to be a high hazard, may choose to follow elements of this procedure as a best management practice.

Upon receipt of a Type 1 or Type 2 PHS chemical by the Science Stockroom, it will be labeled with a high visibility pink sticker. Further, an indication of Type 1 or Type 2 will be noted on the sticker. The images below illustrate this practice.

Type 1 PHS (Potassium Cyanide)	Type 2 PHS (Formaldehyde)
	

<u>Required Steps to Using Type 1 Particularly Hazardous Substances</u>

1. Review the information sources identified in Appendix F to determine if the chemical you intend to use is regulated as a Type 1 PHS, or the labeling as noted above.

2. Follow the "Prior Approval" procedure from above, including the completion of the Particularly Hazardous Substance Use Approval form found in Appendix G, to help characterize and assess the risks and hazard control measures that will be implemented.

3. The area where the Type 1 PHS is to be used will be posted as a "designated area". Signage used to convey this "designated area" information is depicted in Illustration 8.0 below. This signage is available through the Science Stockroom, and is distributed in a laminated format. PI's or lab supervisors shall list the approved Type 1 PHS(s) used in their lab directly on the signage.

4. The lab activities utilizing the Type 1 PHS may then proceed, following the practices outlined in the Appendix G Particularly Hazardous Substance Use Approval form, as well as the appropriate work practices included throughout this plan. All work must be conducted within the designated area.

5. At the conclusion of the experiment, personnel using the PHS will then decontaminate all equipment (if needed) and dispose of waste promptly and properly, as outlined in the Appendix G Particularly Hazardous Substance Use Approval form.

Required Steps to Using Type 2 Particularly Hazardous Substances

1. Review the information sources identified in Appendix F to determine if the chemical you intend to use is regulated as a Type 2 PHS, or the labeling as noted above.

2. The area where the Type 2 PHS is to be used will be posted as a “designated area”. Signage used to convey this “designated area” information is depicted in Illustration 8.0 below. This signage is available through the Science Stockroom, and is distributed in a laminated format. PI’s or lab supervisors shall list the approved Type 2 PHS(s) used in their lab directly on the signage.

3. The lab activities utilizing the Type 2 PHS may then proceed, following the appropriate work practices included throughout this plan. While it is recommended as a best management practice to complete the Particularly Hazardous Substance Use Approval form found in Appendix G when using a Type 2 PHS, it is not a requirement. However, all work must be conducted within the designated area.

4. At the conclusion of the experiment, personnel using the Type 2 PHS will then decontaminate all equipment (if needed) and dispose of waste promptly and properly.

ILLUSTRATION 8.0—PARTICULARLY HAZARDOUS SUBSTANCE (PHS) SIGNAGE

DESIGNATED AREA

For Select Carcinogens, Reproductive Toxins and High Acute Toxicity Chemicals

Authorized Personnel Only

Approved Type 1 PHS chemicals used in this lab/area:
Type 2 PHS (or other higher hazard) chemicals used in this lab/area:

SECTION 9
MEDICAL CONSULTATIONS

All college employees/students working with hazardous chemicals in a laboratory setting shall have an opportunity to receive medical consultation, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

- If an employee/student develops signs or symptoms associated with a hazardous chemical to which they may have been exposed.
- There has been a spill, leak, explosion, or other occurrence in the work area resulting in the likelihood of a hazardous exposure.
- If exposure monitoring reveals that a PEL or action level is routinely violated for any OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.

In the event a medical consultation is deemed necessary, lab supervisors (with the assistance of the Director of Environmental Protection & Safety or Human Resources) must complete the Supervisor's Accident Investigation Report contained in Appendix I of this CHP. This report will be forwarded to the Director of Human Resources, who will make the necessary arrangements with Student Health Services (if the person is a student) or other local health care providers (if the person is an employee). In addition, employees who need to wear respirators to control chemical exposures must be approved through the Director of EP&S prior to wearing the respirator to ensure they are medically qualified to wear one, and are trained and fit tested.

SECTION 10
EMERGENCY PROCEDURES/CONTINGENCY PLAN

All college employees using hazardous chemicals and/or generating hazardous wastes should be thoroughly familiar with the proper chemical/waste handling and emergency procedures relevant to their responsibilities during normal institutional activities and foreseeable emergencies. The following outlines those basic procedures.

1. Emergency Preparedness

All who use dangerous chemicals or equipment in laboratory workstations should be prepared for emergencies before they actually occur. Emergency preparedness begins at a minimum with the following:

- Be prepared for chemical spills, or spills of hazardous/universal/other wastes;
- Before you begin using hazardous materials, be familiar with the MSDS for the appropriate containment materials and safety precautions;
- Before you begin using dangerous equipment, ensure you have been properly trained and authorized to use it;
- Ensure the appropriate emergency equipment, such as fire extinguishers, first aid equipment, emergency eye washes and/or showers, and spill equipment, is accessible as required; and
- Know the procedures for handling those emergencies that may arise in your work area.

2. Level 1 Emergencies

Level 1 emergencies (otherwise referred to as incidental or incipient emergencies) are those that do not pose a significant threat to life, the environment or property. Level 1 emergencies are routine occurrences that normally may be handled safely by trained operational employees in the immediate work area or by maintenance personnel. Common examples of Level 1 emergencies include:

- Minor/incidental spills that pose minimal risk to safety, health or the environment;
- First-aid injuries that can be safely treated with a first aid kit; and
- Minor fires that can be safely extinguished with a hand-held fire extinguisher.

Minor/Incidental Spills
Minor/incidental spills that do not pose a significant safety, health or environmental hazard may include any of the following:

- A spill of a hazardous chemical, such as a solvent like acetone, in a laboratory in quantities not to exceed 1 liter (as a general rule of thumb), that can be safely isolated and contained by lab personnel with staged spill kits;
- A broken universal waste lamp in a maintenance area that again can be safely isolated and contained by trained maintenance personnel with the appropriate equipment; and
- A spill of used oil on a concrete floor within a maintenance area that can be immediately controlled and cleaned up before the oil reaches any release pathways.

<u>Minor Spill Response Steps</u>

- Immediately alert area/nearby personnel, secure the scene, and notify your supervisor.
- The supervisor shall make the determination as to whether or not the spill can be safely controlled and cleaned up by trained individuals with the appropriate equipment, or whether an evacuation and Campus Safety notification is necessary.
- Donn the appropriate personal protective equipment located within your workstation or in a nearby spill kit.
- Deploy spill absorbent/neutralization materials upon the spill as necessary.
    - Spill kits in laboratories have 3 absorbent/neutralization materials for this purpose; sodium sesquicarbonate for acid/acidic spills, citric acid for caustic/basic spills, and Magic-Sorb for solvent/other spills.

    - Additionally, the Science Stockroom has Hg-Absorb for mercury spills.
- Once the chemical or waste has been controlled, absorbed and/or neutralized, consolidate the spill cleanup materials by sweeping inward, and collect in a suitable container.
- Notify your Departmental Chemical Hygiene Officer that you have a full container of spill cleanup materials, who will both label it accordingly and have it picked up by the Director of EPS&S.

Minor First-Aid Injuries
First-aid injuries in general include those that will not require medical treatment, and can be safely and thoroughly addressed by the equipment staged in small first-aid kits. These types of incidents include, but are not limited to, minor cuts, scrapes and abrasions, as well as topical burns and foreign bodies not embedded in the eye. Injuries beyond those that are minor in nature, such as chemical splashes in the eye thus requiring the engagement of an emergency eye wash followed by medical treatment, must be immediately reported to Campus Safety, who will notify the appropriate College personnel or external response agency. The procedures for responding to a minor first-aid incident are as follows:
- The injured individual will immediately notify his/her supervisor, who will assist in determining the nature and severity of the injury, as well as the location of the first-aid equipment.
- The injured individual shall utilize the first-aid equipment as necessary to treat the minor injury. The supervisor shall not assist in treating the first-aid injury unless he/she is properly certified by the American Red Cross.
- In the event blood is dripped upon the floor or other surfaces, the supervisor will notify the area custodian or the Physical Plant, who will take the necessary precautions to clean up the blood spill.

The supervisor must then complete the Supervisor's Accident Investigation Report form (Appendix I of this CHP). Upon completion, this report must be forwarded to Human Resources Department, as well as the Health Center if the incident involved a student.

Minor Fires
Although a properly trained individual with an appropriately rated fire extinguisher may easily extinguish minor fires involving isolated pieces of equipment, fires in general are inherently extremely dangerous. Since college personnel will not engage in fighting uncontrolled fires, the key to knowing the difference between a "minor" and "major" fire is **discretion**. Should there be any question as to the nature and dangers involved with a fire, fires should be considered an emergency incident, requiring the immediate evacuation of all area personnel and building occupants, followed by the notification of Campus Safety. In general, using fire extinguishers to extinguish a fire would not be appropriate if any of the following conditions exist:
- The fire could block your only exit;
- The fire is large, and/or is spreading quickly or uncontrollably;
- The type or size of the fire extinguisher is wrong or insufficient; or
- You have not been properly OSHA trained on using a fire extinguisher.

<u>Minor Fire Extinguishing Steps</u>
- In the event a fire is determined to be minor or incipient in nature, personnel trained in the use of fire extinguishers may proceed with extinguishing activities **AFTER** they have notified Campus Safety, by:
    - Retrieving an appropriately rated fire extinguisher staged from a safely accessible location, and follow the PASS method:
        - **Pull** the trigger pin;
        - **Aim** the extinguisher nozzle toward the base of the fire;
        - **Squeeze** the handle or trigger to activate the device; and
        - **Sweep** the nozzle of the fire extinguisher in a side-to-side motion, applying the dry chemical to the fire from the base of the fire up, until the fire is adequately suppressed or the extinguisher is empty.

3. Level 2 Emergencies

Level 2 emergencies are those that pose some threat to health, safety or the environment, and typically require 1—localized evacuations from buildings/groups of buildings on campus, 2—employee/student mustering at designated assembly points, and 3—the notification of trained internal or external emergency responders (i.e., the local fire department, ambulance services, police, private Hazmat teams). Common examples of Level 2 emergencies include:

- A 5-gallon spill of a highly flammable solvent on a lab floor;
- An actual or potential fracture injury at the Physical Plant; and
- A lab benchtop fire that includes mixed hazard classes (flammable liquids, solid oxidizers, poisons).

The following actions are generally applicable following a Level 2 emergency:

- Know who your Building Coordinator is, as well as the location of you building's Assembly Points and Initial Gathering Points.
- Those teaching or supervising personnel in laboratories are responsible for both communicating the Assembly/Initial Gathering Points information, and for accounting for their whereabouts during an actual emergency evacuation.
- If you discover a potential Level 2 emergency, immediately notify and evacuate all personnel in the immediate area of the emergency incident.
- Contact Campus Safety at x4000 from a secure location, and be prepared to provide the dispatcher with as much information relative to the emergency, including the following:
    - Your name, phone number and exact location;
    - Nature of the incident, and name/type/volume of substances involved (if known);
    - Advise if there are any injuries requiring an ambulance, or if there are visible flames.
- The individual(s) making the initial notification to Campus Safety should secure the area to the safest extent possible, until he/she is relieved by a more experienced or senior college official. Under no circumstances should anyone attempt a rescue operation, fire-fighting, or a spill response during a Level 2 emergency incident. Toxic substances commonly have no odor or other warning properties, and untrained personnel can only worsen the initial emergency incident.
- Campus Safety will immediately dispatch security personnel to the scene, and will notify the primary facility emergency coordinator(s), or any alternates as required.
- The facility emergency coordinator will then authorize which outside emergency response organization(s) will be contacted to safely respond to the emergency incident, and will take any further action in accordance with other College procedures.

4. Level 3 Emergencies

Level 3 emergencies, otherwise referred to as catastrophes, are those occurrences that pose a significant threat to human health, public safety or the environment, and will typically involve a great number of emergency responders/response agencies, and resources. Common examples of Level 3 emergencies include:

- A natural disaster resulting in the widespread disruption of essential functions/services on campus; and
- A major/multi-building fire, or active shooter on campus.

In the event of a Level 3 emergency, emergency responders and local/state/federal authorities will likely assume on-site decision-making. For planning purposes, a Level 3 incident requiring the evacuation of the campus will utilize the Clinton High School as its safe place of refuge, and St. Mary's Church will serve as the alternate location.

APPENDIX A
CHEMICAL STORAGE GUIDANCE

Hazard Class	Examples	Regulatory Guidance	Best Management Practices
Flammable and Combustible Liquids	Acetone, toluene, mineral spirits, paint aerosol cans	No more than 10 gallons of flammable/combustible liquids combined may be stored outside of an approved flammable storage cabinet. Refrigerators used to store flammable/combustible liquids must be explosion proof and labeled as such.	Labs and prep areas should primarily store flammable/combustible liquids in flammable storage cabinets or hoods. De minimus quantities, i.e. 5 gallons/10 containers or less, may otherwise be stored away from ignition sources, and should not be stored on open shelving at or above eye level.
Flammable-Air-Water Reactive Solids	Flammable Solid: --aluminum powder Air Reactive: --lithium hydride Water Reactive: --potassium metal	Reactive chemicals must be stored in accordance with chemical-specific storage guidelines.	Labs and prep areas should primarily store flammable/air/water reactive solids in main chemical storage areas, in designated flammable storage cabinets. De minimus quantities, i.e. 5 pounds/10 containers or less, should otherwise be stored in a cool, dry and closable cabinet.
Oxidizers	Class 1, 2 and 3: --lead nitrate --potassium permanganate --potassium bromate Class 4: --ammonium perchlorate	Oxidizers must be isolated from any flammable or combustible materials. Though there are no other special storage requirements for Class 1, 2 or 3 oxidizers in quantities less than 200 pounds, Class 4 oxidizers may not be stored in excess of 10 pounds in any lab.	Labs and prep areas should primarily store oxidizers in main chemical storage areas, in designated flammable storage cabinets for oxidizers only. De minimus quantities, i.e. 10 pounds/20 containers or less, should otherwise be stored in a cool, dry and closable cabinet.
Corrosive Liquids	Inorganic Acids: --hydrochloric, sulfuric, nitric Organic Acids: --acetic, formic Bases: --sodium hydroxide, potassium hydroxide	Acids and bases must be stored separately from one another, and may not be stored on open shelving at or above eye level.	Labs and prep areas should segregate and store all concentrated inorganic/mineral/oxidizing acids and/or bases in designated corrosive storage cabinets. Concentrated organic acids should be stored in flammable storage cabinets. Hydrofluoric and perchloric acids should be stored in secondary containers. De minimus quantities of concentrated corrosives, i.e. 2 liters or less, or dilute solutions of corrosive liquids, should be stored in designated areas underneath lab hoods.
Highly Toxic Materials	Particularly Hazardous Substances (listed in Appendix G)	Highly toxic materials may be stored with other hazard classes based upon common chemical properties, but should be segregated or isolated in some fashion from those other less hazardous chemicals.	Labs and prep areas should designate specified storage areas for highly toxic materials suitable to the nature and variety of such chemicals the lab primarily uses. These storage areas should be securable and lockable. Secondary containers are recommended for all highly toxic materials.
Low Hazard Chemicals	Agars, sodium chloride, potassium chloride, glycerin, amino acids	Common low-hazard chemicals should be stored in a fashion that minimizes the likelihood of spillage.	Labs and prep areas should store low-hazard chemicals in suitable cabinets or shelves of sturdy construction that are not exposed to heat or light. Open shelves should have lipped edges, and should be floor mounted so as to minimize the need to reach high when retrieving/replacing chemicals.

APPENDIX B
EQUIPMENT/PHYSICAL HAZARD SOP GENERAL FORMAT

EQUIPMENT/PHYSICAL HAZARD SOP	
Equipment Name: **Principal Department & Location:** **Other Information:**	

Identified Health and Physical Safety Hazards:	
☐ Respiratory/Nuisance Dust Hazards ☐ Flying Debris/Eye Hazards ☐ Chemical Splash Hazards ☐ Cut/Laceration Hazards ☐ Point of Operation/Nip/Pinch Hazards	☐ Rotating Parts/Entanglement Hazards ☐ Noise Hazards ☐ Electrical Hazards ☐ Other (describe):

Hazard Control Strategies:	
Primary Engineering Controls: ☐ Guarding/Shielding	**Describe:**
Other Engineering Controls ☐ Ventilation ☐ Interlocks ☐ Other:	**Describe:**
Administrative Controls: ☐ Training ☐ Signage ☐ Other	**Describe:**
PPE (check all that apply): ☐ Safety glasses ☐ Chemical goggles ☐ Face Shield ☐ Apron/Lab Coat ☐ Gloves/Hand Protection ☐ Ear plugs/muffs ☐ Other:	**Describe:**

Emergency Controls:		
☐ Chemical Spill Kit	☐ First Aid Kit	☐ Communications
☐ Fire Extinguisher	☐ Emergency Shower/Eye Wash	☐ Emergency Power Kill Switch

SOP Completed By:		
Name	**Signature**	**Date**

APPENDIX C
LABORATORY SAFETY TRAINING DOCUMENTATION & CERTIFICATION

The following individuals have been trained in accordance with both the OSHA Laboratory Safety Standard (LSS) informational training program requirements and Hamilton College's written Chemical Hygiene Program (CHP), or as otherwise indicated below:

_____ OSHA LSS and the Hamilton College CHP

_____ Other (written lab hazard evaluations for PPE, equipment SOP's, Type 1 or 2 PHS's, etc.)

Training Instructor Name	Signature	Training Date

Name (Print)	Signature	Dept.

APPENDIX D
LAB/DEPARTMENT SPECIFIC TRAINING DOCUMENTATION & CERTIFICATION FOR WORKERS & RESTRICTED PERSONNEL

Hamilton College Worker & Restricted Personnel Safety Training Form

☐ The specific details of the Chemical Hygiene Plan with direct significance and applicability to my work have been made clear to me by my lab supervisor or the Departmental Chemical Hygiene Officer.

☐ I understand and agree to abide by any other specified SOP's applicable to my department, lab or specific area of responsibility.

☐ I have been trained upon and/or understand the various chemical and physical hazards associated with the materials and processes I utilize in my work area, and know to contact my lab supervisor for any additional information I may need.

☐ The methods and/or observations that may be used to detect the presence or release of any hazardous chemical, including air monitoring, continuous monitoring devices, or the visual appearance or odor of hazardous chemicals, have been made clear to me by my lab supervisor.

☐ The measures I can take to protect myself from the chemical and physical hazards located in my work area, including SOP's, safe work practices, engineering controls, emergency procedures, and personal protective equipment, have been made clear to me by my supervisor.

I, ____________________________, have carefully read the worker agreement form for Hamilton College, and understand that the various elements of the Chemical Hygiene Plan and other Departmental requirements will be rigorously and impartially enforced. I also understand that willful or repeated violations will result in my being dismissed from my lab responsibilities and privileges.

________________________________ ____________________________________
Date Signed

____
Training Provider Name Signature Date

APPENDIX E
RECOMMENDED LAB SAFETY AGREEMENT FOR STUDENTS

Hamilton College is committed to providing *all laboratory users* a safe environment in which to work and learn. Students must be well informed of the chemical and physical hazards associated with laboratory activities, and conform to the following rules established for all college laboratories:

1. Wear the appropriate personal protective equipment (PPE) as determined by your lab supervisor at all times.
2. All laboratory work must be approved by the designated lab supervisor.
3. Report all injuries to your lab supervisor immediately. Any person injured in a laboratory must be seen by the Health Center.
4. Eating, drinking or smoking in the laboratory is strictly forbidden. Further, laboratory refrigerators may not be used for the storage of any food/liquid products for consumption.
5. Everyone who uses a laboratory must know the locations of emergency equipment, such as fire extinguishers, fire blankets, eyewashes, showers, first aid kits, spill kits and telephones.
6. Wear the appropriate clothing. Do not wear shorts, cutoffs, or short skirts, nor high-heeled shoes, open-toed shoes or sandals. Confine long hair, jewelry and loose clothing.
7. Never use your mouth to fill pipettes or start siphons. Nothing in the laboratory should go into one's mouth.
8. Unauthorized experiments, horseplay or pranks are strictly prohibited.
9. Always wash your hands prior to leaving the laboratory, even after wearing protective gloves.
10. All hazardous materials must be properly used, stored, labeled and disposed of.
11. Dispose of used hazardous materials, including the first rinse from chemical containers, into designated containers. Thoroughly clean and wash any area contaminated with chemicals in use. Report all spills to your lab supervisor immediately.
12. Know the flammability, reactivity, health hazard and special hazards of any materials you use. All toxic and/or carcinogenic materials must be used in a lab hood. Report any lab hood deficiencies to your lab supervisor.
13. All broken glassware and syringes must be disposed of in designated containers. Never place any sharp item in a regular trash receptacle. Report any broken glassware, faulty equipment or otherwise dangerous situations to your lab supervisor.

I, ______________________________, have carefully read the lab safety agreement for Hamilton College and understand that these rules will be rigorously and impartially enforced. I also understand that willful and/or repeated violations will result in my being dismissed from the lab.

____________________	____________________
Date	Signed
____________________	____________________
Lab Supervisor Signature	Department & Lab Info

APPENDIX F
LISTS OF PARTICULARLY HAZARDOUS SUBSTANCES (PHS's)

As noted in Section 8 above, OSHA generally defines Particularly Hazardous Substances (PHS's) as chemicals that are select carcinogens, reproductive toxins, or have a high degree of acute toxicity. While sections 7 and 8 of this CHP describe how the use of PHS's may be facilitated, the information below identifies those chemicals falling within either the Type 1 or Type 2 PHS category.

Type 1 PHS's
Type 1 PHS's include a number of chemical types regulated by the US EPA/NYS DEC or the US Department of Homeland Security, where the quantity of the chemical is controlled (either in the chemical's virgin state or following waste generation) at 10 pounds or less, as follows:

EPA/NYS DEC Acutely Toxic Chemicals (P-Listed and some F-Listed)
P-listed (and some F-listed) chemicals are generally considered to be those of a high degree of acute toxicity. Since the College is regulated as a "Small Quantity Generator" of hazardous waste, it may neither generate nor store more than 1 kg of acutely toxic hazardous waste on campus during any calendar month. See this LINK for a listing of all acutely toxic chemicals which may result in the generation of a P-listed waste under the federal EPA regulations. Additionally, the NYS DEC considers a number of F-listed spent solvents to be acutely toxic, even though they are not on EPA's P-list. They principally include dioxin precursors, such as tri-, tetra- or pentachlorophenol (2,4,5 or 2,4,6). For the purposes of conformance with this procedure, any chemical on the P-list, as well as tri-, tetra- or pentachlorophenol (2,4,5 or 2,4,6), are considered to be a Type 1 PHS.

EPA/NYS DEC List of Extremely Hazardous Substances
The EPA/NYS DEC regulates the possession of certain chemicals on what's called the "Extremely Hazardous Substances" (EHS) list. Possession of any chemical on this list at or above the threshold planning quantity (TPQ) obligates the College to notify state, county and local emergency response personnel within one month of possession. While the College must traditionally notify such authorities of the possession of any chemical at or above the default TPQ of 10,000 pounds on an annual basis, TPQ's for chemicals on the EHS Substance list are often as low as 10 pounds. This LINK may be consulted to view the entirety of the EHS list. For the purposes of conformance with this procedure, any chemical on this EHS list that has a TPQ of 10 pounds or less is considered to be a Type 1 PHS.

US Department of Homeland Security
The US DHS's "Chemicals of Interest" list is a grouping of nearly 350 chemicals, whereupon possession of any listed chemical above a certain quantity or concentration threshold mandates various security measures be enacted by the College. While the College is in possession of many of the chemicals on this list, it does not currently possess any at or above the technical screening thresholds, and is determined to maintain this status to avoid the additional mandated security provisions. See this LINK for an overview of the entirety of the DHS "Chemicals of Interest" list. For the purposes of both simplification and conformance with this procedure, the following 3 chemicals in the table below are considered to be a Type 1 PHS, where procurement, possession and use is stringently regulated. Therefore, additional discussions must be undertaken between lab supervisors and EHS prior to procurement.

Acetone cyanohydrin	Aluminum phosphide	Phosphorous pentasulfide

Hydrofluoric Acid
Based upon the toxicity and physical hazards associated with hydrofluoric acid, the College has made the determination that HF is also considered to be a Type 1 PHS.

Type 2 PHS's

Type 2 PHS's typically include chemicals recognized as being carcinogenic by OSHA or other consensus organizations. However, unlike Type 1 PHS's, Type 2 PHS's do not have quantity restrictions associated with them, and are much more common to academic laboratory environments.

OSHA Carcinogens

OSHA has identified 30 chemicals in their health standards that are commonly referred to as the "OSHA Carcinogens". While some of these chemicals are only found in industrial environments (like coke oven emissions and cotton dust), other chemicals are regularly used in College labs. See this LINK for the specific list of OSHA Carcinogens. Any chemical on this list is considered to be a Type 2 PHS.

Other PHS Considerations and Lists

The information provided in this appendix is intended to identify those chemicals which are both highly hazardous and regulated by any of a number of federal or state agencies, each for various reasons. However, there are many other chemical types that would meet the definition of highly hazardous in the general sense, but for one reason or another are not regulated to the same extent. To that end, the use of the PHS procedure for other highly hazardous chemicals not as stringently regulated is considered to be a best management practice that laboratory personnel should consider. Below are some important links regarding carcinogens, mutagens and teratogens that should be consulted for inclusion in the PHS procedure:

- National Toxicology Program Report on Carcinogens
- International Agency for Research on Cancer
- California Reproductive Toxins List

CDC/USDA Select Agents & Toxins List

The CDC/USDA regulates the possession of a number of viruses, bacterial lines, and toxins derived from biological sources. At this time, the College is restricted from procuring or possessing **ANY** agents/toxins on this list without having first been authorized by the US Department of Justice, as well as establishing a number of additional managerial and technical safeguards. As such, this list is provided for informational purposes only: CDC/USDA Select Agents & Toxins List

APPENDIX G

PARTICULARLY HAZARARDOUS SUBSTANCE USE APPROVAL FORM

Lab Supervisor Name	**Department**

1. Substance Information

A. Chemical name: CAS number:

B. ☐ Carcinogen ☐ Reproductive Toxin ☐ High Acute Toxicity

C. Estimated Rate of Use (e.g., grams/month):

D. MSDS reviewed and readily available ☐

2. Hazards

Physical Hazards

A. Flammable ☐ B. Corrosive ☐ C. Reactive ☐

D. Stability (e.g., decomposes, forms peroxides, polymerizes, shelf-life concerns) ☐

E. Temperature sensitive ☐ Stable ☐ Unstable F. Known incompatibilities:

Health Hazards

G. Significant Route(s) of Exposure

Inhalation Hazard ☐

Skin Absorption ☐

H. Sensitizer ☐

3. Procedure

A. Briefly describe how the material will be used

B. Vacuum system used ☐

C. If yes, describe method for trapping effluents:

4. Engineering Controls

Ventilation/Isolation

A. Hood required ☐ Yes ☐ No *See hood sticker for the following information*

If yes, hood currently operates at 90 - 120 feet per minute face velocity ☐ Yes ☐ No

Hood number:

B. Glove box required ☐ Yes ☐ No C. Vented gas cabinet required ☐ Yes ☐ No

5. Personal Protective Equipment (PPE) *(Check all that apply)*

☐Safety glasses ☐ Chemical splash goggles ☐Face shield

☐Gloves (type:) ☐Lab coat ☐Chemical Splash Apron

☐Respirator (*requires approval)*

☐Other, please describe:

6. Location/Designated Area

A. Building: B. Room/Lab #:

C. Describe below the area where substance(s) will be used and the method of posting as a designated area.

D. Location where substances will be stored:

E. Storage Method/Precautions

☐refrigerator/freezer ☐hood
☐double containment ☐vented cabinet
☐flammable liquid storage cabinet ☐other, describe:

7. Emergency Equipment

A. Spill control materials readily available ☐ Yes ☐ No

B. First aid equipment readily available ☐ Yes ☐ No

C. Any specialized spill/first aid equipment needed ☐ Yes ☐ No

If so, describe:

8. Waste Disposal

A. In-lab neutralization ☐ Yes ☐ No B. Deactivation ☐ Yes ☐ No

C. Dispose as hazardous waste ☐ Yes ☐ No

If yes, estimate rate of waste generation (e.g., grams or liters/month):

9. Authorization

This individual has demonstrated an understanding of the hazards of the listed substance and plans to handle the substance in a manner that minimizes risk to health and property. He/she is authorized to use the substance in the manner described

Lab Supervisor Signature/Date	**DCHO Signature/Date**

EHS Approval: Name	**Signature**	**Date**

APPENDIX H
KEY TO USING THE PHS USE APPROVAL FORM

Most of the information required as follows can be obtained from the appropriate MSDS sheet for the chemical product to be utilized.

1. Substance Information

A. Enter name and CAS (Chemical Abstract Service) number of the PHS.
B. Carcinogen: if on IARC, OSHA or NTP list; Reproductive toxin: mutagens, teratogens, embryotoxins; High Acute Toxicity: oral LD50 ≤ 50 mg/kg, skin LD50 ≤ 200 mg, air LC50 ≤ 200 ppm or ≤ 2 mg/l.
C. Self-explanatory
D. MSDS must be available in hard copy.

2. Hazards

A. Flammable liquid: flashpoint ≤ 100° F; Flammable solid: liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or which can be ignited readily and when ignited burns vigorously
B. Corrosive: Causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact (pH equal to or less than 2.0, or equal to or greater than 12.5)
C. Reactive: May become unstable or contact with water produces flammable or toxic gas.
D. Unstable: substance will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shock, or high or elevated pressure or temperature. Also includes time-sensitive materials, particularly those that produce peroxides over time.
E. Temperature Sensitive: Must be kept within a certain temperature range to ensure stability.
F. Known Incompatibilities: List chemicals or materials that might cause instability or adverse conditions if mixed with the particularly hazardous substance(s).
G. Inhalation: inhalation of the substance may cause adverse health effects.
   Skin exposure: substance is readily absorbed through skin, or can cause damage to skin upon contact.
H. Sensitizers: Likst any chemicals known to effect the immune system, causing a person to experience allergic reactions, up to and including anaphylactic shock, upon exposure to the chemical, after the initial sensitization.

3. Procedure

A. Briefly describe the part of the experimental procedure that involves the substance, with particular attention to how the chemical will be manipulated.
B. Vacuum systems include central vacuum systems and vacuum pumps within the lab.
C. Describe what will be done to ensure that the substance is not accidentally drawn into the vacuum system. Cold traps or filters are some examples of such measures.

4. Engineering Controls

A. A fume hood should be used for chemicals that may produce vapors, mists, or fumes, or if the procedure may cause generation of aerosols. The hood must have an average face velocity of between 90 and 120 feet per minute. This measurement is noted on the hood survey sticker or flow monitor. The hood number is noted on the top of the fume hood inspection sticker.
B. A glove box should be used if protection from atmospheric moisture or oxygen is needed or when a fume hood may not provide adequate protection from exposure to the substance; e.g., a protection factor of 10,000 or more is needed.
C. Highly toxic gases must be used and stored in a vented gas cabinet connected to a laboratory exhaust system. Gas feed lines operating above atmospheric pressure must use coaxial tubing.

5. Personal Protective Equipment (PPE)

A. Safety glasses protect from flying particles and minor chemical splashes, i.e. opening a centrifuge tube.
B. Chemical splash goggles should be worn when there is a possibility of a significant chemical splash. Most chemical manipulations, particularly where pressure is involved, warrant chemical splash goggles.
C. Face shield, worn with splash goggles, provides full-face protection when working with large volumes of chemicals, or as a secondary means of eye protection.
D. Gloves should be worn when working with any particularly hazardous substance. Since not all gloves offer significant protection from every chemical, it is important to choose the glove that offers the best resistance. See the MSDS, or glove manufacturer compatibility charts for more information.
E. Lab coats should be worn when working with hazardous substances likely to splash, or when there is the need to take additional precautions to protect skin and clothing (like the use pyrophoric and water reactive chemicals). The coat should not be worn outside the laboratory and should be laundered separately from other clothing.
F. Aprons offer chemical resistance/protection from splashes and can be used in conjunction with a lab coat.
G. Respirators offer protection from inhalation of substances when engineering controls are not sufficient or not available. However, the use of respirators requires inclusion in the College's Respiratory Protection Program (including medical surveillance), and as such, the use of respirators must be approved by the Director of EP&S.

6. Location/Designated Area

A. A and B. Building and room number where the substance will be used.
C. Describe where in this room the substance will be used. For example, in a hood, on a specific benchtop, in several areas of the laboratory, etc. This room or area must be posted with a Designated Area sign available through your department Chemical Hygiene Officer or the Science Stockroom Coordinator.
D. Describe where the substance will be stored. Be specific, e.g, on a shelf, in a refrigerator, in a hood, etc.
E. Self-explanatory. Double containment means that the container will be placed inside another container that is capable of holding the contents in the event of a leak and provides a protective outer covering in the event of contamination of the primary container.

7. Emergency Equipment

A. A and B. Self-explanatory.
C. Describe what, if any, special emergency equipment is staged and/or available in the event of an accident. For example, the use of a 2.5% calcium gluconate gel as a topical neutralizing agent for dermal exposures to hydrofluoric acid.

8. Waste Disposal

A. Some corrosive chemicals may be neutralized before disposal via the drain or the hazardous waste program.
B. Some materials, such as ethidium bromide, can be chemically deactivated before disposal via the drain or the hazardous waste program.
C. Self-explanatory.

APPENDIX I
HAMILTON COLLEGE SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Report to be completed by employee's/student's supervisor within 24 hours of the accident, and routed to HR or EHS upon completion. If hospitalization is required, notify HR immediately (or Campus Safety if outside of business hours; they will notify HR).

Check One	☐ Employee	☐ Student Employee	☐ Student	☐ Other/Visitor

Name:	Age:	Time of Accident: am/pm	Date of Accident:	Returned to Work? ☐ Yes ☐ No

Job Classification/Department:	Job Assignment When Injured:	Location of Accident (Specific):

Nature of Injury:	Was 1st Aid Administered? ☐ Yes ☐ No				
	If yes, by who?	☐ Campus Safety	☐ HCEMS	☐ Self	☐ Other

Disposition of Injured Person:	☐ Went to a hospital/urgent care. If so, which one?		
	If hospital, how?	☐ Escorted by campus personnel	☐ Ambulance
	☐ Went to Health Center (for students)	☐ None of the above (i.e. 1st Aid only)	

Detailed description of accident (what happened)?

____

____

Primary cause of accident (why did it happen)?

____

Injury cause types (check all that apply):

☐ Struck by Tool/Object	☐ Slip/Trip/Fall	☐ Chemical Exposure (Other Route)
☐ Struck Against	☐ Falling/Flying Debris	☐ Faulty Equipment
☐ Strain or Overexertion	☐ Caught On/In Between	☐ Inexperience
☐ Repetitive Motion	☐ Hot/Cold Contact Exposure	☐ Safety Rule Violation
☐ Laceration	☐ Chemical Exposure (Inhalation)	☐ Inattention to Job

☐ Other (describe):

When was supervisor informed of accident?	Were any witnesses present?
Was any equipment involved?	If yes, was there any equipment damage?

Supervisor's/instructor's investigation findings and corrective action recommended/taken to prevent recurrence:

____

____

Investigation completed by:	Name:	Date of investigation:
	Signature:	_____/_____/_____
Report reviewed by (HR or EHS)	Name:	Date of review:
	Signature:	_____/_____/_____

APPENDIX J
HAMILTON COLLEGE SIGNIFICANT EXPOSURE INCIDENT REPORT
(For Bloodborne Pathogens, Sharps & Other Biohazard Incidents)

Section 1—Exposure Incident Details	
Name of Person Exposed:	
Date of Incident:	Time of Incident:
Location:	Body Part(s) Exposed:
Details of Exposure Incident (including routes of exposure, how exposure occurred, source of any fluid(s), nature of any chemical contamination, etc.):	
Name of Person Completing This Section:	

Section 2—Internal/On-Campus Medical Assessment (Health Center, HCEMS, Campus Safety)		
Name of Person Making Assessment:		
Date and Time of Assessment:		
Was the exposure incident determined to be significant?	☐ Yes	☐ No—1st Aid Only
Was the exposed person referred for an external medical evaluation?	☐ Yes	☐ No
If yes, where were they seen, by who and when (complete information below)?		

Notes:

- This is a <u>confidential</u> form, and the information contained herein should only be released on a need-to-know basis.
- If the exposure was determined to be a "1st Aid Incident" only, this form should be submitted to the offices of Human Resources and Environmental Protection & Safety for recordkeeping and any necessary follow-up.
- If the exposure was determined to be "Significant", Human Resources (and the Student Health Center in the event a student was involved) will be responsible for interacting with medical professionals and Hamilton's insurance carrier for any necessary mitigation activities. Further, within 15 days of the medical evaluation, a written medical opinion must be provided to the injured person, in accordance with the OSHA Bloodborne Pathogen Standard. See this <u>Link</u> for more information.

APPENDIX K
GENERAL GLOVE SELECTION CHART

Type	Advantages	Disadvantages	Use Against
Natural rubber	Low cost, good physical properties, dexterity	Poor vs. oils, greases, organics. Frequently imported; may be poor quality	Bases, alcohols, dilute water solutions; fair vs. aldehydes, ketones.
Natural rubber blends	Low cost, dexterity, better chemical resistance than natural rubber vs. some chemicals	Physical properties frequently inferior to natural rubber	Same as natural rubber
Polyvinyl chloride (PVC)	Low cost, very good physical properties, medium cost, medium chemical resistance	Plasticizers can be stripped; frequently imported may be poor quality	Strong acids and bases, salts, other water solutions, alcohols
Neoprene	Medium cost, medium chemical resistance, medium physical properties	NA	Oxidizing acids, anilines, phenol, glycol ethers
Nitrile	Low cost, excellent physical properties, dexterity	Poor vs. benzene, methylene chloride, trichloroethylene, many ketones	Oils, greases, aliphatic chemicals, xylene, perchloroethylene, trichloroethane; fair vs. toluene
Butyl	Speciality glove, polar organics	Expensive, poor vs. hydrocarbons, chlorinated solvents	Glycol ethers, ketones, esters
Polyvinyl alcohol (PVA)	Specialty glove, resists a very broad range of organics, good physical properties	Very expensive, water sensitive, poor vs. light alcohols	Aliphatics, aromatics, chlorinated solvents, ketones (except acetone), esters, ethers
Fluoro-elastomer (Viton)	Specialty glove, organic solvents	Extremely expensive, poor physical properties, poor vs. some ketones, esters, amines	Aromatics, chlorinated solvents, also aliphatics and alcohols
Norfoil (Silver Shield)	Excellent chemical resistance	Poor fit, easily punctures, poor grip, stiff	Use for Hazmat work

APPENDIX K-1
GLOVE TYPE AND CHEMICAL RESISTIVITY

* Limited Service	VG= Very Good	G= Good	F=Fair	P=Poor (not recommended)

Chemical	Neoprene	Natural Latex Rubber	Nitrile
*Acetaldehyde	VG	G	G
Acetic acid	VG	VG	VG
*Acetone	G	VG	P
Ammonium hydroxide	VG	VG	VG
*Amyl acetate	F	P	P
Aniline	G	F	P
*Benzaldehyde	F	F	G
*Benzene	F	F	P
Butyl acetate	G	F	P
Butyl alcohol	VG	VG	VG
Carbon disulfide	F	F	F
*Carbon tetrachloride	F	P	G
Castor oil	F	P	VG
*Chlorobenzene	F	P	P
*Chloroform	G	P	P
Chloronaphthalene	F	P	F
Chromic Acid (50%)	F	P	F
Citric acid (10%)	VG	VG	VG
Cyclohexanol	G	F	VG
*Dibutyl phthalate	G	P	G
Diesel fuel	G	P	VG
Diisobutyl ketone	P	F	P
Dimethylformamide	F	F	G
Dioctyl phthalate	G	P	VG
Dioxane	VG	G	G
Epoxy resins, dry	VG	VG	VG
*Ethyl acetate	G	F	F
Ethyl alcohol	VG	VG	VG
Ethyl ether	VG	G	G
*Ethylene dichloride	F	P	P
Ethylene glycol	VG	VG	VG
Formaldehyde	VG	VG	VG
Formic acid	VG	VG	VG
Freon 11, 12, 21, 22	G	P	G
*Furfural	G	G	G
Gasoline	G	P	VG
Glycerine	VG	VG	VG
Hexane	F	P	G
Hydrochloric acid	VG	G	G
Hydrofluoric acid (48%)	VG	G	G
Hydrogen peroxide (30%)	G	G	G
Hydroquinone	G	G	F
Isooctane	F	P	VG
Isopropyl alcohol	VG	VG	VG
Kerosene	VG	F	VG
Ketones	G	VG	P

Chemical	Neoprene	Natural Latex Rubber	Nitrile
Lacquer thinners	G	F	P
Lactic acid (85%)	VG	VG	VG
Lauric acid (36%)	VG	F	VG
Lineoleic acid	VG	P	G
Linseed oil	VG	P	VG
Maleic acid	VG	VG	VG
Methyl alcohol	VG	VG	VG
Methylamine	F	F	G
Methyl bromide	G	F	F
*Methyl chloride	P	P	P
*Methyl ethyl ketone	G	G	P
*Methyl isobutyl ketone	F	F	P
Methyl methacrylate	G	G	F
Monoethanolamine	VG	G	VG
Morpholine	VG	VG	G
Naphthalene	G	F	G
Naphthas, aliphatic	VG	F	VG
Naphthas, aromatic	G	P	G
*Nitric acid	G	F	F
Nitromethane (95.5%)	F	P	F
Nitropropane (95.5%)	F	P	F
Octyl alcohol	VG	VG	VG
Oleic acid	VG	F	VG
Oxalic acid	VG	VG	VG
Palmitic acid	VG	VG	VG
Perchloric acid (60%)	VG	F	G
Perchloroethylene	F	P	G
Petroleum distillates-naphtha	G	P	VG
Phenol	VG	F	F
Phosphoric acid	VG	G	VG
Potassium hydroxide	VG	VG	VG
Propyl acetate	G	F	F
Propyl alcohol	VG	VG	VG
Propyl alcohol (iso)	VG	VG	VG
Sodium hydroxide	VG	VG	VG
Styrene	P	P	F
Stryene (100%)	P	P	F
Sulfuric acid	G	G	G
Tannic acid (65%)	VG	VG	VG
Tetrahydrofuran	P	F	F
*Toluene	F	P	F
Toluene diisocyanate	F	G	F
*Trichloroethylene	F	F	G
Triethanolamine	VG	G	VG
Tung oil	VG	P	VG
Turpentine	G	F	VG
*Xylene	P	P	F

APPENDIX L
WRITTEN LABORATORY HAZARD EVALUATION & CHECKLIST FOR PERSONAL PROTECTIVE EQUIPMENT (PPE) USE

PPE, especially when used in a laboratory environment, should be the final step in ensuring workplace hazards are controlled, and complement any/all engineering, administrative, procedural and other safe work practice controls implemented first. Laboratory faculty/supervisors should use form L-1, L-2, or some other comparable strategy to facilitate written laboratory hazard evaluations as required by OSHA, to ensure any actual or potential hazards associated with work in teaching, research or other lab work areas are properly identified and remedied, so as to avoid injury or illness.

The Hazard Evaluation Process

<u>Step 1</u>
Identify the type of lab or lab-related activity to be evaluated, and list any relevant experiment or process information necessary to provide an overview. You may choose to specify any other procedural controls or limitations to which the evaluation will apply in this section as well (i.e. do's and don'ts).

<u>Step 2</u>
Identify and describe the types of lab hazards to which personnel may be exposed in the lab, as well as the PPE control measures to be employed, within each potential hazard category (eye/face, hand, body/skin, respiratory, and misc/other hazards). Please be as specific as possible.

- Special note 1—if you intend on using a chemical regulated as a Type 1 PHS, conformance with Sections 7 and 8, and Appendices F and G of the CHP is required. This process includes specific information on PPE requirements associated with the Type 1 PHS, and need not be duplicated within this hazard evaluation.
- Special note 2—if you need additional guidance on chemical compatibility/resistivity for gloves used to protect the hands, look at Appendix K of the CHP, or either of the two resources listed below:
  - Microflex Glove Chemical Resistivity Guide
  - Generic Chemical Resistivity Guide

<u>Step 3</u>
Certify the completion of the hazard evaluation process in the box on the final page with your signature and date.

Implementing the Written Laboratory Hazard Evaluation

Upon completion of the laboratory hazard evaluation, it should be used as follows:

- Train personnel who must wear PPE associated with the hazard evaluation, ensuring you address:
  - Types of PPE to be used during the lab activities, when PPE is necessary and how to obtain it in the lab.
  - How to wear, adjust, and use PPE for this lab.
  - How to properly care/maintain, useful life, and disposal of PPE for this lab.
  - Limitations of the PPE for this lab.
  - Other PPE safe work practices (i.e. avoiding cross-contamination by not wearing PPE outside of lab areas, not contacting computers, phones or the like while wearing gloves, etc.)
- Make the hazard evaluation available and document the conduct of PPE training, as follows:
  - For teaching labs, post the completed laboratory hazard evaluation in the lab itself, or include it as a part of the lab materials. While it is not necessary to document the training of students not covered by OSHA, Appendix C of the CHP may be used for such purposes.
  - For research labs and all other types of lab activity where PPE is to be used, employees or restricted personnel (research students, TA's, etc.) should possess or have access to a copy of the hazard evaluation within their assigned lab workstation. Training should be documented by including the hazard evaluation with an individual's completed Appendix D training form.

Appendix L-1—Written Laboratory Hazard Evaluation & Checklist for PPE Use

I am reviewing (check the appropriate box)	☐ **Teaching Lab**	**Course #, Lab Section and Lab/Room #:**
	☐ **Research Lab**	**Research Project, PI and Lab/Room #:**
	☐ **Other**	**List Relevant Details:**
Your name (print):		**Dept:**
Lab Activity/Experiment/Process Details:		

Eye/Face Hazards		**Description of Hazard(s)**	**PPE Required**
	☐ **Chemicals** ☐ **Biological Agents** ☐ **Impact/Flying Debris** ☐ **Thermal/Cryogens** ☐ **Radiological** ☐ **Lasers** ☐ **Welding/Soldering** ☐ **Other:**		

Hand Hazards		**Description of Hazard(s)**	**PPE Required**
	☐ **Chemicals** ☐ **Biological Agents** ☐ **Thermal/Cryogens** ☐ **Radiological** ☐ **Laceration/Injection** ☐ **Crush/Pinch** ☐ **Other:**		

Body/Skin Hazards		Description of Hazard(s)	PPE Required
	☐ Chemicals ☐ Biological Agents ☐ Radiological ☐ Thermal/Cryogens ☐ Laceration/Injection ☐ Crush/Pinch ☐ Other:		

Respiratory Hazards		Description of Hazard(s)	PPE Required
	☐ Gases/Vapors ☐ Fogs/Mists ☐ Dusts/Particulates ☐ Fumes ☐ Bio-Aerosols ☐ Nanoparticles ☐ Other:		

Check appropriate box if respiratory hazards are intended to be controlled wholly through engineering controls:	☐ Fume Hood ☐ Biological Safety Cabinet	☐ Glove Box/Isolation ☐ Other:

Misc/Other Hazards		Description of Hazard(s)	PPE Required
	☐ Electrical ☐ Foot/Feet ☐ Noise ☐ UV/IR Radiation ☐ Other:		

Certification	I hereby certify that the above laboratory hazard assessment was performed to the best of my ability and knowledge, as per OSHA regulations and the Hamilton College Chemical Hygiene Plan, based upon the known or expected hazards present in the lab/lab activity.

Signature:		**Date:**	

APPENDIX L-2
WRITTEN LABORATORY HAZARD EVALUATION & CHECKLIST FOR PERSONAL PROTECTIVE EQUIPMENT (PPE) USE

Laboratory faculty/supervisors (i.e. authorized personnel) should use this form/format so as to facilitate and achieve written laboratory hazard evaluations as required by OSHA. The goal is to ensure that any actual or potential hazards associated with work in teaching or research labs are properly identified, such that students and employees fully understand the PPE control measures to employ to avoid injury/illness.

Faculty/Supv. Name:	**Department:**
Faculty/Supv. Signature:	**Date of Assessment:**
☐ **Teaching Lab**	**List Course #, Lab Section and Lab/Room #:**
☐ **Research Lab**	**List Project/Scope of Work, Researcher Names and Lab/Room #:**

STEP 1: Hazard Identification		
Review and list the chemical (or biological) hazards associated with the lab activity.		**Initials:** ________
STEP 2: Selection of Personal Protective Equipment Control Strategies From Table M-1 Below		
Review Table L-2 below, and identify the typical PPE control strategies to be utilized (otherwise, you may list the specific PPE control measures)	Table M-1 Typical PPE Control Measures: Other Specific PPE Control Measures:	**Initials:** ________
STEP 3: Lab Specific Training for Personal Protective Equipment		
Train lab personnel on the type and variety of PPE to be used, as follows:	• What types of PPE are used in the lab. • When is PPE necessary in the lab. • How to obtain PPE for this lab. • How to wear, adjust, and use PPE for this lab. • How to properly care/maintain, useful life, and disposal of PPE for this lab. • Limitations of the PPE for this lab. • Proper PPE practices including not wearing PPE outside of lab hazard areas (i.e. in hallways and eating areas)	**Initials:** ________
STEP 4: Documentation		
• Post a copy of this written laboratory hazard evaluation within the lab, and maintain a copy for future reference.		
• Deliver original signed laboratory hazard evaluation to the Departmental Chemical Hygiene Officer for permanent recordkeeping and retention.		

TABLE L-2: EXAMPLE GENERIC PPE CONTROL STRATEGIES

Control Strategy	Activity	Potential Hazards	Recommended PPE
A	Low/no hazardous activity (i.e. lab instruction or training)	None	None
B	Work with small volumes (<1 liter) of low hazard chemicals or simple flammables (ethanol) with no splash hazard.	Eye or skin damage.	Safety glasses, light chemical-resistant gloves.
C	Work with small volumes (<1 liter) of common corrosive liquids.	Eye or skin damage.	Safety goggles, light chemical-resistant gloves, lab coat.
D	Work with moderate volumes (>1 liter) of common corrosive liquids, or where any corrosive splash hazard exists.	Poisoning, increased potential for eye or skin damage.	Safety goggles, light chemical-resistant gloves, lab coat and chemical resistant apron.
E	Work with moderate volumes (>1 liter) of simple flammables (alcohols), or work with any volume of poisonous organic solvents (without splash hazards).	Skin or eye damage, potential poisoning through skin contact.	Safety goggles, light chemical-resistant gloves, lab coat.
F	Work with moderate volumes (>1 liter) of simple flammables (alcohols), or work with any volume of poisonous organic solvents (with splash hazards).	Major skin or eye damage, potential poisoning through skin contact, and fire.	Safety goggles, light chemical-resistant gloves, lab coat and chemical resistant apron.
G	Work with moderately toxic or hazardous chemicals (solid, liquid, or gas).	Eye or skin damage, potential poisoning through skin contact.	Safety glasses, light chemical-resistant gloves, lab coat.
H	Work with acutely toxic or hazardous chemicals (solid, liquid, or gas).	Increased potential for eye or skin damage, increased potential poisoning through skin contact.	Safety goggles, heavy chemical-resistant gloves, lab coat.
I	Work with Biosafety Level 1 materials.	Eye or skin damage.	Safety glasses, light chemical-resistant gloves.
J	Work with Biosafety Level 2 materials.	Increased potential for eye or skin damage, increased potential poisoning through skin contact.	Safety glasses, light chemical-resistant gloves, lab coat.
K	Work with an apparatus with contents under pressure or vacuum.	Eye or skin damage.	Safety glasses or goggles, face shield for high risk activities, chemical-resistant gloves, lab coat, chemical-resistant apron for high risk activities.
L	Work with air or water reactive chemicals.	Severe skin and eye damage, and fire.	Work in inert atmosphere, when possible. Safety goggles, chemical-resistant gloves, lab coat, flame resistant lab coat for high risk activities (e.g. Nomex), and chemical-resistant apron for high risk activities.
M	Work with potentially explosive chemicals or reactions.	Splash, detonation, flying debris, skin and eye damage, fire.	Safety glasses, face shield and/or blast shield, heavy gloves, flame-resistant lab coat for high risk activities (e.g. Nomex).
N	Work with low and high temperatures (cryogens, heated materials).	Burns, splashes, fire.	Safety glasses, face shield (when dispensing), lab coat, thermally insulated gloves.
O	Minor chemical spill cleanup.	Skin or eye damage, respiratory damage.	Safety glasses or goggles, light chemical-resistant gloves, lab coat, chemical-resistant apron and booties for high risk activities, dust mask (as needed).

HAMILTON COLLEGE
ENVIRONMENTAL HEALTH & SAFETY PROCEDURES
APPENDIX M

DOOR POSTING TO FACILITATE ADDITIONAL LABORATORY ACCESS PRIVELEGES FOR RESTRICTED PERSONNEL

Restricted laboratory personnel include those students involved in research or senior-thesis type lab activities, and are subject to the provisions of Section 2 of the College's Chemical Hygiene Plan. If restricted personnel cannot be directly supervised by authorized/qualified personnel while working in this lab, they may not engage in active work with occupational or environmental lab hazards, and must work under the buddy system.

Department	
Lab #	
Hours of Access Privileges	
Duration of Permission	

In recognition of the above, the following restricted personnel have been granted access privileges to the lab noted above, at times and for durations as specified:

Student Name	Student Signature

As the authorized person (principal investigator) primarily responsible for lab safety in the lab noted above, I ___________________________________ (print name) authorize the restricted personnel noted on this form to utilize my lab space in a manner consistent with the College's written Chemical Hygiene Plan. I further submit that all restricted personnel with additional access privileges are properly trained on the appropriate work practices and other relevant lab/facility emergency control measures associated with their work.

______________________________ Authorized Person/Principal Investigator Signature	______________ Date
Contact info where I can be reached in an emergency: Home phone number: Cell phone number:	