CHEMICAL HYGIENE PLAN

NEW YORK INSTITUTE OF TECHNOLOGY

OLD WESTBURY AND MANHATTAN CAMPUSES

NEW YORK

CHEMICAL HYGIENE PLAN
NEW YORK INSTITUTE OF TECHNOLOGY
OLD WESTBURY/MANHATTAN CAMPUSES
NEW YORK

Chemistry, Biology, Biomedical Science, and Life Sciences Laboratories

April 2017

Kristen Panella
Director
Office of Environmental Health & Safety
New York Institute of Technology

Dr. Larry Stepp
Chemical Hygiene Officer
NYIT College of Osteopathic Medicine
NYIT Old Westbury Campus

Dr. Niharika Nath
Department Chair
NYIT Life Sciences
NYIT Manhattan and Old Westbury Campuses

Maciej Kapczynski
Chemical Hygiene Officer,
NYIT Life Sciences
NYIT Manhattan Campus

Gary Mintz
Chemical Hygiene Officer,
NYIT Life Sciences
NYIT Old Westbury Campus

CONTACT LIST

For all emergencies, contact Campus Security at:

Old Westbury: (516) 686-7789

Manhattan: (646) 273-7789

For emergencies that occur in the following departments, also contact the following individuals:

Department	Contact	Phone Numbers
NYIT Life Sciences	Niharika Nath Chemical Hygiene Officer	(212) 261-1623 (office)
NYIT College of Osteopathic Medicine	Larry Stepp Chemical Hygiene Officer	(516) 686-3731 (office)
NYIT Life Sciences Manhattan Campus	Maciej Kapczynski Chemical Hygiene Officer,	(212) 261-1617 (office)
All Departments	Kristen Panella Office of Environmental Health and Safety	(516) 686-7731 (office)

Notification after 5:00 p.m.

Contact Campus Security at Old Westbury: 516-686-7789 and Manhattan: (646) 273-7789, who will notify the appropriate emergency response personnel.

Additional Emergency Phone Numbers:

Security	Old Westbury (516) 686-7789 Manhattan (646) 273-7789
Fire Department	911
Kristen Panella Director of Environmental, Health and Safety	(516) 686-7731 (office) (516) 250-9703 (cell)
William Marchand Director of Facilities	(516) 686-7904 (office) (516) 322-1122 (cell)
New York State Department of Environmental Conservation Spill Hotline	(800) 457-7362
New York State Department of Environmental Conservation – Region 1	(631) 444-0350
Nassau County Office of Emergency Management	(516) 573-0636
New York City Department of Environmental Protection	(212) 281-7400
National Response Center	(800) 424-8802
Police Department	(516) 626-1300 or 911
AARCO	(631) 586-5900
Triumvirate Environmental	1-800-427-3320
Miller Environmental	1-800-394-8606

CHEMICAL HYGIENE PLAN
NEW YORK INSTITUTE OF TECHNOLOGY
OLD WESTBURY, NEW YORK

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1.0 INTRODUCTION

1.1 Purpose

This Chemical Hygiene Plan (CHP) has been prepared and implemented at New York Institute of Technology's (NYIT) campuses located in Old Westbury and Manhattan, New York to satisfy the requirements of the Occupational Safety and Health Administration (OSHA) Laboratory Standard found at 29 CFR 1910.1450. The goal of this CHP is to protect laboratory personnel and students from health hazards associated with the use of hazardous materials in laboratory situations and to avoid exposure of laboratory personnel to substances in excess of the permissible exposure limits (PELs) adopted by OSHA.

This CHP has been prepared to allow individual laboratories to adopt the plan unchanged. However, it may be necessary to add components to the CHP that are specific to an individual laboratory. As a result, this CHP represents the ***minimum*** guidelines for the handling of hazardous chemicals on the campus. Individual laboratories are required to develop procedures that are more detailed as their specific situation warrants. In all situations, the Principal Investigator or Laboratory Supervisor will be responsible for enforcing safety measures in the laboratories under their supervision. An acknowledgement form is provided as Appendix A to document that laboratory personnel have reviewed the CHP and laboratory-specific Standard Operating Procedures (SOPs) and have received appropriate training. In order to assist faculty or staff in the development of laboratory-specific SOPs, templates have been developed and included as Appendix B of the document that must be used to complement this CHP. The pertinent sections of the templates, once complete, must be added to Section 12.0 of this CHP. Additional assistance in completing SOPs is available from the Chemical Hygiene Officer (CHO), as necessary.

1.2 General Principles

Some general principles that should be followed when implementing the guidelines of this CHP include:

- The CHP must include procedures that, if properly followed, are capable of protecting employees from chemical hazards and maintaining exposure below specified limits;
- The CHP must be readily available;
- The CHP must indicate specific measures to ensure employee protection; and
- The CHP must be reviewed and evaluated for its effectiveness at least once a year and between annual reviews, as needed.

This CHP conforms to the guidelines and recommendations of the National Research Council found at 29 CFR Section 1910.1450 - Occupational Exposure to Hazardous Chemicals in Laboratories, which should be followed in academic teaching laboratories as well as occupational laboratories.

It should be noted that this CHP applies to all NYIT personnel working in laboratories, including employees, students, visiting scientists and summer laboratory workers. All personnel are to follow the procedures set forth in this CHP. Faculty members advising or supervising student activities are responsible for ensuring good chemical hygiene practices of the students.

1.3 Scope and Applicability

At NYIT, the OSHA Laboratory Standard (as set forth at 29 CFR Section 1910.1450) applies to all employees and laboratory users engaged in the "laboratory use" of hazardous chemicals for either teaching or research. This Standard applies to research and teaching laboratories that carry out small-scale operations (such as those which can be handled safely and easily by one person) using multiple chemicals and procedures, where the procedures are neither a part of, nor simulate, a production process.

The Chemical Hygiene Plan encompasses the following NYIT Departments:

- NYIT Life Sciences
- NYIT College of Osteopathic Medicine

Chemical Hygiene Officers:

Manhattan Campus:

Maciej Kapczynski (212) 261-1617

Old Westbury Campus - NYIT Life Sciences:

Dr. Niharika Nath (212) 261-1623

Old Westbury Campus - NYIT College of Osteopathic Medicine:

Dr. Larry Stepp (516) 686-3731

Building/Room(s) at Old Westbury and Manhattan Campuses covered by the CHP:

Building	Room(s)	Department	Usage
Theobald Hall	402	NYIT Life Sciences	Biology 1 and 2, Embryology, Histology, Biomedical Research
Theobald Hall	404	NYIT Life Sciences	Microbiology, Genetics, Histology, Embryology, Human Physiology
Theobald Hall	406	NYIT Life Sciences	Biology Lab Prep Room
Theobald Hall	407	NYIT Life Sciences	Biomedical Research
Theobald Hall	408	NYIT Life Sciences	Biology1, BioChemistry, Organic Chemistry II
Theobald Hall	410	NYIT Life Sciences	Biology/Organic Chemistry, Organic Chemistry I, Chemistry II
Theobald Hall	412	NYIT Life Sciences	Chemistry Lab Prep Room
Theobald Hall	414	NYIT Life Sciences	Gen Chemistry I, Applied Chemistry
Theobald Hall	416	NYIT Life Sciences	Human Physiology, Human Gross Anatomy,
Theobald Hall	438	NYIT Life Sciences	Biomedical Research
Theobald Hall	440	NYIT Life Sciences	Chemical Stockroom
500 Building	502	NYIT School of Allied Health Professions	Physician Assistant
Rockefeller (NYCOM I)	210	NYIT College of Osteopathic Medicine	Biomedical Research
Rockefeller (NYCOM I)	215C	NYIT College of Osteopathic Medicine	Biomedical Research

Building	Room(s)	Department	Usage
Rockefeller (NYCOM I)	215D	NYIT College of Osteopathic Medicine	Biomedical Research
Rockefeller (NYCOM I)	215F	NYIT College of Osteopathic Medicine	Biomedical Research
Rockefeller (NYCOM I)	216A	NYIT College of Osteopathic Medicine	Medical Education
Rockefeller (NYCOM I)	216B	NYIT College of Osteopathic Medicine	Biomedical Research
Rockefeller (NYCOM I)	217	NYIT College of Osteopathic Medicine	Biomedical Research
Rockefeller (NYCOM I)	315A	NYIT College of Osteopathic Medicine	Biomedical Research
Rockefeller (NYCOM I)	315B	NYIT College of Osteopathic Medicine	Biomedical Research
Riland (NYCOM II)	B20-B27	NYIT College of Osteopathic Medicine	Animal Care
Riland (NYCOM II)	B13/B31	NYIT College of Osteopathic Medicine	Biomedical Research
Riland (NYCOM II)	various	NYIT College of Osteopathic Medicine	Clinic
Riland (NYCOM II)	015	NYIT College of Osteopathic Medicine	Biomedical Science
Riland (NYCOM II)	021	NYIT College of Osteopathic Medicine	Biomedical Research
Riland (NYCOM II)	024	NYIT College of Osteopathic Medicine	Biomedical Research
Riland (NYCOM II)	025	NYIT College of Osteopathic Medicine	Biomedical Research
Riland (NYCOM II)	031	NYIT College of Osteopathic Medicine	Biomedical Research
Riland (NYCOM II)	374	NYIT College of Osteopathic Medicine	Anatomy
WWTP	Lab	Facilities	Chemical
1855 Broadway, Manhattan, NY	901/901A	NYIT Life Science	Chemistry
1855 Broadway, Manhattan, NY	902/902A	NYIT Life Science	Biology

2.0 REGULATORY OVERVIEW

The OSHA Laboratory Standard applies to all employees and students engaged in the "laboratory use" of hazardous chemicals on NYIT Campuses. The following sections present the general requirements of the OSHA Laboratory Standard.

2.1 Exposure Limits

For OSHA-regulated substances, laboratory employees are required to adhere to the Action Levels, or in their absence, OSHA's Permissible Exposure Limits (PELs). Action Level means "*a concentration designated in 29 CFR 1910 for a specific substance, calculated as an 8-hour time-weighted average, which initiates certain required activities, such as exposure monitoring and medical surveillance.*"

2.2 Exposure Determination

Initial monitoring and periodic monitoring (as necessary) of employee exposures to OSHA-regulated substances is required when there is a *reason to believe* that an Action Level, or in its absence, a PEL, has been exceeded. Employees must be notified within 15 days of the results of the monitoring.

2.3 Chemical Hygiene Plan

OSHA requires that a CHP be developed and implemented to protect laboratory workers from health hazards associated with chemicals in the laboratory. The CHP is a written program that includes the policies, procedures and responsibilities to protect worker safety.

2.4 Employee Information and Training

Employees must be provided with information and training regarding the requirements of the OSHA Laboratory Standard, the CHP and the hazards of chemicals present in the work area.

This training must be provided whenever an employee is initially assigned to a laboratory area or when new hazards are introduced into an existing laboratory.

2.5 Medical Consultations/Examination

Laboratory employees shall be provided with medical examinations under the following conditions:

- When an employee develops signs or symptoms of exposure to a hazardous chemical in the laboratory;
- When monitoring reveals exposure in excess of an Action Level or Permissible Exposure Limit (PEL) for an OSHA-regulated substance for which there are exposure monitoring and medical surveillance requirements; or
- When an event, such as a spill, leak or explosion takes place, where there is a likelihood of exposure.

These examinations shall be provided at no cost to the employee. The name, address and phone number of the physician contracted with NYIT to provide these examinations can be obtained from the CHO.

2.6 Hazard Determination

Labels on incoming chemical containers must not be removed or defaced. Safety Data Sheets (SDSs) received with chemical shipments must be maintained on-file. For substances synthesized in the laboratory, a hazard determination must be made.

2.7 Respiratory Protection

NYIT maintains a written Respiratory Protection Program as required by 29 CFR 1910.134. NYIT employs engineering controls to maintain exposure levels below permissible limits established by OSHA, ACGIH, and NIOSH. However, in situations where respirators

may be required, the employee must request to use a respirator from the Environmental Health and Safety (EH&S) office. Prior to receiving a respirator the following steps must be completed:

- The employee must submit a medical questionnaire to NYIT's designated physician or other licensed health care professional (PLHCP)
- The employee must undergo a follow-up medical examination if required which may include medical tests (such as a pulmonary function test), consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination on an employee's ability to use a respirator.
- Upon receipt of a written recommendation from the PLHCP, NYIT will make a determination regarding the employee's ability to use a respirator. If approved, the employee must be fit tested and receive training in on the Respiratory Protection Standard, including respiratory hazards, types of respirators, and proper use and care of a respirator

All respirators shall be NIOSH approved. Fit testing must be conducted by NYIT or designee prior to employee's initial use of the respirator and then at least annually thereafter and whenever a different respirator (size, style, model or make) is used.

2.8 Recordkeeping

The results of training, exposure monitoring as well as medical consultations and exams must be maintained on file in accordance with 29 CFR 1910.1020. These records are maintained on file in the EH&S Office.

3.0 CHEMICAL HYGIENE PLAN ELEMENTS

The OSHA Laboratory Standard requires that the CHP, when implemented, be capable of protecting laboratory users (employees and/or students) from health hazards associated with chemicals in the laboratory and that it keep exposures below occupational exposure limits.* The CHP must be made readily available to all laboratory users, and must contain the following elements:

- Designation of personnel responsible for implementation of the CHP, including assigning a CHO.
- Standard Operating Procedures (SOPs) relevant to safety and health considerations to be followed when laboratory work involves the use of chemicals and/or biological materials. Criteria that the employer will use to determine and implement control measures to reduce exposure to hazardous materials including engineering controls, the use of personal protective equipment and hygiene practices. Particular attention shall be given to the selection of control measures for materials that are known to be extremely hazardous.
- A requirement that fume hoods and other protective equipment are functioning properly and specific measures to be conducted to ensure the proper and adequate performance of such equipment.
- Provisions for personnel information and training.
- Provisions for medical consultation and medical examination.
- Provisions for additional personnel protection for work with particularly hazardous substances.
- The circumstances under which a particular laboratory experiment, operation, procedure or activity shall require prior approval from the appropriate department chairperson before implementation.

* *At NYIT, these "occupational exposure limits" include either Threshold Limit Values (TLVs), which are established by the American Conference of Governmental Industrial Hygienists (ACGIH), or Permissible Exposure Limits (PELs) promulgated by Federal OSHA, whichever is LOWER.*

4.0 DESIGNATION OF RESPONSIBILITY

The following designates responsibility for implementation of the OSHA Laboratory Standard and this CHP at the NYIT Campuses:

- Laboratory User (this includes all NYIT employees, visiting scholars, other researchers and any student conducting research at NYIT and Teaching Assistants): These individuals are required to follow safe work practices and attend all required training. These individuals must be familiar with the CHP, as well as safety manuals unique to their laboratory. Laboratory users are responsible for following all safety SOPs and waste disposal procedures contained in this CHP while working at NYIT. Students must read the safety rules and sign the agreement form provided in Appendix C of this document.

- Laboratory Supervisor (faculty, a Principal Investigator (PI) or individual given charge of a laboratory): These individuals are responsible for ensuring that all employees and students in the laboratory follow the CHP, providing necessary hands-on training, developing the laboratory specific SOPs using the *Chemical Hygiene Plan Template* as it relates to their research, ensuring that the CHP is available to all users of the laboratory, and providing "prior approval," as necessary. A copy of the Chemical Hygiene Plan Template is provided as Appendix B of this document.

- Chairperson of each Science Department: These individuals are responsible for monitoring chemical hygiene within their department and taking corrective action as necessary.

- Chemical Hygiene Officer: This individual implements the laboratory CHP including the following:

  - Works with administrators, other employees and students to improve and implement the chemical hygiene policies and practices.

  - Monitors procurements, usage and disposal of chemicals used in the laboratories via Hazard Communication, Right-to-Know, and Resource Conservation and Recovery Act (RCRA) (Hazardous Waste Management) activities.

  - Ensures appropriate audits are conducted and results maintained by all departments.

  - Assists the faculty and staff in developing precautions and adequate facilities.

  - Knows the current legal requirements concerning regulated substances.

  - Seeks ways to improve the chemical hygiene program.

- Utilizes resources within NYIT and the community to develop and refine the CHP to keep the information up-to-date and assist in safety training.

- Develops implements and continues updating the chemical hygiene training program.

- In addition to the above, the Chairperson of each Science Department and the CHO are responsible for implementing and continuance of the CHP. This includes the following responsibilities:

  - Ensuring that all Laboratory Supervisors and their delegates know and follow the procedures contained in the CHP.

  - Ensuring that appropriate protective equipment is available and assign responsibility to ensure the proper working condition of the equipment.

  - Providing required annual training to all appropriate personnel.

  - Conducting regular, formal chemical hygiene and housekeeping inspections at least once per year within each laboratory, including routine inspections of emergency and ventilation equipment.

  - Knowing the current legal requirements concerning regulated substances used in the laboratories and incorporate any new regulations into the CHP.

  - Assisting in determining the required levels of protective apparel and equipment for employees and students engaged in laboratory activities.

  - Ensuring that available facilities are adequate for the use of any new material/ chemical being ordered, providing guidance on safe laboratory procedures and assisting with the annual review and update of the CHP.

- Dean (NYIT Life Sciences and NYIT College of Osteopathic Medicine): These individuals oversee their respective departments' compliance with the CHP, reviews reports from the CHO, initiates enforcement action for non-compliance with the CHP as appropriate and determines and assesses fiscal responsibility of the departments resulting from fines and/or damages stemming from non-compliance with the CHP.

- Chemical Hygiene Committee: This committee is an advisory body that annually reviews the CHP, reviews and recommends NYIT policy on laboratory safety, reviews compliance and accident reports, and formulates improvements to the CHP to reduce risk of recurrence.

5.0 STANDARD OPERATING PROCEDURES

The following Standard Operating Procedures (SOPs) are generic and apply to most laboratories where chemicals are used. These SOPs should be modified, as appropriate, for each specific laboratory utilizing the template provided in Appendix B of this document. SOPs specific to procedures and operations conducted in each laboratory must be developed and included in Section 12.0 of each laboratory's CHP. Specific laboratory SOPs (manuals) will be maintained by the class professor and/or principal investigator.

5.1 Emergency Procedures

5.1.1 Priorities

An emergency is any event that requires that work stop immediately and special procedures be implemented to protect life, health and/or property. The best time to know what to do in an emergency is before, not after, it happens. The best time to read this CHP is before laboratory work begins, prior to any potential fire or chemical spill. Although no single guide can possibly cover the range and combination of events that can constitute an emergency, the following emergency procedures and Appendix D, "Procedures for Handling Hazardous Incidents," will help personnel with the planning process that will best fit each laboratory's situation. Experimental protocols or written procedures must always include safety measures, and at times may need to include specific emergency procedures. In any case, all such emergency procedures will need to be practiced and reviewed periodically. Most emergencies will be small, consisting of a single unexpected event. More serious emergencies involve a series of events which stem from an initial incident, expanding in sequence. Under any circumstances, decisions may have to be made quickly, often without adequate information, in a context that may have no precedent. Personnel should use the best judgment available, and try to stay within the following general priorities:

LEAVE the area of danger. This is of paramount importance to enable rescuers to do what is necessary to sustain life. If the area includes other people's work space, make sure they leave as well. If equipment can be safely turned off during egress, do so.

ALERT all personnel that there is an emergency during egress.

EVACUATE the building, if necessary. Pull the fire alarm during egress to activate the fire alarm system.

CALL Campus Security from the nearest safe area (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789). Calling takes precedence over everything in all emergencies except evacuation. This also applies for seemingly minor emergencies; it is far better to make an occasional unnecessary call than to fail to call and needlessly endanger life or health. The individual should state their name, the location and nature of the emergency, whether an ambulance or firefighting equipment is needed, and any hazards that might threaten emergency response, and the phone number and location at the scene where they can be reached. After calling, individuals should stay off the phone. The only exception is in cases of poisoning, when the Poison Control Center may need to be called: 1-800-POISON1 (1-800-222-1222).

PROTECT the life and health of anyone who may be injured. The First Aid advice given in this CHP is contingent on rescue equipment and qualified personnel being 2 or 3 minutes away. Suitable modifications to the emergency procedures should be made if this is not feasible. After calling, all actions within the capabilities of on-site personnel should be performed to preserve life; however, personnel should not attempt to do more than the necessary first aid procedures unless the individual is specifically trained to do so. Subsequent steps will depend on the nature of the emergency and the assessment of its severity. In each of the following situations, all individuals should move to a safe place, summon help quickly, and try to protect the lives of those involved.

5.1.2 Injury

Ideally, only people with first aid training should render first aid assistance. In an emergency, however, untrained personnel may be better than none. Individuals should stay calm, do only what is necessary before trained help arrives, and follow these priorities:

REMOVE THE VICTIM FROM THE AREA OF DANGER – fire, spill, fumes, etc. If the victim is not conscious, **DO NOT ENTER THE AREA,** immediately "Call for help."

[NOTE: If the victim is in contact with electricity, he or she becomes "the area of danger." Avoid direct physical contact with the injured and the source of power; disconnect the power, or push/pull the victim away from the circuit with a non-conductive material (e.g., board, rope, etc.).]

CALL FOR HELP by dialing Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789). Always initiate the process to get trained medical help

before taking any other extensive action. For a serious injury (e.g., very heavy bleeding, chemical in eyes, etc.), the situation will often require brief stabilization before calling. Common sense will dictate this potentially difficult decision, but in no case should calling be delayed except for the most immediate life-threatening situation. If two individuals are available, one can call for help while the other remains with the injured.

Treat for **CHEMICAL CONTACT**. If the chemical was ingested, call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) and then the Poison Control Center (1-800-222-1222). Follow their instructions. If for some reason professional advice cannot be obtained, do not give the victim water, milk or anything else unless so directed by a Safety Data Sheet (SDS) or other text. Do not induce vomiting if the victim complains of pain or a burning sensation in the mouth or throat or if the ingested substance is known to be caustic, a cleaning fluid, or a petroleum product. Induce vomiting only if directed to do so by Poison Control. To induce vomiting, place the victim's head below the hips, position the mouth down or to the side, and place a finger at the back of the victim's throat.

If the chemical was inhaled and the victim is conscious, call the campus emergency number and then carry or drag the victim to fresh air. Do not let the victim walk unassisted or engage in any unnecessary activity that will increase the circulation of poison in the bloodstream. If artificial respiration is necessary, ensure poison from the victim is not inhaled. If the victim is not conscious, do not enter the area; the victim may have been overcome by gases in the area, or by a lack of oxygen in the space.

If the chemical was splashed in the eye, immediately seek an eyewash, safety shower, or spigot. The eye must be washed for at least 15 minutes with the eyelids held open to allow maximum exposure of the eyeball. While washing, check for contact lenses by looking into the eye, and by asking the victim. Ask the victim to remove them if possible. Otherwise, contacts may be removed under gentle water pressure. Do not attempt to remove contacts by hand or with any other object. Emergency personnel are trained to do this. Be careful not to rub the eyes.

If chemicals are on the skin, follow the recommendations under the First Aid section of the SDS. If such information is not readily available, wash the affected area with clean water continuously for 15 minutes. Remove any clothing contaminated with chemicals; being careful not to become contaminated as well. Be aware of the possibility of inadvertent injection or unnoticed introduction of chemicals into the body. Many solids, oily liquids or water solutions can enter through cuts in the skin. In addition, many oily liquids and oil soluble solids will be absorbed through the skin. Keep victim quiet and wait for medical assistance.

Treat for **SHOCK**. Though in appearance less dramatic than the above injuries, shock can kill just as quickly. If a person goes into severe shock, treatment for shock takes priority over all first aid except for reestablishing airway, control of bleeding and CPR.

Symptoms of shock include paleness, cold and clammy skin, weakness, nausea/ vomiting, shallow breathing, rapid pulse, cold sweat, chills and shaking. If possible, treat the cause of shock (e.g., control heavy bleeding). Keep victim warm and lying down. Elevate legs if no spinal or head injuries are suspected. Keep airway open and give non-alcoholic liquids if the victim can swallow and does not have an abdominal injury.

5.1.3 Fires and Explosions

All laboratory users should know the fastest exit route, alternate exit routes and the location of fire alarm pull-stations in the immediate lab area. Laboratory doorways and aisles should be kept clear at all times.

During evacuation, turn off equipment and move explosive materials away from possible heat, if there is time to safely do so. Leaving the area quickly is the highest priority. Do not use elevators, and do not use fire extinguishers unless trained to do so.

5.1.4 Chemical Spills

Procedures for handling spills in the laboratory are provided in Appendix D "Procedures for Handling Hazardous Incidents" of this CHP.

5.1.5 Identifying Hazardous Substances in Emergencies

In order to help identify hazardous substances involved in an emergency, signs should be posted on doors bearing the Laboratory Supervisor's name and phone number and information communicating potential hazards in the room.

5.1.6 Reporting Accidents

In the event of a laboratory accident/incident, Campus Security must be called (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789). The Security Office will complete an Incident Report Form which must be signed by the Laboratory Supervisor and/or PI and sent to EH&S, the Department Chair and the CHO. Campus Security will also maintain a copy of an

incident report form. This form contains valuable information to help determine causes of accidents and prevent future accidents in the laboratory. It should be completed for all laboratory accidents, no matter how minor.

5.1.7 Power Failures

If a laboratory loses power during an emergency, the building should be evacuated as quickly as possible by utilizing the building's evacuation plan. Personnel should shut down any reactions or experiments that may cause additional hazards if it is safe to do so. Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) should be called from the nearest safe area to report the power failure and await assistance. The emergency generator should start within a few seconds and emergency lighting will be available to facilitate evacuation. In accordance with OSHA, building/room exit signs must be illuminated.

5.2 General Laboratory Behavior

5.2.1 Safety Rules

The following provides some general safety rules to be followed within each laboratory.

- Know the location of the laboratory and building exits.
- Know the location and use of the safety showers and eyewashes.
- Know the location and use of spill kits, where available. Only trained personnel should clean up a spill.
- Know the location of a phone that can be used in an emergency.
- Know the potential hazards of the materials, facilities and equipment in the laboratory. If personnel are uncertain, they should ask their instructor, supervisor or the office of EH&S.
- Use the proper safety equipment for the procedure. This could include a fume hood, glove box, biosafety cabinet, shield or other equipment.

- Do not wear contact lenses in laboratories where the CHO has determined that contact lenses should not be worn.

- Always wear eye protection while working in the laboratory. Safety glasses are sufficient for normal work in a biology laboratory. However, splash goggles are required for chemical work, especially where a splash hazard is present or for work with dusts and powders.

- Lab coats must be worn at all times while working in the laboratory.

- Wear other personal protective gear where laboratory or experimental conditions dictate. This includes laboratory aprons, gowns, gloves, gauntlets, goggles, face shields, dust masks, respirators*, and other equipment.

- Wear clothes that protect the body against chemical spills, dropped objects and other accidental contact. Consult the Chemical Safety Officer for specific policies regarding prohibited clothing.

- Shoes must cover the whole foot (open toed, open heel are not permitted).

- Secure hair back and off of shoulders when in the laboratory. Remove articles of clothing or jewelry that might become contaminated or entangled in equipment.

- Do not store food or drink in the laboratory or in refrigerators used to store chemicals, or use laboratory equipment for eating or drinking.

- No eating, drinking, smoking or applying cosmetics in the laboratory.

- For safety and security reasons, avoid working alone in the laboratory, particularly after hours. The extent of the procedures is dependent on the nature of the laboratory work and the degree of potential hazard. The Laboratory Supervisor is responsible for determining and implementing procedures to provide for emergency notification and periodic checks of an individual.

- **Do not pipette by mouth**. Use only mechanical pipetting devices.

- Wash hands frequently when handling chemicals and before leaving the laboratory. Beware of contamination on clothing, door knobs, lab benches, etc. Remove protective gloves and other protective gear (e.g., aprons, lab coats etc.) before leaving the laboratory to help prevent the spread of contamination.

- Follow written protocols or instructions. Perform only experiments authorized by the CHO. (See Appendix E "Forms For Laboratory Operations that Require Review and Approval.")

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* *Anyone requiring respiratory protection must contact EH&S for more information and for a determination of the appropriate respiratory protection based upon the procedures being performed.*

- Do not move or disturb equipment in use without the consent of the user.
- "Horseplay" is not allowed in the laboratory.
- Follow good housekeeping practices. Clean up as you go, and keep work areas, aisles and exits uncluttered.
- Keep laboratory doors closed.
- Do not deface labels on chemical containers. Make sure all labels correctly identify the container's contents.
- Report all accidents and injuries immediately to the laboratory instructor, Laboratory Supervisor or CHO. Contact Campus Security at Old Westbury: 516-686-7789 and Manhattan: 646-273-7789 who will contact the appropriate emergency response agencies.
- Report all unsafe conditions to your Instructor, Laboratory Supervisor, EH&S or CHO and/or Security.

5.2.2 Additional Rules for Laboratory Supervisors and Instructors

The following provides additional rules for Laboratory Supervisors and Instructors:

- Take responsibility, in attitude and action, for the safety conditions of each laboratory under your control.
- Set an example by wearing protective equipment and by following proper laboratory procedures to promote safe work habits.
- Carefully review all laboratory experiments for possible safety problems before the experiments are assigned to students.
- Make both preventative and remedial safety measures part of the instruction. Be sure all students and laboratory workers are familiar with emergency procedures and equipment.
- Be alert for unsafe conditions. Inspect often and intelligently. Take effective corrective action promptly.
- Assume responsibility for visitors and require that they follow the same rules as students and other laboratory workers.

- Keep a current file of publications on pertinent laboratory safety and encourage its use.

5.2.3 Rules for Custodial Workers

The following are general rules for custodial workers in the laboratory:

- Sweep, mop, wash the floors and remove normal trash from any laboratory.
- Do not touch any material, container or waste container affixed with a biohazard symbol or radiation symbol.
- Do not touch, disturb, move or handle any containers of any chemicals or materials except those issued to you by your department. If chemicals or other laboratory materials need to be moved in order to perform your duties, have the Laboratory Supervisor arrange for this to be done, or contact your supervisor.
- If the contents of any containers (other than those issued to you) are spilled, DO NOT TOUCH THEM OR ATTEMPT TO CLEAN THEM UP. Immediately inform your supervisor, who will contact emergency personnel.
- Wear safety eyewear (glasses or goggles) if there are persons working in the laboratory.
- Do not eat, drink, smoke or apply cosmetics in a laboratory.
- If you have any questions, contact the Laboratory Supervisor first, EH&S and/or your supervisor.

5.2.4 Rules for Facilities Personnel and Outside Contractors

The following are general rules for maintenance workers in the laboratory:

- Before working in a laboratory, in a chemical fume hood or any part of the associated ductwork, inform the Laboratory Supervisor about what you will be doing and when you will be working.
- The Laboratory Supervisor is responsible for assuring that your work area within the room is free from physical, chemical and/or biological hazards. Your work area may include hoods, sinks, cabinets and benches, bench tops, floor and/or equipment. You may be required to repair, move, remove, replace, paint, etc. as part of your duties.

- Do not handle or move chemicals in the laboratory. If you need chemicals moved in order to perform your duties, have the Laboratory Supervisor arrange for this to be done.

- Generally, you should not move or handle equipment in the laboratory. If your work requires you to move, remove or replace a piece of equipment, have the Laboratory Supervisor assure you that the equipment is free of any physical, chemical and/or biological hazards.

- Do not eat, drink, smoke or apply cosmetics in the laboratory.

- In situations where the hazard cannot be totally removed, specific work procedures must be developed in conjunction with the Laboratory Supervisor and the office of EH&S. If there is a chance your work may bring you in contact with chemical hazards (e.g., working on laboratory fume hoods) or when working in rooms where chemical experiments are taking place, the Laboratory Supervisor will provide you with the necessary protective equipment, including gloves, safety glasses, goggles, etc.

- When working on a fume hood, ask the Laboratory Supervisor if the hood was used for perchloric acid or radioactive materials. Contact the EH&S Office before performing maintenance on any part of a perchloric acid or radioactive material fume hood system (including: hood, base, duct, fan, stack, etc.). Lubricate perchloric acid hood fans with fluorocarbon grease only.

- If you are working in a room labeled with a radiation symbol, contact the Laboratory Supervisor before beginning work to have all radioactive materials removed from the work area.

- If you have any questions, contact the Laboratory Supervisor first, your supervisor next, and finally, the EH&S Office.

- If you cause or encounter a spill, do not attempt to clean it up. Leave the area and call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) to report it. Security will contact the necessary emergency personnel and the EH&S Office. Notify the Laboratory Supervisor and your supervisor of the situation.

5.3 Safety Systems

5.3.1 Personal Protective Equipment

The following provides a general description and use of some personal protective equipment (PPE) to be utilized within the laboratory. A hazard assessment must be conducted

by each Laboratory Supervisor to determine what specific PPE must be worn in the laboratory. A copy of NYIT's Personal Protective Equipment Program is provided as Appendix F to assist in conducting this assessment. A copy of the completed assessment must be included in Section 12.00 of each laboratory's CHP.

5.3.1.1 - Eye Protection

- Safety Glasses: Safety glasses provide protection from impact hazards such as broken glass or flying objects. Safety glasses must be worn at all times while working in the laboratory except when additional hazards are present as outlined below. Safety glasses are NEVER appropriate for use in Chemistry laboratories.

- Splash Goggles: Eyes are particularly sensitive to any contact with chemicals; therefore, splash goggles must be worn at all times in laboratories where there is a risk of splash or when dusts or powders are being used outside of a fume hood. Safety glasses do not offer sufficient protection from fumes or particles entering from the side.

- Shields: Standing shields and face shields protect the face and neck. Shields of good rigidity and strength which protect the face and neck should be used for vacuum work, when working with low or high pressure systems, or where mild explosions may be anticipated.

5.3.1.2 - Respiratory Protection

Dust masks, cartridge respirators, self-contained breathing apparatus or any other type of respiratory protection should not be necessary in a properly designed laboratory. If you believe you may nevertheless require such protection, contact EH&S for information and recommendations.

5.3.1.3 - Skin and Body Protection

- Gloves: Gloves protect the hands against contact with chemicals and also against abrasion and extremes of heat and cold. Check gloves before use for worn spots, cracks and other signs of wear. When removing gloves, be careful to avoid touching the outside of the gloves with your bare hands; also avoid touching door knobs, light

switches, etc. with the gloves. Always remove gloves (and all other potentially contaminated protective gear) before leaving the laboratory.

Different kinds of gloves offer different levels and types of protection. Gloves made of cotton or cotton with leather protects against abrasion, sharp objects and glass; however, they offer virtually no wet chemical protection and may actually absorb chemicals and keep them in contact with the skin. Surgical type gloves made of rubber or synthetic rubber offer some hand protection and also allow dexterity. For more substantial protection against some acids and most other corrosives, heavy rubber gloves are available with various lengths of forearm protection. Heavy rubber gloves do not effectively protect against a number of concentrated acids, organic solvents or polychlorinated biphenyls (PCBs). These substances require gloves made of a synthetic material (e.g., neoprene, nitrile rubber or Viton) depending on the chemical being used. Insulated gloves should be used when dealing with temperature extremes. Proper fit and comfort must also be considered when selecting gloves. Personnel must also be careful about allergies to latex and to avoid using latex gloves if they are or suspect that they may be allergic to latex.

- Aprons and Lab Coats: Aprons and lab coats protect the body as gloves do the hands. Heavy duty rubber aprons should be used for protection against strong acids and bases. As discussed above, heavy rubber will not protect against all materials, in which case a synthetic material must be used. Vinyl aprons are recommended for general use. Cloth lab coats are also useful, but mainly for protecting clothing.

  As with gloves, lab coats and aprons should remain in the laboratory. Many substances found in the laboratory can be inadvertently taken home on lab coats and aprons.

- Shoes: Sturdy closed shoes should be worn in the laboratory at all times to protect against spills and splashes which reach the floor. Leather shoes offer better protection against corrosion than canvas shoes. *Open-toed and open-heeled shoes are prohibited in the laboratory.*

5.3.1.4 - Hearing Protection

Standards for hearing protection and acceptable noise levels have been established by OSHA regulations. If you feel that a noise hazard is present in the laboratory, contact the CHO for evaluation and recommendations.

5.3.1.5 - Fire Protection

In the event of a fire, personnel are required to pull the fire alarm and EVACUATE IMMEDIATELY. Do not attempt to fight the fire. Alert others as you go. Do not reenter the building until the fire department tells you it is safe.

5.3.2 Laboratory Equipment

The following provides a description and use of some common protective equipment found in the laboratory. Guidance for performing inspections of laboratory equipment to ensure proper operation is provided in Appendix G.

5.3.2.1 - Fume Hoods

Fume hoods are a common means of control of exposure to toxic substances. The recommended minimum face velocity used in NYIT laboratories is 100 feet per minute (fpm) at a minimum sash height of 12 inches. The fan system shall be able to accommodate all fume hoods on the same fan system opened to 18 inches while still achieving 100 fpm face velocity.

Hoods shall ventilate by a dedicated exhaust fan with ducts leading directly from the hood to the roof. Horizontal ducts shall be pitched down to prevent accumulations of vapors in low spots. Duct velocities shall be maintained high enough to minimize the trapping of vapors in the exhaust system. Terminal exhaust points shall be located at least 25 feet from any possible air intake (e.g., air intake grills, doors, operable windows) and positioned at a height that allows adequate dispersion of fumes.

A newly installed or modified hood exhausting vapors from a continuing process that is left unattended shall have an air flow switch connected to a visible and audible warning device. Appropriate safeguards shall be provided for flammable and explosive agents vented through the hood (e.g., explosion-proof motors and control, scrubber units, biohazard filters).

NOTE: The use of perchloric acid is prohibited unless the hood has been designed for its specific use and manipulation.

All fume hoods shall be inspected and certified annually to determine a proper face velocity of 100 fpm. The airflow into and within the fume hood shall not be excessively turbulent (anything above 150-180 fpm). These fume hoods shall be checked by representatives from EH&S on an annual basis during laboratory safety reviews. All fume hoods functioning properly shall have a certification label affixed to the sash height at which the fume hood was certified. Any fume hood not working properly shall have a yellow sign affixed to the sash prohibiting its use until serviced. EH&S shall submit a work order for fume hoods failing certification requirements during laboratory safety reviews.

The following provides guidelines for safe fume hood use and are to be followed when using a fume hood. All Laboratory Supervisors should periodically review these procedures with all laboratory personnel.

- Chemical or other materials stored in the fume hood should be kept to an absolute minimum. Stored materials cause disruption to airflow patterns within the hood and pose a risk to the user. See diagram of airflow patterns through empty and cluttered fume hoods;
- Avoid potential exposures by not putting any part of your body, with the exception of hands and forearms, into the fume hood;
- During manipulation and operation within the fume hood, sashes shall be kept at the certification sticker height to ensure proper air flow and protection of the user;
- When fume hoods are not being used, fully lower the sash to offer protection from experiments inside the hood;
- Filters shall be maintained as recommended by the manufacturer;
- If any fume hood is suspected of not operating properly, discontinue use of the fume hood and contact EH&S at 516-686-7731 to arrange for testing of the fume hood(s);
- Do not use fume hoods which have not been certified. To have a fume hood certified, contact EH&S;

- If the fume hood is covered with materials to protect light sensitive substances, then an opening not less than that which can be considered safe for operation shall be maintained; and

- Fume hoods equipped with automatic alarms shall be inspected by the user more frequently than once per year with the frequency of this testing based on fume hood usage.

5.3.2.2 - Glove Boxes

Where highly toxic substances must be contained, or reactive substances must be handled in an inert or dry atmosphere, it may be necessary to use a completely enclosed unit such as a glove box.

5.3.2.3 - Eyewashes

An emergency eyewash unit should be located in most laboratories and should deliver a gentle flow of clean, aerated water. The eyewash must be kept free of obstructions. When a chemical has splashed into the eye, immediately irrigate the eye. Flush the eye with a copious amount of water under gentle pressure. If the victim is wearing contact lenses, have him/her remove them at once if possible. Forcibly hold the eye open to wash thoroughly behind the eyelids. The victim must be given prompt medical attention regardless of the severity of the injury. Continue irrigating for 15 minutes before transport to a hospital or health center.

Eyewash units and safety showers are installed and maintained by NYIT Facilities. Eyewash units must be inspected weekly by the Laboratory Supervisors and a record of the inspections should be maintained near the unit. The CHO and the applicable Department Chair will determine the need and location for new showers and eyewash stations. If there is a problem with a unit or need for an additional eyewash, contact the EH&S.

5.3.2.4 - Safety Showers

Most laboratories should have a safety shower in an easily accessible location. The shower area must be kept clear of obstructions. In case of chemical contamination over a large part of the body, the contaminated clothes must be removed immediately and the person doused with water continuously for 15 minutes or until medical help arrives. A blanket can be used for warmth and modesty during dousing. Call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) immediately to summon help. Safety shower units must be inspected and tested on an annual basis by NYIT Facilities and the inspection should be recorded on a tag attached to the shower. If there is a problem with a unit or need for an additional safety shower, contact the EH&S.

5.3.2.5 - Ground Fault Circuit Interrupters

A ground fault circuit interrupter is an electrical device that protects against leakage of electrical current to ground. If even a minor leakage is detected, the device opens the circuit preventing possible electrocution. Ground fault circuit interrupters can be portable (i.e., placed within the laboratory where needed) or installed in the circuit box itself. These devices are required where damp or wet conditions are likely.

5.4 Preparing for Laboratory Work

Prior to initiating any laboratory work, a plan should be prepared describing the objectives of the experiment, the chemicals and equipment needed, and the sequence of steps to be followed, including safety measures. The following sections provide additional information regarding the contents of the plan.

5.4.1 Chemicals

Complete descriptions of the chemicals used in the laboratory can be found on the Safety Data Sheets (SDSs), which contain information on physical characteristics, hazards, disposal,

and routine and emergency precautions. An SDS is available for virtually every chemical marketed and can be obtained from the chemical supplier or a computer-based information system. The Right-to-Know law requires, among other things, that persons who may be exposed to chemicals be trained in general and specific chemical hazards and safety. SDSs must be used as part of this training. An SDS must be acquired by each professor and/or researcher for every chemical used and kept on-file in each laboratory or in an accessible central location for reference. The SDS information must be made readily available to every laboratory worker who will be handling the chemical in question. Procedures should be designed to use the least hazardous chemicals and the minimum possible quantity of each chemical that will still allow meaningful results. Using smaller quantities of chemicals means that less can be spilled or volatilized, and that less must be treated and/or disposed as hazardous waste (as necessary).

5.4.1.1 Ordering Chemicals

Any staff or faculty ordering chemicals for use at New York Institute of Technology must complete the Purchase Requisition of Chemicals form (Appendix I). This policy is to ensure that we can confidently track and monitor all chemicals on NYIT's campuses. This also will give the EH&S department the ability to review the Safety Data Sheet (SDS) for the chemical to help assess hazards and ensure proper protocols for handling, storage and disposal are in place before the chemical arrives. This form along with the SDS for each chemical to be ordered must be sent to bkellehe@nyit.edu. Also, only this form must be submitted to Procurement along with any quotes or documents they require. Any questions or concerns please contact the EH&S department.

5.4.1.2 Shipping Chemicals, Hazardous Materials and Biologicals

Many biological materials, as well as dry ice and common preservatives, are regulated as dangerous goods when shipped in transit via ground, air, rail or vessel. The shipping of hazardous materials can pose a serious danger to human health, property and the environment if

the materials are improperly packaged and labeled and release their contents during transportation. All packaging must comply with the Department of Transportation (DOT), the Federal Aviation Authority (FAA) and the International Air Transport Association (IATA) dangerous goods regulations. Federal and international regulations require that the packager be certified to ship biological products, diagnostic or infectious materials, hazardous materials or dangerous goods. Any department that needs to ship any hazardous material at New York Institute of Technology must first contact Ada Wong (awong09@nyit.edu) or Susan Christie (schris05@nyit.edu) for assistance.

5.4.2 Biologicals

New York Institute of Technology (NYIT) ensures the safe and secure use of biological materials used in research. Key objectives of safeguards for research activities utilizing biological materials are to prevent occupational exposures and accidental releases of biological agents that could harm employees, patients, students, the public, or the environment. To meet these important safety and security objectives, the New York Institute of Technology Institutional Biosafety Committee (IBC) exists to facilitate comprehensive oversight, including review and approval, of the use of biological materials at NYIT. Any staff or faculty conducting any research of a biological material must complete and submit the Institutional Biosafety Committee Biosafety Protocol Form for Recombinant DNA and Microorganisms in Research Form (Appendix J) to the IBC for approval. A biological material can be but not limited to any bacteria, viruses, rickettsia, parasites, prions, fungi, toxins, deoxyribonucleic acid (DNA), and ribonucleic acid (RNA), known to be, or suspected of being, hazardous to humans, plants, and animals, ALL human-derived and primate-derived biological materials used in research, and any recombinant or synthetic nucleic acid molecules, and cells, organisms, and viruses containing such molecules.

5.4.3 Equipment

Specific information must be obtained regarding any equipment to be used. Most equipment is sold with this information, ranging from a one-page instruction sheet to complete

manuals. This information must be read thoroughly and followed exactly to ensure the safest use of the equipment. When used equipment is sold or donated to NYIT, laboratory personnel must obtain operating instructions for the equipment, if possible.

5.4.4 Written Procedures

Developing a protocol is basic to the experimental process and should result in a written set of procedures. Writing procedures allows the researcher or instructor to go through the experiment in the planning stage and identify areas where special precautions may be necessary. The written protocol will provide workers with step-by-step instructions that minimize the chance for errors. A written protocol will allow for modifications and will include safety precautions (e.g., wear splash goggles, pour acid into water, perform operation in fume hood, etc.). Written procedures should also include SDSs for all chemicals used in the experiment. In addition, a laboratory notebook should be kept during the procedure to document each action and its result. In the event of an accident, the written procedures and laboratory notebook may indicate what went wrong and possibly why.

5.4.5 Setting Up

Prior to initiating work, the written procedures should be reviewed following the expected sequence of the experiment. The materials to be used should also be reviewed to assess their degree and nature of hazard (e.g., flammability, volatility, reactivity, etc.). All equipment and supplies should be laid out prior to actual work beginning, including the appropriate protective equipment (e.g., hoods, glove boxes, gloves, aprons, safety goggles, shields, lab coats, etc.). The work area should be uncluttered and orderly. Where areas of possible contamination and exposure might exist, precautionary measures should be taken, such as lining the work surface with absorbent paper. In addition, all necessary equipment to deal with a spill or accident should be on-hand (absorbent materials, spill kits, etc.).

5.5 General Laboratory Equipment Setup

The following sections provide procedures and recommendations for the general setup of laboratory equipment.

5.5.1 Preparing the Work Space

Work space should be uncluttered. Only necessary materials, equipment, protocols, instructions, notebook, and pen or pencil should be present. Books, unnecessary materials and scraps of paper should be removed and properly stored. Measuring equipment, such as glass cylinders, should be kept where it will not be easily knocked over. Do not place equipment on the floor of a working area where it may trip others or be knocked over.

Use only equipment that is free of flaws (e.g., cracks, chips, inoperative switches, frayed cords, etc.). Ensure that all necessary guards are in place before using equipment. Examine glassware carefully. All defective glassware should be returned to the stockroom for replacement or safely discarded. All defective electrical equipment must be repaired before use or discarded.

Set up clean, dry apparatus, firmly clamped and well back from the edge of the laboratory bench. Keep burners and open flames a safe distance from solvents and reagent bottles. Allow enough space for the equipment used and enough working space to avoid crowding other workers and disturbing their apparatus. Select vessels of the proper capacities for each experiment. Place a tray or absorbent paper under the apparatus to confine spilled liquids.

All equipment must be properly supported to prevent unnecessary movement and to maintain proper alignment during the experiment. Apparatus attached to a ring stand should be positioned so that the system's center of gravity is over the base and not to one side. Securely attach clamps to the stands. Set up the equipment with adequate space and configuration for removing burners or baths. Orient equipment so that stopcocks, hoses and other attachments will not be loosened by gravity. Use a retainer ring or spring where necessary.

Use a fume hood if the experiment is expected to evolve noxious odors, or toxic or flammable gases, vapors or fumes. Do not use perchloric acid, hydrofluoric acid or radioisotopes in hoods that are not specifically approved for those materials.

Use a protective shield when conducting a reaction which may result in a mild explosion or when using a vacuum system (which may implode). Use a face shield that is sufficiently large and strong to protect your face and neck, or use a standing shield. A standing shield is necessary if an explosion hazard exists. Standing shields must be adequately stabilized with weights or fasteners to prevent the shield from being knocked over by an explosion, and should be secured near the top. Eye protection must be worn even when using the shields.

5.5.2 Glassware

Pyrex or borosilicate glassware is recommended for all laboratory glassware except for special experiments which use ultraviolet or other light sources. The only soft glass provided in the laboratory should be reagent bottles, measuring equipment, stirring rods and tubing. Any sizable non-spherical glass equipment to be evacuated, such as suction flasks, should be specially designed with heavy walls. Dewar flasks and large vacuum vessels should be taped or otherwise screened or contained in a metal jacket to avoid flying glass from an implosion. Thermos bottles, with thin walls, are not adequate substitutes for Dewar flasks.

Large bottles and jars containing acids or corrosive chemicals should only be moved in suitable acid bottle carriers, such as those made of rubber.

- Cuts from glass constitute the most common laboratory accident and potentially one of the most dangerous, as an open cut provides a pathway for toxic chemicals to enter the bloodstream directly. Do not begin any operation requiring cutting, bending or inserting glass into a stopper or hose without understanding the complete procedure and the appropriate precautions to be taken for each separate step. Do not use chipped or broken glassware. Discard it properly.

- Glass and sharp objects must be disposed of in properly labeled impervious containers to prevent accidental cuts and punctures. Disposal of broken glass along

with paper and trash is a hazard to the Housekeeping/Custodial staff. Procedures for proper disposal of glassware are provided in Appendix H, "Policy for the Disposal of Laboratory Glassware, Hazardous Waste and Regulated Medical Waste.

- Do not leave pipettes sticking out of bottles, flasks or breakers.
- Do not attempt to remove glass tubing from stoppers by force. If tubing is stuck, carefully, cut it off.
- Glass blowing and other artistic endeavors are prohibited.
- Decontaminate glassware that has been exposed to infectious substances or materials.
- Chemical bottles must be emptied, rinsed with an appropriate solvent (usually water), and have the label defaced before disposal in impervious containers as general refuse.
- Residual rinse water must be collected in accordance with NYIT's hazardous waste management procedures.
- Heated glassware and containers should be handled with special heat-resistant gloves.

5.5.3 Electricity

Electricity becomes a hazard in the laboratory when the current comes in contact with a person or a flammable or explosive material. Care with electrical connections, particularly with grounding and not using frayed electrical cords, can reduce such dangers.

Equipment in the laboratory must have grounded (three-prong) plugs or be double insulated. Temporary wiring and the use of extension cords are prohibited. All wiring must meet the National Electric Code specifications. Where wet conditions are likely, ground fault circuit interrupters must be installed. All switches that are not directly and obviously attached to a piece of equipment should be labeled to show the equipment they control. In-line cord switches are discouraged.

If, when you touch a piece of electrical equipment, you feel a shock or "tingle," you should disconnect it and report it for repair immediately. Shorts in circuitry get worse and delay in repair greatly increases the hazard. If you suspect a piece of equipment to be electrically dangerous, take it out of service and notify the Laboratory Supervisor to arrange for repair.

Never attempt to repair any electrical equipment with the current on. Equipment that is faulty or broken must be unplugged and moved or taped in such a way that it cannot be accidentally plugged in or turned on. The equipment should be clearly labeled as unsafe and not to be used while awaiting repair. Repairs or changes to the building electrical system must be referred to NYIT's Buildings and Grounds Department.

5.5.4 Vacuum Operations

Due to the pressures involved, equipment used in vacuum operations must undergo frequent, regular and careful inspection. Apparatus must be assembled so as to avoid strain. Heavy assemblies must be supported from below as well as by the flask neck. Vacuum apparatus should always be placed well back from the edge of the bench top or hood sill, where it will not be accidentally struck. The apparatus should be inspected frequently for signs of fatigue, wear or cracks.

- Shielding: Either standing shields or face shields should be used in all vacuum operations, especially when the apparatus contains flasks of 0.5 liter or larger.

- Vacuum Desiccators: Vacuum desiccators should be treated with care, including possible enclosure in a box or approved shielding device for protection, in case of an implosion. When opening a desiccator that has been under vacuum, make sure that atmospheric pressure has been completely restored. A "frozen" vacuum desiccator lid can be loosened by a single-edge razor blade inserted as a wedge and then tapped with a wooden block to raise the lid.

- Water Aspirators for Vacuum: Water aspirators for vacuum are used mainly for filtration purposes. Only equipment that has been approved for this purpose should be used. Never apply a vacuum to a flat bottom flask unless the flask is a heavy-walled filter flask designed for that purpose. Place a trap and a check valve between the aspirator and the apparatus so that water cannot be sucked back into the system if the water pressure should fall unexpectedly while filtering. These recommendations also apply to rotary evaporation operations where water aspirators are being used for vacuum.

- Vacuum Pumps: A cold trap should be placed between the apparatus and the pump so that volatiles from a distillation do not get into the pump oil or out into the laboratory atmosphere. Exhausts from pumps should be properly vented. All pumps must also have a belt guard to prevent hands or loose clothing from being pulled into the belt pulley.

- Vacuum Distillations: When performing vacuum distillations, always allow the apparatus to cool to room temperature before breaking the vacuum. It is preferable to first fill the apparatus with an inert gas such as nitrogen or argon.

- Pressure Operations: As with vacuum operations, the equipment used in high pressure procedures must be regularly and frequently inspected for any signs of wear or fracture. Each pressure vessel should be clearly stamped or labeled with its basic allowable working pressure, the allowable temperature at this pressure and the material of construction. Always use a pressure relief disk or other suitable device in pressure systems. The relieving pressure and setting data should be printed on a tag attached to installed pressure-relieving devices and the setting mechanisms should be sealed.

  Before any pressure equipment is altered, repaired, stored or shipped, it should be carefully vented and cleaned. When assembling such apparatus, avoid strain and excessive force. Threads must match correctly. Never use oil or hydrocarbon-based lubricant on apparatus that will contain oxygen. Kel-F oils or greases (polychlorotrifluoroethylene oils or greases) are the proper lubricants for these systems. In assembling copper tubing, avoid sharp bends and allow flexibility. Check for hardening and cracking in the copper; replace if necessary.

  All reactions under pressure must be shielded and prominent signs should be placed to warn others of high pressure hazard. Non-sparking tools will be used.

5.5.5 Heating

- Open Flame: Wherever possible, use heating mantles, heating tapes or laboratory hot plates in place of gas (Bunsen) burners. When using a heating mantle, always operate below the maximum allowable voltage for that mantle. An open flame must never be used where explosive or flammable chemicals are present, but the presence of such chemicals may be unsuspected or sudden. If a burner must be used, distribute its heat with flame-retardant wire gauze or by moving the burner about beneath the container being heated. Test tubes being heated in this manner should be held with a test tube holder at about a 45 degree angle and heated gently along the side, not at the bottom, to minimize superheating which may cause the contents to be ejected. Avoid pointing a test tube toward yourself or any nearby person.

- Gas Shut Off Valves: Some laboratories are provided with a piped-in gas supply equipped with either a manual or "slap switch" shut-off valve. When the gas is not in use the valve must be in the "off" position. Before turning on the room gas supply, ***check all the gas valves in the room to be certain they have been turned off***.

- Hot Oil Baths: Hot oil used for heating purposes is often overlooked as a hazard, yet it carries serious dangers, such as 1) spattering caused by water falling into hot oil, 2) smoking caused by decomposition of the oil or of organic materials in the oil, and 3)

fire caused by overheated oil bursting into flame. Operating baths should not be left unattended unless a high temperature cut off is installed. Precautions should be taken to contain any spills of hot oil caused by breakage or overturning of the baths. Fiberboard, cardboard or other combustible components must not be used in heated apparatus.

In evaluating a hot oil bath setup, carefully consider the size and location of the bath, the operating temperature and temperature-control device, the type of oil used (silicone oil is suggested for most heating baths), the ventilation available, and the method of cooling the hot oil. A label on the bath should include the name of the oil and its safe working temperature. Silicone oil is a safe non-flammable fluid that can be used in heating baths to 250ºC (about 480ºF) without decomposition.

- Temperature Control: The rates of most reactions increase as the temperature increases. Highly exothermic reactions may become dangerously violent unless provisions are made for cooling, for example, by bringing a cooling bath up around a flask. Virtually all reactions require some temperature control and thus apparatus should be assembled in such a way that either heating or cooling can be quickly applied or withdrawn. A suitable thermometer should be used in a boiling liquid where a strong exothermic reaction is likely so that there will be warning and time to apply cooling.

  Boiling stones or boiling sticks should be used in unstirred vessels of boiling liquid (other than test tubes) to prevent superheating and "bumping." Do not reuse boiling stones or sticks. Do not add boiling stones or sticks or any other solid material to a liquid that is near its boiling point since this is likely to cause splattering or boil over.

5.5.6 Cooling

- Flowing Water: When cooling with flowing water, beware of differences in water pressure when operations have to be left unattended for long periods, particularly overnight. Although it is strongly discouraged, it is sometimes necessary to conduct an experiment requiring cooling overnight. Prior to conducting the experiment, the following steps must be implemented: 1) set up the experiment - you must wire all rubber or plastic tubing to metal or glass connections to help prevent the tubing from detaching, thus avoiding the risk of a flood; 2) make two signs giving your name and the date and stating that there is an experiment being conducted overnight; 3) post one sign on the hood sash and the other outside the door; 4) call Security to inform them that you are conducting an experiment overnight; and 5) install an automatic water regulator in the line, if necessary, to keep the flow even or institute some other additional contingency method if wire alone will not prevent floods.

- Cooling Baths: When ice water is not cool enough as a bath, salt and ice may be used. For even lower temperatures, dry ice may be used with an organic liquid, such as acetone, ethanol, isopropanol or ethylene glycol. Ethylene glycol, with a flash

point 111ºC (230ºF), is the best of the three listed above, considering flammability. When choosing a liquid for use with dry ice, you must consider the viscosity, flammability, volatility, solubility in water and the possibility of toxic vapors.

Few, if any, liquids are free from all of these hazards. Your choice must also be made based on the temperature requirements of your procedure and the limitations of your equipment.

- Cryogenics: Cryogenic equipment setups involve hazards due to extremely low temperatures and also hazards associated with the high pressure gases that are often part of such setups (see the following section on Compressed Gases). Be careful to control ignition sources and to monitor the formation of very high or very low concentrations of oxygen.

  Safe management of the hazards associated with extremely low temperatures requires thorough understanding of the unique conditions created. For example, the extreme cold of liquid nitrogen can make metals and other materials brittle. Uninsulated equipment can condense oxygen from the air to yield dangerously high concentrations of liquid oxygen, which can explosively ignite many combustibles. On the other hand, liquid nitrogen left open reduces the oxygen content of air as the oxygen condenses and the nitrogen evaporates. A person working in an inadequately vented area could lose consciousness without warning and will die without rescue. Good ventilation is essential in all cryogenic operations along with an understanding of the low-temperature behavior of the substances involved.

  Contact of liquefied gases with eyes or skin produces serious burns. Damaged tissue should be flooded with a gentle stream of water, not warmer than body temperature (using an eyewash, for example). The affected area should then be dried very gently (excluding eyes) and protected until medical assistance arrives. In order to avoid contact with liquefied gases, wear goggles, face shield and insulated gloves that fit loosely enough to throw off in case of a spill. The body should be completely covered with no skin exposed. Do not wear jewelry and avoid clothing with cuffs or pockets that could trap and hold a cryogenic liquid close to the skin.

  Place objects into a cryogenic liquid slowly and pour liquids into containers slowly in order to minimize the inevitable boiling and splashing.

  For the same reason, dry ice should be added to liquid slowly and in small amounts to avoid foaming and boil over. Handle dry ice with dry leather or insulated gloves and never lower your head into a dry ice chest, as the oxygen content may be inadequate and suffocation can result.

  Dewar flasks and cold traps should be taped to prevent flying glass in case of breakage. Avoid pouring cold liquid over the edge of a Dewar flask as it may break and implode.

5.5.7 Compressed Gases

Gases are supplied in cylinders under great pressures, some as much as several thousand pounds per square inch. If the valve is broken off at the cylinder neck, the cylinder becomes a potentially deadly rocket, propelled with great momentum and high speed. Gas cylinders have been documented to cause extensive property damage, injury and death. For this reason, all gas cylinders, full or empty, must always be strapped, chained or otherwise secured to a sturdy support to prevent the cylinder from falling and breaking the valve off. All cylinders of compressed gas should be treated as high energy sources and therefore regarded as potential explosives.

In addition, released gas can rapidly displace the breathing air in a room causing suffocation. Many gases are toxic or corrosive and can cause injury if inhaled or contacted in even small amounts. Many gases are reactive with other materials or gases. Oxygen, in greater than normal concentrations, greatly increases the risk of fire and explosion.

Compressed gas cylinders have certain safety features, including special valves, fittings and caps. For example, many gases have special valves that prevent the inadvertent mixing of incompatible gases. The best protection, however, lies in following the guidelines developed over years of experience with the hazards of compressed gas.

- Use of Compressed Gases: Always keep cylinders secured to a solid support except during transport to and from the stockroom or the vendor's truck. Cylinders in storage or otherwise not currently being used must have the regulator removed and the valve cap installed.

  Begin with thorough knowledge of the substances and equipment involved. Always know the identity of the gas in a cylinder; if for some reason a cylinder is unlabeled, return it to the vendor; do not guess. Know the properties and potential of the gas to be used and the proper procedures for its use. Be careful not to exceed the design pressure of the apparatus. Always wear safety glasses when handling or using compressed gases.

  Carefully inspect fittings, regulators and apparatus for damage before using. Do not use damaged equipment. Use only regulators, gauges and connections with matching

threads that are designed to be used with the gas or gases involved. Never lubricate, modify, force or tamper with a cylinder valve.

Only those tools approved by the cylinder vendor should be used on cylinder connections. Do not modify or alter cylinders or their attachments. Use cylinders and manifold systems only with their appropriate pressure regulators.

Use cylinders only in well ventilated areas. Corrosive gases should be used only in locations with access to safety showers and eyewash stations. Corrosive, toxic and flammable gases should be used only in fume hoods designed for use with the particular gas or group of gases. Use flammable gases only after proper bonding and grounding connections have been made.

Do not expose cylinders to temperatures higher than about 50ºC (122ºF). Some rupture devices on cylinders will release at about 65ºC (149ºF). Some small cylinders, including those not fitted with rupture devices, may explode if exposed to high temperatures.

Open cylinder valves slowly. Rapid release of a compressed gas will cause an unsecured gas line to whip dangerously and also may build up a static charge which could ignite a combustible gas. Never direct high pressure gases at a person, or use compressed gas or compressed air to blow away dust or dirt since resultant flying particles can be dangerous. Close cylinder and bench valves when the cylinder is not in use; the pressure regulator is not sufficiently strong to assure safe closure.

Do not extinguish a flame involving a highly combustible gas until the source of the gas has been shut off. Otherwise, it can re-ignite causing an explosion.

Always use a trap to prevent back siphoning of liquid chemicals and a check valve to prevent back flow of gases into the cylinder. When gas is passed from a cylinder into a vessel containing a liquid, contamination of the cylinder gas with other chemicals is a real possibility. Such contamination makes the gas unsuitable for future use and may result in explosion with resultant injury, damage or even death. Use of a safety trap to contain liquid and a check valve to prevent back flow of gas will eliminate this possibility. Safety traps and check valves are installed immediately after the pressure regulator and before the vessel containing the liquid. The safety trap should have a volume of about one and one half times the total liquid volume in the system.

Never bleed a cylinder completely empty. Always leave a residual pressure (about 25 psig) to keep contaminants out. Promptly remove the regulators from empty cylinders being sure to bleed the gas from the regulator first. Replace the protective caps at once. Mark the cylinder "EMPTY" as described for used cylinders below. Never refill a cylinder.

- Used Cylinders: Handle used cylinders as you would full cylinders. Keep them strapped or chained at all times. Store the used cylinders separately, if possible, from full cylinders so there is no chance of confusing them. Mark all used cylinders

"EMPTY" by tearing the attached tag to indicate empty. If the tag is missing mark the cylinder "MT" or "EMPTY" in removable writing (such as chalk).

- Leaking Cylinders: A leaking cylinder is an immediate hazard to health and property and must be addressed immediately. The properties of the leaking gas determine the hazard and the degree of response. In any case it will be necessary to contact the vendor's emergency contact number for further instruction. Keep in mind certain types of gas containers such as liquid helium and nitrogen are designed to continuously vent. This is normal and these vessels must never be stored in a confined space.

  POISON GASES: If a cylinder containing a poisonous gas is found to be leaking outside of a hood and it can't be turned off, the building must be evacuated by pulling the fire alarm. Personnel may be required to provide important information to assist the emergency responders.

  FLAMMABLE GASES: If a cylinder containing a flammable gas is found to be leaking follow the procedure outlined for poisonous gases.

  OXYGEN: If an oxygen cylinder is found to be leaking, evacuate the work area immediately and contact Facilities Services. Oxygen-enriched atmospheres can cause normally noncombustible materials to be extremely flammable. Many substances will burst into flame in the presence of pure oxygen. Be prepared to evacuate the building and call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789.

  NON-FLAMMABLE GASES: Although these gases are not toxic themselves they can displace the oxygen in a room and cause asphyxiation. If there is a leak from a cylinder containing this type of gas, evacuate the room and contact Security at Old Westbury: 516-686-7789 and Manhattan: 646-273-7789.

- Transportation: Do not move a cylinder unless the cap is in place. Transportation of a cylinder without the cap or, even worse, with a regulator still attached is dangerous and not permitted.

  Generally, cylinders must be transported on a hand truck to which they can be strapped or chained. Cylinders may be rolled on edge only for very short distances. Use an elevator to move cylinders to upper or lower floors. If stairs must be used, move cylinders on a hand truck that is equipped for stairs.

  When handling cylinders, always consider the cylinder to be full. Do not allow cylinders to strike each other or to be dropped, cut, scraped or otherwise damaged.

- Storage: Keep only those cylinders currently in use in the laboratory. Cylinders in use or in storage must be secured to a sturdy object, such as a wall, bench or stand using a strong strap or chain.

Store full and used (empty) cylinders only in isolated areas that are ventilated and protected from direct sunlight, rain, snow, damp ground, heat, fire or electrical contact. Temperatures in storage should be maintained between -20ºF and 120ºF unless the manufacturer indicates otherwise. Storage can be indoors or outdoors under shelter. Never store or use cylinders in corridors, stairwells or in high traffic areas.

Cylinders of the same gas should be stored together. Oxidizers should be separated from flammable and combustible materials by 20 feet or by a one-hour rated firewall and 5 feet of space. In addition, store used (empty) and full cylinders separately, if possible, and clearly indicate whether each cylinder is full or empty.

Keep caps on all cylinders except when connected for use and keep cylinders upright whether in use or storage.

5.6 Handling Chemicals

The following provides guidelines and principles for safely holding, pouring, mixing, transporting, storing, etc. of chemicals. The list of situations covered below is far from complete. Instead, the most common ways in which chemicals are handled in the laboratory is emphasized. Safety precautions for use of laboratory equipment can be found in Safety Systems (Section 5.3) and General Laboratory Equipment Setup (Section 5.5).

5.6.1 Personal Contact

The primary safety goal in handling chemicals is to prevent the chemicals from entering the body. It cannot be said too often that protective gear must be worn at all times and precautions for avoiding personal contact with the chemicals must always be in mind. The following provides recommended actions.

- Avoid direct contact of any chemical to the hands, face and clothing. Be aware of what you touch; for example, be careful not to touch gloves to your face. After any skin contact and always before you leave the laboratory, wash face, hands, and arms. Leave all equipment in the laboratory.
- Never taste chemicals or sniff directly from chemical containers.
- Never eat, drink, chew gum, smoke or apply cosmetics in the laboratory.

- Dispense and handle hazardous materials only in areas where there is adequate ventilation.

- If you believe that significant ingestion, inhalation, injection or skin contact has occurred, call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) and the Poison Control Center (1-800-222-1222). Follow the emergency procedures given in the Emergency Procedures section (Section 5.1).

5.6.2 Handling Containers

Clearly label all chemical containers. The OSHA Laboratory Standard requires that labels on incoming chemical containers not be removed or defaced. Do not use any substance from an unlabeled or improperly labeled container. Printed labels that have been partially obliterated or scratched off or crudely labeled by hand must be properly relabeled. Unlabeled chemical containers are a violation of the Hazard Communication Standard and the Right-to-Know Act and must be promptly relabeled or sent for proper disposal.

Carefully read the label before removing a chemical from its container. Read it again as you promptly re-cap the container and return it to its proper place. The names of distinctly different substances are sometimes nearly alike; mistakes are easy to make and can be disastrous.

If a stopper or lid is stuck, use extreme caution in opening the bottle. Friction caused by removing tops may cause explosions with some substances (such as peroxides formed from ethers or dry picric acid).

Support beakers by holding them around the side with one hand. If the beaker is 500 ml or larger, support it from the bottom with your other hand. If the beaker is hot, use beaker forceps or tongs, and place the beaker on a heat-resistant pad.

Grasp flasks by the center neck, never by a side arm. If the flask is round bottomed, it should rest on a proper sized cork ring when it is not clamped as part of a reaction or distillation assembly. Large flasks (greater than 1 liter) must be supported at the base during use.

5.6.3 Pouring

Do not pour liquids or powders toward yourself. Stoppers too small to stand upside down on the bench should be held at the base and outward between two fingers of the pouring hand.

Use a funnel if the opening being poured into is small. If a solid material will not pour out, be careful when inserting anything into the bottle to assist removal. Students should seek advice from instructors before proceeding.

Always add a reagent slowly; do not "dump" it in. Observe what takes place when the first small amount is added and wait a few moments before adding more.

When combining solutions, always pour the more concentrated solution into the less concentrated solution or water. Stir to avoid violent reactions and splattering. The more concentrated solution is usually heavier and any heat evolved will be better distributed. This procedure is particularly applicable in preparing dilute acid solutions. Be sure to wear goggles and use the hood when diluting solutions.

Remember the A-W rule. Always add acid to water, never water to acid. Make sure the stopcock is closed and has been freshly lubricated before pouring a liquid into an addition or separatory funnel. Use a stirring rod to direct the flow of the liquid being poured. Keep a beaker under the funnel in the event that the stopcock opens unexpectedly.

Use extreme caution and wear an apron, gloves and goggles with a face shield whenever pouring bromine, hydrofluoric acid or other very corrosive chemicals to avoid painful chemical burns. Face shields should always be worn when extremely hazardous chemicals are being used.

5.6.4 Pipetting

Never pipette by mouth. Use an aspirator bulb or similar mechanical pipetting device.

5.6.5 Storage

Keep as few chemicals as possible on the bench top. All chemicals not immediately needed should be properly stored.

Chemicals should never be stored or placed out on the floor. This poses a risk of spillage and/or injury to the people in the laboratory.

Do not store incompatible materials together or in close proximity. Use safety cans with flame arrestors for quantities of flammable solvent greater than 4 liters and be sure to leave a space at the top of a closed container for liquid and vapor expansion. If chemical purity requirements preclude metal containers, glass containers may be used. Containers no larger than one pint (500 ml) should be used to store NFPA Class IA liquids, including, but not limited to, acetaldehyde, diethyl ether, ethyl chloride, methyl formate, low boiling petroleum ether, pentane and propylene oxide.

Store large containers of reagents on low shelves, preferably in a tray adequate to contain spills or leakage.

Dispense corrosive liquids in small containers, no larger than 500 ml, preferably in chemically resistant coated containers. Never take more than is immediately needed.

5.6.6 Cold Storage

Ordinary household refrigerators constitute a hazard when used for storage of flammable or unstable chemicals. These units produce conditions which can lead to an explosion. Domestic (household-type) refrigerators may not be used for flammable chemical storage unless suitably modified to eliminate all possible contact between vapors and electric spark or arcing. Explosion-proof refrigerators are preferred.

When searching for an item in a refrigerator used for chemical storage, be careful not to inhale vapors that may have built up inside the unit.

All chemicals, including those stored in refrigerators, should be sealed and labeled with the name of the material, the date it was placed in storage and the name of the person storing it there. Refrigerators should be cleaned on a regular schedule and old chemicals should be properly discarded.

Food for consumption must never be stored in any refrigerator used to store chemicals. Food that is found in a chemical storage refrigerator will be confiscated.

5.6.7 Storage of Flammable Chemicals

Keep flammables in use in the laboratory in safety cans specifically designed for that purpose at all times. In the event that such cans are not available, glass bottles may be used with the proper precaution. The containers used by the manufacturer must meet certain standards for shipping. These same containers are not always suitable for routine use. The shipping container must be sealable and of suitable shape and strength for transport. This transport is usually within another container (e.g., carton, crate, etc.). Keep all flammables away from direct sunlight and sources of heat. Cabinets shall be labeled in conspicuous lettering, "FLAMMABLE–KEEP FIRE AWAY."

Flammable storage cabinets are designed to protect the contents from external fires. For this reason, the door(s) must be kept closed except when removing or replacing the cabinet's contents. These cabinets do not necessarily protect people from solvent vapors during normal use of the cabinet. Vent kits are available for flammable storage cabinets; however, these cabinets are tested with the vent holes closed. The NFPA Flammable & Combustible Liquids Code Handbook recommends against venting these cabinets as this practice may defeat the designed purpose. Where particularly noxious or toxic chemicals are being used, cabinets may be vented with prior CHO approval. If the cabinet must be vented, only fire rated vents may be used.

The interior of the cabinet is capable of withstanding the effects of vapors from solvents but not of other materials such as corrosives. As these materials are incompatible with most flammables, only flammable storage cabinets are designed with a lip to contain a two-inch depth of a spilled liquid.

5.6.8 Storage of Acids

Acid storage cabinets are designed to withstand corrosion, contain spills, keep like materials together and protect the contents from physical damage. If ordinary cabinets used for acid storage show signs of deterioration, relocate the acids to a specially designed cabinet. As acids are incompatible with alkalis, flammables and other classes of chemicals, only acids may be stored in these cabinets. Acids and other chemicals may not be stored on the floor.

Dichromate cleaning solution is an unsuspected source of pressure build up explosions in the laboratory. Although storage of this cleaning solution in the glass shipping container was a common laboratory practice, it has led to several serious incidents. Occasionally, used dichromate solution will contain sufficient amount of organic material from previous glass cleanings to evolve a large enough quantity of carbon dioxide to explosively rupture a screw topped glass bottle. Dichromate cleaning solution should not be used without CHO and EH&S approval.

5.6.9 Chemical Inventories

The Right-to-Know law requires that all laboratories that have not received research and development exemptions prepare, maintain and update a list of all chemicals present in the laboratory. The list should include, for each container, the chemical name(s) of the contents, the CAS Number (Chemical Abstracts Service Number), the quantity and the container type. This list is also useful for acquiring the SDSs needed and to carry out work both safely and in compliance with the OSHA standards. For example, identification of a substance as a Particularly Hazardous Substance and a carcinogen and taking the appropriate precaution in its

use would not be possible without compiling this list. It is the responsibility of the Laboratory Supervisor to maintain the inventory list and supply the EH&S office with a copy annually.

In the case of shared spaces, a current chemical inventory and SDSs for chemicals present should be readily available to other users.

5.6.10 Transportation

Bottles of 2 liters or more should be transported in bottle slings or bottle carriers that could completely contain the substance in the event of breakage. This is particularly important in transporting corrosive, toxic or flammable liquids. If you need to move several such containers at once within a building, use bottle carriers and a properly designed cart to transport the material. All containers should be tightly capped during transport.

Smaller bottles can be carried by their handles or by grasping the label and placing the little finger under the base of the bottle. Never try to balance a bottle by holding it solely from underneath. Approach all doors with caution.

If you do drop and break a container of a hazardous material, you must leave the area of danger and call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) to report the spill and to request assistance.

5.7 Chemical Hazards

This section contains descriptions of the general categories of chemical hazard and the principles of safety associated with each. This section purposefully does not contain advice for handling specific chemicals. Safe work in a chemical laboratory requires very detailed knowledge of the nature, potential and compatibilities of each substance used; cursory or selective description in this CHP would be misleading and, as a result, unsafe. Anyone planning an experiment or procedure should acquire and review an SDS for each substance, as well as for

all likely products and byproducts. SDSs for each chemical present in the laboratory must be available to every laboratory worker.

The following categories provide a structure for deliberating and planning protection against common chemical hazards. In actual practice, such hazards do not group themselves in neat categories but usually occur in combination and/or sequence. The categories and concepts are provided as an aid to awareness and as encouragement for consistent safe planning and practice.

5.7.1 Flammability

Flammability is one of the most common chemical hazards. The exact degree of hazard, however, depends on the specific substance and the conditions you expect to use it in. To handle a flammable substance safely, you must know its flammability characteristics: flash point, upper and lower limits of flammability, and ignition requirements. This information appears on each SDS.

- Flash Point: For a liquid, the flash point is the lowest temperature at which the liquid gives off enough vapor to form an ignitable mixture with air and produce a flame when a source of ignition is present. Many common laboratory solvents and chemicals have flash points that are lower than room temperature.

- Ignition Temperature: The ignition temperature of a substance is the minimum temperature required to initiate self-sustained combustion. Some ignition temperatures can be quite low (for example, carbon disulfide at 90°C [194°F]).

- Autoignition: Autoignition or spontaneous combustion occurs when a substance reaches its ignition temperature without the application of external heat. This characteristic is particularly important to keep in mind in the storage and disposal of chemicals.

- Limits of Flammability: Each flammable gas and liquid (as a vapor) has a limited range of flammable concentration in mixtures with air. The lower flammable limit (or lower explosive limit) is the minimum concentration below which a flame is not propagated when an ignition source is present; such a mixture would be too lean to burn. The upper flammable limit (or upper explosive limit) is the maximum concentration of vapor in air above which a flame is not propagated; such a mixture is too rich. The flammable range (or explosive range) lies in between the two limits.

Listed measurements of all these characteristics (i.e., flash points, ignition temperatures, limits of flammability) are derived through tests conducted under uniform and standard conditions that may be very different from actual practice. For example, concentrations of vapor in air in a laboratory are rarely uniform and point concentrations can be quite high. It is good practice to set maximum allowable concentrations at 10 percent of the listed lower limit of flammability within closed systems. (It is important to note that, generally, this 10 percent limitation is still well above the maximum concentration considered to be safe for health considerations.)

- Precautions with Flammable Liquids: Flammable liquids do not burn; their vapors do. For a fire to occur there must be: 1) a concentration of vapor between the lower and upper flammable limits; 2) an oxidizing atmosphere, usually air; and 3) a source of ignition. As it is unlikely that air can be excluded and unrealistic (given the constant possibility of a spill) to assume that the vapor concentration can be controlled, the primary safety principle for dealing with flammable liquids is strict control of ignition sources.

  Ignition sources include electrical equipment, open flames, static electricity and, in some cases, hot surfaces. Others working in the laboratory should be informed of the presence of flammable substances so that ignition sources can be eliminated. Obviously, it is very important to know which of those sources is capable of igniting the substance you are using.

  Remember most flammable vapors are heavier than air and will spread out horizontally for considerable distances until an ignition source is contacted.

  If possible, flammable liquids should be handled only in areas free of ignition sources. Heating should be limited to water and oil baths, heating mantles and heating tapes.

  Static-generated sparks can be sudden ignition sources. When transferring flammable liquids in metal equipment, take care that metal lines and vessels are bonded together and grounded to a common ground.

  Ventilation is very important. A fume hood should be used when flammable liquids are allowed to stand in open containers or are handled in any way.

- Precautions with Flammable Gases: Leakage of compressed or liquefied gases can quickly produce a flammable or explosive atmosphere in the laboratory. This is obviously true where the gases themselves are flammable and under high pressure, but may also be true in the use of non-pressurized liquefied gases. For example, even relatively safe liquefied gases such as liquid air or liquid nitrogen, if kept in open vessels for too long, will generate concentrations of liquid oxygen which can contribute to an explosion. Proper care with compressed gas cylinders and cryogenic setups is essential (see General Laboratory Equipment Setup, Section 5.5).

5.7.2 Explosiveness

Ignition of flammable vapors or gases can occur with such speed that an explosion results. Other substances are explosive in themselves in response to heat, mechanical shock or contact with a catalyst. With some substances, very tiny amounts of impurity are sufficient to begin a reaction that quickly becomes explosive.

- Precautions: Become aware of all hazards of each chemical you are using. It is crucial that you know its potential including its compatibility with other substances. This information can be obtained from the SDS.

  Be alert to any unusual change in the appearance of a reaction mixture. Rapid unexpected temperature rise or fuming are signals for emergency measures such as removing the heat source, quickly applying a cooling bath or leaving the room.

  Explosive compounds should be protected from the conditions to which they are sensitive (e.g., mechanical shock, heat, light, etc.). Check the SDS or other reference to determine those conditions. Such substances should be brought to the laboratory only as required and only in the smallest quantities absolutely necessary. Reactions involving or producing explosives should be designed on as small a scale as possible and should be done behind a suitable barricade.

  Special care should be taken to ensure that equipment is maintained (e.g., that oil is routinely changed in vacuum pumps) and that heating methods used do not cause or increase the potential for ignition.

  Other laboratory workers must be notified when an explosive hazard is present through direct announcement and conspicuous warning signs.

- Personal Protection: Highly exothermic or potentially explosive reactions must never be left unattended.

  In addition to protection otherwise required in the laboratory, wear face shields and heavy gloves at all times when handling known explosive substances. Laboratory coats of a flame-resistant material or treatment may help reduce minor injuries from flying glass or flash fire. When serious explosive hazard is anticipated, shields and barricades will be necessary along with devices for manipulating equipment at a safer distance (e.g., long-handled tongs, stopcock turners, mechanical arms, etc.). Contact the CHO or Facilities Services or Security if you plan to run an experiment with a significant explosion potential.

5.7.3 Toxicity

Toxicity is the potential of a substance to cause injury by direct chemical action with body tissues. Whether the effect is acute or chronic, the only way to avoid such injury is to prevent or greatly minimize contact between toxic chemicals and body tissues.

- Measurement: The dose or amount of chemical you are exposed to determines the body's response. In the workplace, there are certain guidelines or regulations which limit your exposure to hazardous substances. These guidelines, which are set by various regulatory or professional organizations, are referred to as "workplace exposure limits."

  A workplace exposure limit is the airborne concentration of a material below which most persons can be exposed for long periods of time without adverse effects. These limits are based on an 8-hour time-weighted-average (TWA) over a working lifetime. Permissible Exposure Limits (PEL) are those set by OSHA. Workplace exposure limits may be expressed as Threshold Limit Values (TLV) or Workplace Environmental Exposure Limits (WEEL).

  A Short-Term Exposure Limit (STEL) is the maximum concentration limit for a continuous 15 minute exposure period, provided that the daily TWA is not exceeded. Because workplace exposure limits are generally expressed as average concentrations, excursions above these values are permitted. The exposure levels during such excursions must be below the STEL. However, there are certain levels which must never be exceeded even instantaneously. These are known as the ceiling levels for a TLV, or TLV-C.

  All these measurements, though often based on data from animal research, refer to the exposure and resistance of a healthy adult. These levels do not necessarily apply to pregnant women, their unborn fetuses or adults who are ill or under special stress. In such situations, the individual and his/her supervisor or instructor must carefully consider all pertinent information. Laboratory Services can be consulted in such matters.

- Acute Toxicity: Acute toxic effects are usually produced by a single large dose; generally well above the TLV, received in a short period of time. The effects are immediate and may be partially or totally reversible. Acute toxic effects include:

  Simple Asphyxiation: the body does not receive enough oxygen (e.g., when gaseous nitrogen has displaced the air in a room).

  Chemical Asphyxiation: the body is prevented from using oxygen (e.g., when carbon monoxide instead of oxygen is absorbed in the blood).

Anesthetic: causes dizziness, drowsiness, headaches and coma (e.g., by the vapors of many organic solvents).

Neurotoxic: the brain's control of the nervous system is slowed down or changed.

Corrosive: body tissue is directly damaged by reaction with chemicals (e.g., by strong acids or bases [see separate subtopic below]).

Allergic: repeated exposure to a chemical produces sensitizing until there is an allergic reaction at the contact site (usually skin).

- Chronic Toxicity: Chronic toxicity refers to adverse or injurious effects that can result from prolonged exposure to a substance, sometimes at dose levels just above the TLV. Damage may not appear for many years and is often irreversible. As a result, this class of hazard is both very difficult and very important to guard against. The body can filter and process levels of toxicity that might seem surprisingly high but over extended periods of time, even with a very low dose, the filtering process may fail, and damage may occur. Types of chronic toxic effects include:

  Carcinogenicity: produces cancer (e.g., asbestos and vinyl chloride are known to produce cancer in humans).

  Mutagenicity: alters cell genes resulting in subsequent generations exhibiting genetic damage.

  Teratogenicity: harms developing fetus.

  Reproductive Toxicity: interferes with the reproductive system in men and women.

  Specific Organ Toxicity: damages specific organs (e.g., carbon tetrachloride can cause liver damage).

- Precautions: The precautions to take against contact with toxic substances are repeated many times throughout this CHP. With chemicals of low acute toxicity, it may be tempting to be less rigorous yet it is precisely those chemicals which most require continual caution, an unvarying habit of safety.

  You must protect your body against all forms of chemical contact: absorption, inhalation, ingestion and injection. Never eat, drink or smoke in the laboratory; wear the appropriate protective gear, and always remove it before you leave the laboratory. Make sure you carefully wash your hands before leaving the laboratory.

  Remember that the chemicals you bring home on your clothes will have a more powerful effect on growing children and elderly people than on most adults.

  In order to know what level of personal protection will be adequate, keep up to date on recent tests for substances you are using. SDSs are updated regularly and you

should consult the most recent data each time you begin a new procedure. The best precaution is to treat all chemicals as toxic.

5.7.4 Corrosives

Corrosiveness is a form of acute toxicity sufficiently common and hazardous to merit separate discussion. Corrosive chemicals include strong acids, strong bases, oxidizing agents and dehydrating agents. When these substances come in contact with skin, eyes or the surface tissues of the respiratory tract, they react with the tissues they touch and cause local injury.

- Liquid Corrosives: A liquid corrosive will act on the skin rapidly or slowly depending on concentration and length of contact. These chemicals react directly with the skin, dissolving or abstracting from it some essential components, denaturing the proteins of the skin or disrupting the skin cells. Mineral acids, organic acids and bases are among the typical liquid corrosives.

  When handling liquid corrosives, contact with them must be scrupulously avoided. Wear goggles, rubber or suitable synthetic gloves, and a face shield, when deemed appropriate. A rubber or synthetic apron and rubber boots may also be necessary. Since many liquid corrosives also release irritating vapors, procedures using these materials should be performed in a fume hood.

- Solid Corrosives: Solid corrosives interact with the skin or other surfaces when dissolved by moisture. Damage then occurs both from the corrosive action and from the heat of reaction with water. Because they are solid, these chemicals are relatively easy to remove. However, since they may not react immediately and may not be painful at first (as with the caustic alkalis), they may cause much damage before being detected.

  Solid corrosives are most commonly dangerous in a finely divided state. Dust control and good exhaust ventilation are essential, as well as goggles, gloves and other protective clothing. In case of chemical contact, much care must be taken during the emergency shower irrigation to remove all particles of solid matter that might be lodged in the skin or clothes.

- Gaseous Corrosives: Gaseous corrosives pose the most serious health hazard of all corrosives because of possible damage to the lungs, including spasm, edema, pneumonia and even death. Different corrosive gases affect different parts of the lung (e.g., ammonia affects the upper respiratory tract, while phosgene affects the lung, causing pulmonary edema) but all are to be avoided.

It is thus crucial that corrosive gases not be inhaled. Careful design and use of fume hoods is essential. Skin and eyes must also be protected since gases contact all exposed parts of the body.

5.7.5 Impurities and Combinations

SDSs and chemical reference books contain information on pure chemicals, known mixtures and proprietary materials. Unfortunately there are no such sheets for other materials found in the laboratory, including solutions, mixtures of unknown or uncertain composition, and byproducts of reactions, all of which are common in the laboratory. Impurities, synergistic effects, formation of unexpected products and byproducts, insufficiently clean equipment, and the combination of vapors from your experiment with that of your neighbor's can all produce sudden and unanticipated hazards.

There is no absolute protection against all contingencies. However, it helps to wear protective gear, to clean equipment scrupulously, to be aware of experiments in progress in nearby areas and to be completely familiar with emergency procedures.

5.8 Decontamination and Waste Disposal

The following sections contain information regarding appropriate decontamination and waste disposal procedures to be implemented in all laboratories.

5.8.1 Decontamination

Decontamination should be a continual process performed during as well as after an experimental procedure. Cleaning should include yourself and your clothing, laboratory surfaces, equipment and containers. Wash hands frequently while working in the laboratory; when you leave, remove protective gear and inspect clothing.

Care with gear and clothing will prevent taking chemicals home with you. Care with equipment and containers will help avoid future contamination and surprise mixtures. Such care

requires planning as well as good housekeeping. Decontamination and disposal methods should be part of your written procedures.

When washing glassware, work with a few items at a time and allow them to drain where they will not fall over. If anything falls, let it fall rather than risk severe cuts by grabbing it as it breaks. If glass has broken in a sink containing water, drain the water and then use forceps and/or cut resistant gloves when picking out broken pieces.

Clean vessels or equipment with appropriate materials (e.g., water, soap, acid, etc.). Do not proceed unless you are sure which materials to use. Check Safety Data Sheets (SDSs) and other references for advice on the proper cleaning materials to use with the specific substance to be cleaned up. Follow directions carefully. If you have any questions, call the CHO.

5.8.2 Waste Disposal

NYIT has programs in place for the management of waste generated in campus laboratories. Details of the programs are provided in Appendix H, Policy for Disposal of Laboratory Glassware, Hazardous Waste and Regulated Medical Waste.

6.0 CRITERIA TO DETERMINE AND IMPLEMENT CONTROL MEASURES

6.1 Determination

Whenever possible, SDSs or other respected chemical references will be reviewed by the CHO for chemicals to be used in the laboratory prior to the use of that chemical. Other respected chemical references should be consulted as well for more detailed information. This information, along with information on the conditions under which the chemical is to be used, will generally be utilized to determine the degree of protection required. The CHO will review the procedures to be implemented, as well as the chemicals to be used, to determine if exposure monitoring is necessary. If determined to be necessary, the appropriate control measures will be determined and implemented.

6.2 Implementation

Once the required degree of control is determined, control measures will be selected. The following presents some of the control measures that may be selected for implementation.

6.2.1 Engineering Controls

Engineering controls reduce an exposure at its source. Engineering controls are the method of choice for reducing exposures and will be used whenever possible/practicable. Examples of some engineering controls include:

- Substitution of hazardous materials or operations with those that is less hazardous.
- Use of laboratory fume hoods.
- Use of glove boxes or other enclosures.
- Use of local exhaust ventilation (e.g., “elephant trunks,” slotted exhaust hoods, canopy hoods, etc.).

6.2.2 Administrative Controls

Administrative controls are work practices which are designed to control exposures. Administrative controls will be used in conjunction with engineering controls or when engineering controls are impractical or not feasible. Examples of administrative controls include:

- Limiting time of exposure to maintain levels below acceptable exposure limits.
- Utilizing good housekeeping procedures to reduce exposures.

6.2.3 Personal Protective Equipment

Personal protective equipment (PPE) does not reduce the source of exposure but rather protects the individual. PPE will be used in addition to engineering controls, while engineering controls are being installed or when engineering controls are impractical or not feasible. Some examples of personal protective equipment include:

- Respirators: Includes dust masks, as well as other types of respiratory protective equipment. NYIT relies upon engineering controls to prevent employee exposure to hazardous chemicals below Permissible Exposure Limits. However, NYIT does have a written Respiratory Protection Program in case of a situation where respiratory protection is needed. If you think you need respiratory protection in your workplace, contact the CHO to have your workplace evaluated.
- Gloves, aprons, boots and other skin protection.
- Goggles and face shields.

A copy of NYIT's Personal Protective Equipment Program is provided as Appendix F to assist Laboratory Supervisors in conducting a hazard assessment of their laboratories. A copy of the completed assessment must be included in Section 12.00 of each laboratory's CHP.

7.0 DOCUMENTING PROPER FUNCTIONING: FUME HOODS AND OTHER PROTECTIVE EQUIPMENT

7.1 Fume Hoods

All renovated/retrofitted or newly installed fume hoods will be equipped with a flow indicating device. In the absence of such a device, other methods can be used to determine if a fume hood is functioning properly (e.g., checking the face velocity with small hand-held velocity meter, or by hanging a small piece of tissue, or a "tell-tail" from the sash).

Designated Laboratory Supervisors will survey all fume hoods at least semiannually to determine if they are functioning in accordance with the guidelines provided in Appendix G. All hoods will be inspected annually. Any hood malfunctions will be reported to the CHO, who will coordinate the repairs with EH&S. EH&S will ensure that all required repairs are made, inclusive of any ductless fume hoods. A copy of the survey results will be posted on the fume hood and the CHO will maintain a copy of the results on file. The Department Chair will also be informed in writing of the results of the survey. Any fume hood found to not be operating in accordance with these requirements due to the user's actions (e.g., hood is cluttered) will be referred to the Laboratory Supervisor for correction. Under certain circumstances, fume hoods will be placed out of service by the CHO until such repairs can be made. All records of proper hood operation and hood repairs will be maintained by the CHO.

7.2 Safety Showers and Eyewashes

All safety shower and eyewash units will be inspected routinely by the Laboratory Supervisor or Principal Investigator (see Appendix G for procedures and frequency). Safety shower and eyewash units found to not be operating in accordance with campus requirements must be promptly reported to EH&S. If repairs cannot be made immediately, the shower or eyewash station will be placed out of service until such repairs are completed. The CHO will determine whether malfunctioning equipment necessitates ceasing operation. All records of proper operation and repairs will be maintained by the CHO.

All inspected units will be tagged with the date of the inspection and the initials of the person completing the inspection.

7.3 Biological Safety Cabinets

All biological safety cabinets will be inspected routinely by the Laboratory Supervisor (see Appendix G for procedures and frequency). If biological safety cabinets are found to not be operating in accordance with campus requirements contact the CHO, who will coordinate repairs with EH&S. A copy of the survey results will be posted on the fume hood and the CHO will maintain a copy of the results on file. The Department Chair will also be informed in writing of the results of the survey. All biological safety cabinets must be inspected annually by an outside contractor. All inspected units will be marked with the date of the inspection, initials of the person completing the inspection and the inspection results. Any biological safety cabinets found to not be operating in accordance with these requirements due to the user's actions (e.g., cabinet is cluttered) will be referred to the Laboratory Supervisor for correction. Under certain circumstances, biological safety cabinets will be placed out of service by the CHO until repairs can be made. All records of proper hood operation and hood repairs will be maintained by the CHO.

7.4 First Aid Kits

In accordance with OSHA's requirements, first aid kits must be readily available for worker use. All first aid kits must be American National Standards Institute (ANSI) approved.

8.0 EMPLOYEE INFORMATION AND TRAINING

The intent of the Information and Training Program is to inform workers of the physical agents and hazardous chemicals in their laboratory, and the nature of the risks associated with handling these materials. Before working with any hazardous materials, laboratory workers will be informed of the conditions under which the materials may be harmful or may cause injury. The workers will be trained in the proper control methods (e.g., engineering, personal protective equipment, etc.) and appropriate procedures necessary to control occupational exposure to hazards in the laboratory. This training is designed to satisfy the requirements of the OSHA Occupational Exposure to Hazardous Chemicals in the Laboratories Rule (the OSHA Laboratory Standard) and the Community Right-To-Know (RTK) Act. The CHO is responsible for preparing or coordinating the preparation of the training presentations, coordinating the training schedule and ensuring all employees, including trainers, are appropriately trained.

The information and training will be provided to NYIT laboratory employees in annual training sessions. First, an initial orientation session will be provided, scheduled and documented by the EH&S office. Each Department covered under this CHP is responsible for ensuring all departmental employees have attended the training session. The session covers the topics outlined below, under "General Orientation (Classroom Training)". Second, training session's specific to the employee's work area must be scheduled by the employee's Department. This session must cover the items listed below, under "Laboratory Training (Hands On/Specific to Work Area)". Each Department should provide attendance forms to document this "hands-on" training session. A copy of the completed Department attendance form must be sent to the CHO for compliance documentation and filing.

8.1 General Orientation Training

All laboratory employees whose job responsibilities include the use of laboratory space and/or exposure to chemical hazards will receive this training. Training will be performed upon initial hire and then as needed. The General Orientation Training lecture will be provided by the CHO or designee and will consist of the following topics:

- Regulatory Review - the contents of the OSHA Laboratory Standard and the RTK Act will be reviewed and a copy will be made available in the EH&S office.

- Chemical Hygiene Plan - The contents of the Chemical Hygiene Plan, including laboratory-specific SOPs will be reviewed.

- Physical and Health Hazards - the physical and health hazards of chemical exposure will be reviewed, including, but not limited to, biohazards, carcinogens, compressed gases, corrosives, cryogenic materials, embryotoxins, explosives, flammables, mutagens, oxidizers, poisons, radioactive materials, reactive materials, sensitizers, and teratogens.

- Methods of Determining Exposure - the following methods of determining exposure will be reviewed:

  – Exposure monitoring

  – Evaluation of work practices

  – Use of senses, primarily sight with emphasis on sense of smell and focusing on the odor threshold of materials with poor warning properties.

- Permissible Exposure Limits (PELs) - PELs and other occupational exposure limits will be reviewed. If a material is considered hazardous but has no PEL, EH&S will help establish controls for working with the material safely.

- Central Files - Employees will be informed that each laboratory should maintain Safety Data Sheets (SDSs) for the chemicals that they use. Employees will be informed of the location and availability of these hazard information resources. Additional reference materials (available in individual departments) regarding the hazards, safe handling and storage of hazardous materials will also be discussed.

- Chemical Exposure Prevention - the following exposure prevention mechanisms will be reviewed:

  – Engineering Controls:

    Substitution - Substitute less hazardous materials in place of a more hazardous material, whenever possible.

    Isolation/Enclosure - Enclose the lab experiment or procedure (e.g., utilize glove box).

    Ventilation - Remove airborne toxic materials from workers breathing zone through use of local exhaust ventilation (e.g. fume hoods).

- Administrative Controls - minimize exposure through good housekeeping procedures by minimizing exposure time through good work practices.

- Personal Protective Equipment - use of personal protective equipment will be discussed, including eye and face protection, skin protection (e.g., gloves, aprons, lab coats, etc.) and respiratory protection.

- Spill Response Policy – review of the Procedures for Handling Hazardous Incidents policy and incident reporting.

8.2 OSHA Required Training

The OSHA Required Training will review all of the applicable regulations required for workers in laboratories and provide a more thorough understanding of the regulatory requirements than that presented in the General Orientation Training. The CHO will determine which workers require this training based on their responsibilities during normal working hours. The EH&S Department will be responsible for conducting this training on an annual basis. This training will include, but may not necessarily be limited to, the following:

- Hazard Communication Standard
- Laboratory Standard
- Blood-Borne Pathogens
- Personal Protective Equipment

8.3 Specific Laboratory Training

Laboratory Supervisors and Principal Investigators are required to ensure that employees working within laboratories under their control are appropriately trained. Laboratory employees will be trained prior to the employee initiating work within the laboratory and then retrained as needed. Documentation regarding completion of the specific laboratory training must be provided to the CHO.

The specific laboratory training will consist of hands-on training specific to each work area and will be provided by the Laboratory Supervisor or Principal Investigator and will consist of the following topics:

- CHP Availability - The location and availability of the Chemical Hygiene Plan (CHP) for individual laboratories will be reviewed.

- SOPs - Standard Operating Procedures developed for that specific lab will be reviewed, as applicable.

- Emergency Procedures - Emergency procedures and equipment for the lab (e.g., location and use of eyewash, safety showers, fire extinguishers, exit routes, etc.) will be reviewed.

- Safety Equipment - Safety equipment used in the lab (e.g., fume hoods, face shields, gloves, etc.) will be reviewed.

- Designated Areas - Designated areas and any special procedures for handling extremely hazardous substances will be reviewed.

- Signs and Symptoms of Exposure - Signs and symptoms associated with exposure to materials in the laboratory will be reviewed. In addition, the methods and observations used to detect the presence or release of hazardous materials in the laboratory will be covered again in the hands-on training.

- Spill Response – Specific spill response procedures to be utilized in the laboratory based on the chemicals located within.

9.0 MEDICAL CONSULTATIONS AND EXAMINATIONS

Employees, who believe that they have been adversely exposed to chemicals in the workplace, or at the direction of the CHO, will seek a medical examination with NYIT's doctor. The name, address and phone number of the physician contracted with NYIT to provide these examinations can be obtained from the CHO.

9.1 Medical Consultation

9.1.1 Offering Consultations

NYIT shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

- Whenever the employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- When monitoring reveals exposure in excess of an Action Level or Permissible Exposure Level (PEL) for an OSHA-regulated substance for which there are exposure monitoring and medical surveillance requirements.
- Whenever an event takes place such as spill, leak or explosion where there is likelihood of significant exposure to hazardous chemicals.

All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

9.1.2 Information Provided to the Physician

NYIT shall provide the following information to the physician:

- The *identity* of the hazardous chemical(s) to which the employee or student may have been exposed;
- A *description of the conditions* under which the exposure occurred, including quantitative exposure data, if available; and
- A description of the *signs and symptoms* of exposure that the employee or student is experiencing, if any.

9.1.3 Physician's Written Opinion

For examination or consultation required under this standard, NYIT shall obtain a written opinion from the examining physician, which shall include the following:

- Any recommendation for *further medical follow up*;
- The *results* of the medical examination and any associated tests;
- Any *medical condition* which may be revealed in the course of the examination which may place the employee or student at increased risk as a result of exposure to a hazardous chemical found in the workplace; and
- The written opinion shall not reveal specific findings of diagnosis unrelated to occupation exposure.

These records will be maintained on file in the EH&S and Human Resources Departments.

9.1.4 Exposure Evaluation Following an Incident

The initial evaluation of an incident for possible exposure and the person responsible for establishing the need for a medical consultation/examination is the CHO.

9.1.5 Medical Records

NYIT shall keep written records of all such medical examinations. These records must be maintained for the length of employment or enrollment plus thirty years. In addition, the following is required:

- Such records must contain, but do not have to be limited to, the physician's opinions, recommendations, results of any tests performed and any follow-ups.
- Upon written request, such records shall be made available for review by the employee, student or an authorized representative.
- All such records shall be maintained and made available for review in accordance with OSHA Standard 29 CFR 1910.1020.

10.0 PROVISIONS FOR PROTECTING EMPLOYEES WHEN WORKING WITH PARTICULARLY HAZARDOUS SUBSTANCES

Consideration will be given to adopting the procedures described in this section, as appropriate, when performing laboratory work with any particularly hazardous substance, including carcinogens, reproductive toxins, any substance that has a high degree of acute toxicity or a chemical whose toxic properties are unknown.

10.1 Definitions

The following definitions apply:

- Select carcinogen: Any substance defined as such in 29 CFR 1910.1450 and any other substance described as such in the applicable SDS.
- Reproductive toxin: Any substance described as such in the applicable SDS.
- Substances with a high degree of acute toxicity: Any substance for which the LD50 data described in the applicable SDS cause the substance to be classified as a "highly toxic chemical" as defined in ANSI Z129.1.*
- Chemical whose toxic properties are unknown: A chemical for which there is no known statistically significant study conducted in accordance with established scientific principles that establish its toxicity.
- Particularly hazardous: For the purposes of this CHP, any chemical meeting the definition of any of the above four categories.

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* *ANSI Z129.1 includes chemicals in any of the following categories:*

1) *A chemical that has a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally into albino rats weighing between 200 - 300 grams each, or*
2) *A chemical that has a median lethal dose (LD50) of 200 mg or less per kg of body weight when administered by continuous contact for 24 hours (or less, if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kg each, or*
3) *A chemical that has a median lethal concentration (LC50) in air of 200 ppm by volume or less of gas or vapor, or 2 mg per liter of mist, fume or dust, when administered by continuous inhalation for one hour (or less, if death occurs within one hour) to albino rats weighing between 200 and 300 grams each, provided such concentrations and/or conditions are likely to be encountered in a reasonably foreseeable manner.*

- Designated area: A hood, glove box, portion of a laboratory or an entire laboratory room designated as the only area where work with quantities of particularly hazardous chemicals shall be conducted.

10.2 Conditions for Usage

A "designated area" will be established in the laboratory for use of the particularly hazardous substance. Designated areas shall be posted and their boundaries clearly marked. Only those persons trained to work with particularly hazardous chemicals will work with those chemicals in a designated area. All such persons will:

- Use the smallest amount of chemical that is consistent with the requirements of the work to be performed.
- Use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps.
- Store particularly hazardous chemicals or remove them from storage.
- Decontaminate a designated area when work is completed.
- Prepare waste from work with particularly hazardous chemicals for waste disposal in accordance with the specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA). (For further information on specific disposal requirements, contact EH&S).
- Store all particularly hazardous chemicals in locked and enclosed spaces.
- Since the decontamination of jewelry may be difficult or impossible, avoid wearing jewelry when working in designated areas.
- Wear long-sleeved disposable clothing and gloves known to resist permeation by the chemicals used when working in designated areas. (For further guidance on selection of protective clothing, contact the CHO.)
- Conduct a "dry run" of procedures involving particularly hazardous substances.

11.0 LABORATORY OPERATIONS THAT REQUIRE PRIOR REVIEW AND APPROVAL

Prior approval must be obtained when a laboratory procedure presents a significant risk of injury, illness or exposure to hazardous substances. The risk is considered significant when there are very large quantities of particularly hazardous substances involved or the experimental procedures exacerbate the potential for a hazardous condition. Obviously, these conditions must be applied on a case-by-case basis.

11.1 Prior Review and Approval by a Principal Investigator

For routine operations, other than those detailed under in the next section ("Prior Review and Approval by the Chemical Hygiene Committee"), the principal investigator, or someone designated by the principal investigator, may review and approve operations by completing the "Safety Review and Approval Checklist." Only principal investigators or their designees who have attended NYIT-sponsored Laboratory Standard Training may review and approve these laboratory operations.

11.2 Prior Review and Approval by the Chemical Hygiene Committee

The Chemical Hygiene Committee is an advisory body to the science departments composed of relevant administrators and science faculty. The committee's role is to facilitate dialog between faculty and the administration to promote regulatory compliance and safety in the science departments. The committee's recommendations represent a peer review of proposed projects and operating procedures. The committee is not empowered to stop any projects that it does not approve. The findings will be forwarded to the appropriate Dean and the CHO, who will review the recommendations, and either approve the project or forward the findings with their recommendations to the Provost for review.

The following would require prior approval by the Chemical Hygiene Committee before proceeding with a particular experiment or activity:

- When it is likely that occupational exposure limits could be exceeded or that other harm is likely.

- When there is a failure of any of the equipment used in the process that did or could have resulted in injury, illness or exposure of a laboratory worker to a hazardous material, the Chemical Hygiene Committee must grant approval before the procedure may be undertaken again.

- When any laboratory workers become ill or suspect that they or others have been exposed due to any experimental procedure.

- When there was or nearly was an explosion or uncontrolled reaction that did or could have resulted in damage to property or injury to people.

Principal investigators who wish to obtain prior approval from the Chemical Hygiene Committee must provide the committee with the information on the "Request for Prior Approval" form. If animals are to be used in this research activity, approval must be obtained from the NYIT Institutional Animal Care and Use Committee (IACUC) for the Use and Care of Animals.

The current Chemical Hygiene Committee consists of the following employees:

- Larry Stepp, Ph.D., CHO
- Mr. Brian Kelleher, NYIT Environmental Safety, Assistant Director
- Mr. Kristen Panella, NYIT Environmental Safety, Director
- Kurt Amsler, Ph.D., Associate Dean for Research
- German Torres, Ph.D. Faculty
- Simone Hoffmann, Ph.D., Faculty

The required checklists and forms for applying for prior approval are provided in Appendix E of this document ("Forms for Laboratory Operations that Require Prior Review and Approval").

12.0 LABORATORY SPECIFIC CHEMICAL HYGIENE PLAN STANDARD OPERATING PROCEDURES AND COMPLETED TEMPLATES

All laboratories using chemicals are required to have a written Chemical Hygiene Plan (CHP) in place specific to the chemicals used in each laboratory. NYIT has developed this general CHP that addresses the basic required elements of a CHP. However, it is the responsibility of each Laboratory Supervisor and/or Principal Investigator (PI) to utilize the general CHP and complete the appropriate CHP templates or equivalent to create a laboratory-specific CHP. The general CHP can be adopted unchanged unless there are different hazards present in the specific laboratory that are not addressed in the general CHP. At minimum, each laboratory will be required to complete Templates 1 through 3. When complete, these templates must be added to Section 12.0 of the laboratory-specific CHP. If assistance is needed with this CHP requirement, contact the CHO. Copies of these templates are provided in Appendix B. In addition, each laboratory must complete a hazard assessment and include laboratory-specific requirements for PPE in Section 12.0. A copy of NYIT's Personal Protective Equipment Program is provided as Appendix F to assist Laboratory Supervisors in conducting this assessment.

APPENDIX A

CHEMICAL HYGIENE PLAN REVIEW
ACKNOWLEDGMENT FORM

CHEMICAL HYGIENE PLAN
NEW YORK INSTITUTE OF TECHNOLOGY

I affirm that I have reviewed the laboratory's Chemical Hygiene Plan and the laboratory's Standard Operating Procedures, and received appropriate training.

Laboratory Supervisor: _____

Principal Investigator: _____

Printed Name	Signature	Date

CHEMICAL HYGIENE PLAN
NEW YORK INSTITUTE OF TECHNOLOGY

REVIEW ACKNOWLEDGMENT FORM

I, _____, the undersigned, have reviewed the New York Institute of Technology Chemical Hygiene Plan and become familiar with the policies and procedures applicable to my responsibilities and work.

I understand that I have a responsibility to conduct my work in a manner consistent with the policies and procedures set forth in this document, as appropriate.

Name: _____

Signature: _____

Date: _____

Department: _____

APPENDIX B

LABORATORY-SPECIFIC CHEMICAL HYGIENE PLAN TEMPLATE

NEW YORK INSTITUTE OF TECHNOLOGY - NYIT CAMPUS
CHEMICAL HYGIENE PLAN
LABORATORY-SPECIFIC CHEMICAL HYGIENE PLAN TEMPLATE

All laboratories using chemicals are required to have a written Chemical Hygiene Plan (CHP) in place specific to the chemicals used in each laboratory. The NYIT Campus of New York Institute of Technology (NYIT) has developed a general CHP that addresses the required elements of a CHP. However, it is the responsibility of each Laboratory Supervisor and/or Principal Investigator (PI) to review the general CHP and complete the appropriate CHP templates designed to complement the general CHP. The general CHP can be adopted unchanged unless there are different hazards present in the respective laboratory that are not addressed in the general CHP. At minimum, each laboratory is required to complete Templates 1 through 3. Following completion, the templates will be added to Section 12.0 of the general CHP. In addition a hazard assessment must be completed to determine laboratory-specific requirements for personal protective equipment (PPE) and included in Section 12.0. Appendix F of the CHP provides a copy of the NYIT Personal Protection Equipment Program to assist completing the assessment. If you need assistance with these CHP requirements, contact the CHO.

TEMPLATE NO. 1:
GENERAL LABORATORY INFORMATION

Laboratory Supervisor: _____

Principal Investigator: _____

Laboratory Location(s) (Building/Rooms): _____

_____

Department Information

Department Safety Representative (current list): _____

_____

Location of Department Safety Bulletin Board (current list): _____

_____

Location of Building Emergency Assembly Point (current list): _____

_____

TEMPLATE NO. 2:
EMERGENCY INFORMATION

As applicable, please provide information regarding the emergency procedures and equipment specific to the laboratory(ies) under your control. Where applicable, you may just reference the emergency contact information posted in your laboratory.

- **Evacuation procedures** (e.g., close fire doors, secure certain equipment, etc.)

- **First-aid kit** (e.g., location, contents, maintenance responsibility, etc.)

- **Spill cleanup materials (**e.g., location, contents, maintenance, procedures, etc.)

- **Laboratory monitors or alarms (**e.g., operation, response, maintenance, etc.)

- **Other**

Per NYIT policy, all significant **injuries must be documented** via the *NYIT Injury to Employee/Student Form* as soon as possible. A copy of this form is available in your department office as well with the Security Office and/or Human Recourses. Completing the form is necessary for potential reimbursement for personal medical costs or Worker's Compensation Claims.

Per NYIT policy, **all fires must be reported to Security immediately** (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) – even if the fire is out. Be sure to report if any of the following occurred: the use of a fire extinguisher (the extinguisher may need to be replaced or refilled), an injury or property damage.

TEMPLATE NO. 3:
HEALTH AND SAFETY REFERENCES

Please identify the title and location of any additional health and safety reference materials (e.g., Merck Index) associated with the laboratory which employees may use to aid them in their work.

	Reference	**Location**
1.		
2.		
3.		
4.		
5.		

Safety Data Sheets (SDS):

Per the Occupational Safety and Health Administration (OSHA), all laboratory chemical users must know, 1) what an SDS is, 2) the SDS's relevance to their health and safety, and 3) how to readily access SDSs. These items must all be covered in the departmental laboratory safety orientation program.

SDSs are required to be maintained in each laboratory for the hazardous chemicals routinely used therein. Please identify specifically where the SDSs are located.

BACKGROUND: STANDARD OPERATING PROCEDURES

A complete CHP includes **Standard Operating Procedures (SOPs)** to assist workers in minimizing chemical exposure in the laboratory**.** This is generally interpreted to mean that SOPs are provided for the following operations (**not** for all possible chemical operations):

- Operations involving what OSHA specifically designates as **Particularly Hazardous Substances (PHS),** namely, "select" carcinogens, highly acute toxins and reproductive toxins; and

- Other "high-hazard" chemical operations.

In order to assist laboratories in developing their SOPs, the following resources are provided herein:

- **Template No. 4**: A generic SOP for using Particularly Hazardous Substances (PHSs)

- **Template No. 5**: A blank SOP for other high-hazard chemical operations

However, these information resources are very general and cannot cover all possible operations. **Therefore, it is the responsibility of the laboratory supervisors and/or the PIs to develop new SOPs (or augment the generic PHS SOP) as necessary to protect their workers.** The decision regarding whether a specific SOP is required is the prerogative, but also the responsibility, of the Laboratory Supervisor and/or the PI.

TEMPLATE NO. 4:
Standard Operating Procedure for
Use of "Particularly Hazardous Substances"

Per OSHA, Particularly Hazardous Substances (PHSs) are **"Select" Carcinogens, Reproductive Toxins and Highly Acute Toxins**.

This generic PHS SOP is provided for use by NYIT laboratories. Laboratory Supervisors and PIs are responsible for editing and/or augmenting this generic SOP as necessary given their local usage conditions. If a particular procedure listed below cannot feasibly be followed, then alternative techniques that offer equivalent protection should be provided herein. Laboratory supervisors and PIs must develop SOPs for specific PHSs, or classes of related PHSs, if determined to be necessary for adequate worker safety. These laboratory-specific SOPs must be approved by the CHO and EH&S and must be reviewed by the Laboratory Supervisor and PIs whenever the Chemical Hygiene Plan is reviewed.

Date of last revision to SOP:

1. **Laboratory SOP Name: USE OF PARTICULARLY HAZARDOUS SUBSTANCES (PHSs)**

   PHSs include, but are not necessarily limited to, the following:

   - "Select" carcinogens, meaning:
     - Regulated by OSHA as a carcinogen; or
     - Listed under, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
     - Listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or
     - Listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
     - After inhalation exposure of 6–7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3;
     - After repeated skin application of less than 300 (mg/kg of body weight) per week; or
     - After oral dosages of less than 50 mg/kg of body weight per day.
   - Reproductive toxins
   - Highly toxic chemicals, including select agents

2. Approval Required

Discuss any circumstances under which this operation requires prior approval (e.g., undergraduates cannot perform this operation without specific consent).

3. Personal Protective Equipment

List specific personal protective equipment required (e.g., gloves, coats, eyewear. etc.) Refer to Appendix F to complete this section or contact the CHO.

Employ the following, whenever feasible, while using a PHS:

- **Protective eyewear**, such as approved safety glasses, goggles or face shields. The latter should be used when handling corrosives in large quantities (e.g., >1 gallon).

- **Lab coats**, particularly when using a PHS that is readily absorbed through the skin or is corrosive to skin tissue.

- **Lab gloves** that are chemically-resistant to the particular material. Please note that some common carcinogens such as dichloromethane and benzene readily permeate common lab gloves such as neoprene and nitrile.

- All **respirators**, other than dust masks, must meet OSHA requirements.

4. Engineering/Ventilation Controls

Describe the required engineering controls (e.g., fume hoods, glove boxes, biosafety cabinets, pressure relief valves, leak detection systems, automatic shutoff valves, etc.). Consider the following:

- Volatile or dust/aerosol-producing PHSs must be used in a **fume hood, glove box, ducted biosafety cabinet or an ES&H-evaluated snorkel exhaust**. Use of these chemicals on an open bench is prohibited except when impractical to use otherwise (e.g., equipment cannot fit in hood). In these cases, other controls (e.g., respirator) must be employed.

- When used outside any of the containment devices mentioned above, containers must be sealed. Please note that the use of volatile PHSs such as formalin, dichloromethane and benzene on an open laboratory bench, in open containers, would probably result in worker exposures above the OSHA legal/safe limits for those materials.

5. Any Special Chemical Handling, Storage, Cleanup or Disposal Requirements

Describe any special chemical handling, storage, cleanup or disposal requirements.

- Under the CHP, an area must be designated for working with PHSs. The designated area may be the entire laboratory, an area of the laboratory or a device such as a laboratory hood. **At NYIT, the designated PHS work area is the entire laboratory**, unless the Laboratory Supervisor specifies otherwise herein.

- PHSs must be stored in completely-sealed containers. Although hood storage of chemicals is generally discouraged, volatile PHSs can be stored in a fume hood if deemed necessary.

- PHS spills must be completely cleaned up. Spills that cannot be safely and completely managed by laboratory personnel must be reported to Campus Security for assistance.

- Like all chemical wastes, PHS disposal must be conducted in accordance with the hazardous waste procedures. PHSs cannot be placed in the sewer system, trash or be allowed to freely evaporate.

TEMPLATE NO. 5:
Standard Operating Procedures for High-Hazard Chemical Operations

This blank template is for use in developing SOPs for any "high-hazard" chemical operation not covered by Template No. 4. High-hazard substances include but are not limited to the following:

- Explosives
- Pyrophoric liquids and solids
- Water reactives (flammable)
- Self-reactive substances
- Flammable gases
- Acutely toxic substances

The development of laboratory-specific SOPs for high-hazard chemical operations is the responsibility and decision of the Laboratory Supervisor and/or PI. OSHA does not provide specific requirements for SOP content. The Chemical Hygiene Officer (CHO) recommends that the following elements be considered in SOP development, but Laboratory Supervisors and PIs should expand on these elements, as appropriate. These laboratory-specific SOPs must be approved by the CHO and EH&S and must be reviewed by the Laboratory Supervisor and PIs whenever the Chemical Hygiene Plan is reviewed.

Date of last revision to SOP:

1. Laboratory SOP Name

SOPs can be based on a specific chemical, a class of chemicals, a specific or set of laboratory procedures, a specific piece of equipment, etc.

2. Approval Required

Discuss any circumstances under which this operation requires prior approval (e.g., Safety committee or that undergraduates cannot perform this operation without my specific consent).

3. Hazardous Chemicals

List all chemicals and their respective hazard class (e.g., carcinogenic, highly toxic, flammable, teratogen, corrosive, etc.) and attach SDSs.

	Chemical Name	Hazard Class
1.		
2.		
3.		
4.		

4. Personal Protective Equipment

List all specific personal protective equipment necessary (e.g., gloves, coats, eyewear, etc.). Refer to the hazard assessment in Appendix F to complete this section. If a respirator is needed, contact the CHO.

5. Engineering/Ventilation Controls

Describe all required engineering controls (e.g., fume hoods glove boxes, biosafety cabinets, pressure relief valves, leak detection systems, auto-shut off valves, etc.).

6. Any Special Chemical Handling, Storage, Cleanup or Disposal Requirements

Describe any special chemical handling, storage, cleanup or disposal requirements.

7. Other

TRAINING RECORD:
LABORATORY-SPECIFIC CHEMICAL HYGIENE PLAN

The following individuals have reviewed and understand the preceding Laboratory-Specific Chemical Hygiene Plan.

Laboratory Supervisor: _____

Principal Investigator: _____

Printed Name	Signature	Date

APPENDIX C

STUDENT LABORATORY SAFETY RULES AND AGREEMENT FORM

NEW YORK INSTITUTE OF TECHNOLOGY
CHEMICAL HYGIENE PLAN

DEPARTMENT: _____

Laboratory Safety Rules

The following safety rules must be observed while in the laboratory. Any individual not observing these rules will be asked to leave.

1. Approved eye protection (goggles) must be worn at all times when doing laboratory work.* The wearing of contact lenses, even under safety glasses or goggles, is forbidden. Contact lenses restrict the washing out of chemicals in the eye.
   *(Splash or indirect vented - available from NYIT Bookstore.)
2. Laboratory coats must be worn at all times.* A limited number of coats are available or rent during each laboratory period. A valid ID and a $2 charge will be collected by lab personnel.
   *(White, 3/4 length long sleeve)
3. Note locations of fire exits, fire extinguishers, eye-wash stations, and safety showers.
4. In case of fire or accident, call the laboratory instructor or technician at once. (Wet towels are very efficient at smothering small fires.)
5. Neither smoking nor eating is permitted in the laboratory.
6. Do not use mouth suction when filling pipettes with chemical reagents. Use the suction bulbs provided for this operation.
7. Exercise great care in noting odors and fumes. Avoid breathing fumes of any kind. Use the fume hoods whenever called for in the instructions.
8. Perform no unauthorized experiments.
9. Never work in the laboratory alone.
10. **Organic chemicals should never be disposed of in sinks. Use the waste containers provided for this purpose. Ask the instructor or technician if in doubt. NYIT has a "no chemical down the drain" policy.**
11. Do not throw solids into the sinks.
12. Tie back or otherwise confine long hair when working in the laboratory.
13. Shoes must be worn when working in the laboratory. Bare feet, sandals, slippers or open-toed shoes are not permitted.
14. No equipment is to be removed from the laboratory without proper authorization.
15. Labs are kept locked until the instructor arrives.

Detach this portion and return signed statement to your instructor. The instructions above should be retained for later reference.

I have read the genera/laboratory instructions and the special safety rules, and I will observe them in my biology/chemistry course.

Print Name: _____

Signature: _____ Date: _____

Course: _____ Section: _____

ID #: _____

APPENDIX D

PROCEDURES FOR HANDLING HAZARDOUS INCIDENTS

NEW YORK INSTITUTE OF TECHNOLOGY
CHEMICAL HYGIENE PLAN
PROCEDURES FOR HANDLING HAZARDOUS INCIDENTS

A hazardous incident is any incident where hazardous materials are spilled, discharged as a gas or where control of radioactive material has been lost. The CHO must be informed of all hazardous incidents.

1. Spills

In the event of a spill of a chemical (either solid or liquid), the following must be evaluated: (1) whether the chemical poses an *immediate danger to health, life or property*[1] or to the environment; (2) whether the amount spilled can be safely handled; and (3) whether the chemical and amount can be easily and safely cleaned up. Only trained personnel may clean a spill. The following must also be performed by the person discovering the spill:

- Call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) immediately. The caller must identify himself/herself and provide information requested. Security will then notify the necessary emergency personnel and the EH&S Office. The EH&S Director and CHO will determine if the spilled material poses a hazard to personnel in the area or the environment and if so, will immediately initiate the evacuation of the area and/or building.

- The EH&S Director will determine the character, source, amount and extent (if applicable) of any materials released. The EH&S Director will notify all necessary facility personnel to initiate control, containment and cleanup activities.

- If the EH&S Director determines that additional assistance is required to control, contain and clean up the spill, he/she or designated alternate shall contact the appropriate authorities. The telephone numbers of outside emergency assistance (i.e., local fire department and local police department) are listed on the table provided on page D-4. The EH&S Director or designated alternate will meet the contractor and escort the contractor to the scene.

[1] Immediately Dangerous to Health, Life or Property - Any spill containing a toxic, flammable, suffocating or reactive substance that when released is capable of causing:

- Permanent injury or death to someone in the area or responding to the spill (e.g., nitrogen gas release in a laboratory, 100 mL of spilled bromine or a large spill of flammable liquid).
- Spills involving greater than 1 liter of an extremely flammable substance, such as diethyl ether or an uncontrolled release of flammable gas.
- Spills of materials known to cause explosions or violent releases of pressure (e.g., nitromethane or organic peroxides).

- Following completion of the cleanup activities, a spill report presenting all pertinent information will be prepared and filed in the EH&S office.

Spill control equipment has been placed in various strategic locations throughout the Biology and Chemistry laboratories for responding to chemical spills. Only trained personnel should attempt a spill cleanup. If these kits are used for any purpose, the Laboratory Supervisor must be notified so that the contents of the kits can be replenished. NYIT also keeps absorbent materials in each laboratory. Please see the department Laboratory Supervisor or CHO with any questions.

Used spill control equipment and recovered materials generated during the cleanup of a spill or leak must be managed and disposed of off-site in accordance with all applicable federal, state and local regulations. Contact the EH&S Office with questions regarding proper management and disposal.

2. Gaseous Discharge

Gaseous discharges are more serious events than spills since gases are capable of poisoning more readily and causing suffocation. A gaseous discharge can arise from compressed gas cylinders or runaway/unexpected reactions of various chemicals. If there is a gaseous discharge in a laboratory, IMMEDIATELY EVACUATE THE ROOM. Following evacuation, the following should be performed:

- If the discharged material poses a hazard to personnel in the area or the environment, immediately evacuate the area and/or building. Evacuation can be performed by sounding the fire alarms located throughout the building. Following evacuation, call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646-273-7789) must be called immediately.

- If the chemical does not pose a threat to personnel in the area, Security or anyone on the call list at the end of this procedure must be notified. Security will inform the caller of any additional procedures that must be performed.

3. Radiation Incidents

In all incidents dealing with radiation, the Radiation Safety Officer must be contacted immediately (516-686-3731).

IN ALL CASES, when calling the emergency number, the caller must be sure that all pertinent information is given to Security. This includes:

- The caller's name;

- The chemical substance involved in the release, if known;

- Details of any injuries, including the type of injury and a description of the individual involved;
- An estimate of the quantity of chemical substance spilled;
- The time and duration of the spill/discharge, if known;
- The location of the release, where and onto what surface;
- Any known or anticipated acute or chronic health risks associated with the spill/ discharge, if known.

CONTACT LIST

For all emergencies, contact Campus Security at:

Old Westbury: (516) 686-7789

Manhattan: (646) 273-7789

For emergencies that occur in the following departments, also contact the following individuals:

Department	Contact	Phone Numbers
NYIT Life Sciences	Michael Hadjiargyrou Chemical Hygiene Officer	(516) 686-7739 (office)
NYIT College of Osteopathic Medicine	Larry Stepp Chemical Hygiene Officer	(516) 686-3731 (office)
NYIT Life Sciences Manhattan Campus	Maciej Kapczynski Chemical Hygiene Officer,	(212) 261-1617 (office)
All Departments	Kristen Panella Office of Environmental Health and Safety	(516) 686-7731 (office)

Notification after 5:00 p.m.

Contact Campus Security at Old Westbury: 516-686-7789 and Manhattan: (646) 273-7789, who will notify the appropriate emergency response personnel.

Additional Emergency Phone Numbers:

Security	Old Westbury (516) 686-7789 Manhattan (646) 273-7789
Fire Department	911
Kristen Panella Director of Environmental, Health and Safety	(516) 686-7731 (office) (516) 250-9703 (cell)
William Marchand Director of Facilities	(516) 686-7904 (office) (516) 322-1122 (cell)
New York State Department of Environmental Conservation Spill Hotline	(800) 457-7362
New York State Department of Environmental Conservation – Region 1	(631) 444-0350
Nassau County Office of Emergency Management	(516) 573-0636
New York City Department of Environmental Protection	(212) 281-7400
National Response Center	(800) 424-8802
Police Department	(516) 626-1300 or 911
AARCO	(631) 586-5900
Triumvirate Environmental	1-800-427-3320
Miller Environmental	1-800-394-8606

SPILL REPORT FORM

Date of Spill: _____

Names of Individuals Involved:	M/F	Age	Injured (Y/N)	Dept.
Supervisor/PI:				
Supervisor/PI:				

Time of spill: _____ **Location of spill:** _____ **Volume spilled (est.)** _____

I. Brief description of how the spill occurred (if known)

_____

_____

II. Describe how the spill was contained and cleaned up, and by whom:

_____

_____

Name of Person Completing Form	Signature	Dept.	Phone No.

SUPERVISOR SIGNOFF: Supervisors must inspect and certify that the spill was properly cleaned up.

Name *(Please print)*	Sign	Phone No.

CHEMICAL HYGIENE OFFICER SIGNOFF: The CHO must certify this form.

I. Did the spill exceed EPA/NYSDEC reportable quantity for the substance? Y or N _____

II. EPA/NYSDEC Case and Operator No. _____

Note: There are no penalties for reporting a spill below regulatory reporting limits. However, there are penalties for failing to report spills above reporting limits.

Name *(Please print)*	Sign	Phone No.

The CHO will send a copy of the completed form to Facilities Services and keep the original on file.

NEW YORK INSTITUTE OF TECHNOLOGY
CHEMICAL HYGIENE PLAN
CHEMICAL SPILL RESPONSE AND CLEANUP PROCEDURE

Spills of chemicals must be recognized as being potentially hazardous to all persons involved. The range and quantity of hazardous chemicals used at NYIT require preplanning to respond safely to spills. The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. Spill control equipment such as absorbents, neutralizing agent and personal protective equipment are available in each laboratory or laboratory prep room to clean up minor spills. A **minor chemical spill** is one where there has been no personal injury and the laboratory staff is capable of safely handling without the assistance of safety or emergency personnel. All other chemical spills are considered **major chemical spills**. This procedure has been developed to ensure that NYIT personnel know what action to take in the case of a chemical spill. ***ALL spills requiring use of spill kits must be reported to the CHO and EH&S Office***

PROCEDURE

Do not attempt to clean up a spill of ***any*** hazardous chemical larger than 500 milliliters (ml) or a spill involving chemicals that are highly toxic by yourself. You should know the hazards associated with any chemicals used in your laboratory by consulting the Safety Data Sheet (SDS) before using them, and you should know how to respond to a chemical spill. NYIT has developed the following procedure for responding to chemical spills:

Minor Chemical Spill

In the event of a minor chemical spill (less than 15 ml):

- Alert people in the immediate area of the spill and evacuate any unnecessary personnel.
- Don personal protective equipment including, at a minimum, safety goggles, gloves and long-sleeve laboratory coat.
- Avoid breathing vapors from spill.
- Confine spill to small area
- Use appropriate spill kit materials to neutralize, absorb and clean up the spilled chemical (consult SDS for information).
- Collect the residue and place in a compatible container. Label the container to identify the contents.

- Contact the EH&S office for disposal or if additional assistance is required.

Major Chemical Spill

In the event of a major chemical spill (more than 15 ml):

- Immediately attend to injured/exposed personnel, evacuate the area, close the door, and notify any persons in adjacent areas. Call Campus Security (Old Westbury: 516-686-7789 and Manhattan: 646 273-7789) and provide the following information:
  - Your name and phone number.
  - Name(s) of personnel injured/exposed.
  - What spilled and how much.
  - Where the spill occurred.

- Remain calm. Leave the spill area but stay in a safe area near the spill. Provide the emergency response personnel information on what was spilled, the amount spilled, the SDS, if available, any injuries or exposures and how the incident occurred.

- If you or other laboratory personnel have suffered from a chemical exposure or are feeling any symptoms described on the SDS, notify your supervisor and go to the hospital immediately and tell the Emergency Room physicians that you have been exposed to a chemical spill. All employees should be aware of the location of the nearest hospital and the shortest route from their laboratory to the hospital. Take the SDS with you – the CAS Nos. can assist the physicians in obtaining treatment information.

- If someone is exposed to a spill and is unconscious, move them *if you can do so at no risk to yourself* and call NYIT Security immediately.

- If the spill is not considered hazardous, try to contain it until emergency personnel arrive.

- Dispose of chemicals as chemical waste in approved, properly labeled containers in accordance with NYIT's Hazardous Waste Management Program.

- Release reporting may be required – Security will handle any required reporting.

Following any spill, notify the CHO, EH&S and the Laboratory Supervisor and prepare an Incident Report and Investigation Form. Completed forms must be submitted to the EH&S Office.

NEW YORK INSTITUTE OF TECHNOLOGY
CHEMICAL HYGIENE PLAN
INCIDENT REPORT AND INVESTIGATION [Replace with NYIT form?] yes I will replace

TYPE OF INCIDENT – CHECK ALL THAT APPLY			
❑ INJURY/ILLNESS	❑ VEHICLE DAMAGE	❑ PROPERTY DAMAGE	❑ FIRE
❑ SPILL	❑ AIR EMISSION	❑ HIGH LOSS POTENTIAL	❑ OTHER

GENERAL INFORMATION

OFFICE/DEPARTMENT:_____ REPORT # _____
DATE OF INCIDENT: _____ TIME (AM/PM) _____
SUPERVISOR ON DUTY: _____AT SCENE OF INCIDENT? Y__N__

DAY OF WEEK _____
LOCATION OF INCIDENT: _____
WEATHER CONDITIONS: _____
ADEQUATE LIGHTING AT SCENE?: Y____ N ___ N/A___.

_____

DESCRIBE WHAT HAPPENED

(Attach additional sheet if necessary)

_____
_____
_____
_____

AFFECTED EMPLOYEE INFORMATION

NAME: _____NYIT EMPLOYEE ? Y__N ___

HOME ADDRESS:_____
SOCIAL SECURITY NUMBER:_____ AGE _____
HOME PHONE NUMBER: (_____)_____
JOB CLASSIFICATION: _____YEARS IN THAT JOB _____
YEARS WITH D&B/WFC: _____
NUMBER OF HOURS WORKED PRIOR TO INCIDENT(that day): _____
DID INCIDENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION? Y ___ N

INJURY/ILLNESS INFORMATION

NATURE OF INJURY OR ILLNESS: _____

_____

OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM: _____

_____

FIRST AID PROVIDED?: ___ Y ___ N
IF YES, WHERE WAS IT GIVEN: (ON SITE, OTHER) _____
IF YES, WHO PROVIDED FIRST AID? _____
WILL THE INJURY/ILLNESS RESULT IN:
RESTRICTED DUTY __ LOST TIME ___ UNKNOWN

_____

MEDICAL TREATMENT INFORMATION

WAS MEDICAL TREATMENT PROVIDED? ___ Y ___ N
IF YES, WAS MEDICAL TREATMENT PROVIDED:
ON SITE ___DR.'S OFFICE___HOSPITAL
NAME OF PERSON(S) PROVIDING TREATMENT: _____
ADDRESS WHERE TREATMENT WAS PROVIDED: _____

TYPE OF TREATMENT _____

_____

_____

VEHICLE AND PROPERTY DAMAGE INFORMATION

VEHICLE/PROPERTY DAMAGED: _____
DESCRIPTION OF DAMAGE: _____

_____

_____

_____

SPILL AND AIR EMISSIONS INFORMATION

SUBSTANCE SPILLED OR RELEASED: _____
ESTIMATED QUANTITY/DURATION: _____
IS THIS A REPORTABLE QUANTITY?_____
RESPONSE ACTION TAKEN: _____

_____

_____

_____

ADDITIONAL INFORMATION (e.g. witnesses)

_____

_____

_____

_____

_____

_____

NOTIFICATIONS:

NAME(S) OF NYIT PERSONNEL NOTIFIED: _____

_____

_____

_____

PERSONS PREPARING REPORT

EMPLOYEE NAME: (PRINT) _____ SIGN: _____

EMPLOYEE NAME: (PRINT) _____ SIGN: _____

SUPERVISOR'S NAME: (PRINT) _____ SIGN: _____

FOLLOW-UP INVESTIGATION REPORT

DATE OF INCIDENT: _____ DATE OF INVESTIGATION REPORT: _____

INCIDENT COST: ESTIMATED: $_____ ACTUAL: $_____

OSHA RECORDABLES: ___ Y ___ N
RESTRICTED DAYS ____ # DAYS AWAY FROM WORK _____

CAUSE ANALYSIS

IMMEDIATE CAUSES – ACTIONS AND CONDITIONS THAT CONTRIBUTED TO THIS EVENT

BASIC CAUSES –SPECIFIC PERSONAL OR JOB FACTORS CONTRIBUTED TO THIS EVENT

ACTION PLAN

WHAT HAS AND/OR SHOULD BE DONE TO CONTROL THE CAUSES LISTED? INCLUDE MANAGEMENT PROGRAMS FOR CONTROL OF INCIDENTS IF APPLICABLE.

ACTION	PERSON RESPONSIBLE	TARGET DATE

PERSONS PERFORMING INVESTIGATION

INVESTIGATOR'S NAME: (PRINT) _____ SIGN: _____DATE: _____

INVESTIGATOR'S NAME: (PRINT) _____ SIGN: _____DATE:_____

MANAGEMENT REVIEW

Project Manager: (PRINT)_____ SIGN: _____DATE: _____
COMMENTS: _____
_____
HSC: (PRINT) _____ SIGN: _____DATE: _____
COMMENTS: _____
_____

NOTE: Attach additional information as necessary

EXAMPLES OF IMMEDIATE CAUSES

SUBSTANDARD ACTIONS	SUBSTANDARD CONDITIONS
1. Operating equipment without authority	1. Guards or barriers
2. Failure to warn	2. Protective Equipment
3. Failure to secure	3. Tools, equipment, or materials
4. Operating at improper speed	4. Congestion
5. Making safety devices inoperable	5. Warning system
6. Removing safety devices	6. Fire and explosion hazards
7. Failure to use PPE properly	7. Noise exposure
8. Using defective equipment	8. Exposure to hazardous materials
9. Improper loading	9. Poor housekeeping
10. Improper lifting	10. Extreme temperature exposure
11. Improper position for task	11. Illumination
12. Improper placement	12. Ventilation
13. Servicing equipment in operation	13. Visibility
14. Under influence of alcohol/drugs	
15. Horseplay	

EXAMPLES OF BASIC CAUSES

PERSONAL FACTORS	JOB FACTORS
1. Capability	1. Supervision
2. Knowledge	2. Engineering
3. Skill	3. Purchasing
4. Stress	4. Maintenance
5. Motivation	5. Tools/equipment
	6. Work standards
	7. Wear and tear
	8. Abuse or misuse

MANAGEMENT PROGRAMS FOR CONTROL OF INCIDENTS

1. Leadership and administration	10. Health control
2. Management training	11. Program audits
3. Planned inspections	12. Engineering controls
4. Task analysis and procedures	13. Personal communications
5. Task observation	14. Group meetings
6. Emergency preparedness	15. General promotion
7. Organizational rules	16. Hiring and placement
8. Accident/Incident analysis	17. Purchasing controls
9. Personal protective equipment	

APPENDIX E

FORMS FOR LABORATORY OPERATIONS THAT REQUIRE REVIEW AND APPROVAL

NEW YORK INSTITUTE OF TECHNOLOGY - NYIT CAMPUS
CHEMICAL HYGIENE PLAN
SAFETY TRAINING AND PROJECT SAFETY REVIEW

This section contains policies and forms pertaining to safety training for laboratory workers at the NYIT Campus and specific circumstances in which safety procedures must be reviewed prior to initiating a laboratory project or procedure. This section and those that follow describe the following:

1. Training for all laboratory workers;
2. Safety review for visiting collaborators or projects occurring at NYIT involving materials not purchased by NYIT; and
3. Use of materials or procedures in which a safety incident previously occurred.

These policies ensure that all applicable training, safety reviews, and Federal, State and local regulations have been addressed prior to commencing laboratory work. This procedure contains three policies and forms associated with each policy.

This procedure is applicable to laboratory workers who are individuals working in teaching or research laboratories as salaried or paid employees only. This formally includes faculty, adjuncts, teaching assistants, graduate assistants, research assistants, post-doctoral associates, summer employees, and graduate and undergraduate students who are employed to work in a teaching or research laboratory.

SAFETY TRAINING POLICY

All laboratory workers employed by NYIT and working in a teaching or research laboratory are required to complete safety training. All laboratory workers are required to complete a general safety training program that is conducted by the EH&S Department or delegate and review the Chemical Hygiene Plan (CHP). All laboratory workers in a research laboratory are required to complete safety training for the laboratory worker's specific laboratory environment. This training shall be conducted by the laboratory worker's Laboratory Supervisor. A laboratory worker in a teaching laboratory is required to complete safety training for any teaching laboratory (ies) in which the laboratory worker will work. This training shall be conducted by the CHO or his/her delegate at the start of each semester.

NYIT Training Program Schedule:

The CHO shall announce and distribute a schedule to all Departmental Chairs and Principal Investigators for the NYIT Training Program. Laboratory workers entering NYIT at a time which is out of sequence with the scheduled NYIT Training Program may receive individual training by the CHO that is valid until the next scheduled group session. Training certification is valid for one year.

Research Laboratory Training Schedule:

The Laboratory Supervisor or principal investigator must provide training to each laboratory worker prior to commencing laboratory work and when/if the hazards change.

Teaching Laboratory Training Schedule:

The departmental chair or delegate (e.g., chair of the department safety committee, laboratory instructor) must provide safety training for each teaching laboratory staffed by the laboratory worker. Training must be completed prior to commencing laboratory work and when/if the hazards change.

Duration of Training Certification:

Each training program certification (i.e., NYIT, Research, Teaching) is valid for one calendar year.

Record Keeping:

A record of the completed Training Certification Form (attached) for each laboratory worker will be maintained by the CHO. Annually, preferably at the start of each academic year, the CHO shall distribute a list of laboratory workers certified under each program to Departmental Chairs and Principal Investigators.

Recommended Items for Review by the NYIT/Research/Teaching Training Program

In addition to reviewing the Chemical Hygiene Plan, each training program must review the following items:

Select Agents

If Select Agents will be used, review laboratory-specific procedures provided in Section 12.0 of the CHP and follow the instructions given.

Hazardous Chemical Usage

Review any chemicals or general class of chemicals that will be used during the project.

Radiation Usage

Review radioactive sources or materials needed to perform the project (including X-rays). Special certification is required for the use of radioactive sources and may require the addition of relevant sections to the CHP.

Animal and Human Usage

Review protocol for the use of animals in the proposed research. Special certification is required for use of animals and human subjects in laboratory procedures.

Laser Usage

Review lasers that will be used in the research/teaching environment. Special training certification is required for laser usage.

Additional items recommended for review:

1. Identification of hazards associated with materials and equipment.

   Review the hazards that may be encountered, including but not limited to, toxicity, flammability, pressure, vacuum, temperature extremes, noise, explosives, etc. This information should be included in the general description. The references listed below may be consulted to obtain this information

2. Review written procedures for the proposed research.

3. Ensure copies of the most recent SDS for each material are available.

   The information contained in the SDS should be reviewed with all individuals who will be involved in the procedure.

4. Review the potential for emergency situations to occur and how these can be addressed (e.g., runaway reaction, loss of temperature control, etc.).

5. Identify the location of shut-offs for bottled gases or other critical valves/shut-offs and how they can be safely reached and closed.

6. Review specific emergency shutdown instructions required for the equipment to be used. Ensure instructions are posted and visible.

   It is recommended that emergency shutdown procedures be posted for all overnight and unattended operations. Ensure that a Caution Sign is posted on the laboratory door.

7. Identify types of protective equipment required to perform the assigned work with the hazardous materials involved (e.g., gloves, safety glasses, goggles, face shields, lab coats, etc.).

   For assistance with selecting appropriate protective equipment, refer to Appendix F of the CHP or contact the CHO.

8. Identify procedures to implement in the event of accidental contact (e.g., inhalation, ingestion, skin contact, etc.).

   This information is available on the SDS.

9. Identify procedures for a spill or other emergency.

   This information can be found in Appendix D of the CHP. Additional information may be obtained by reviewing the SDS or by contacting the EH&S Office.

10. Determine whether the least hazardous materials and minimum practical quantities are being used.

11. Identify whether appropriate safety equipment is available and in proper working condition (e.g., fume hoods, glove boxes, etc.).

12. Identify procedures for the proper disposal of waste generated during the experiment.

SAFETY REVIEW AND APPROVAL CHECKLIST

This form must be completed prior to initiating a project at NYIT. This checklist must be completed by the Laboratory Supervisor and Principal Investigator.

Name of Proposal or Project: _____

Location where work will be performed: _____

Principal Investigator: _____

Department: _____

Date ____/____/____

List all individuals who will be working on this project and who have been trained in this procedure.

_____

_____

_____

_____

_____

_____

General

Provide a brief description of the activity that will be carried out. Activities can include, but are not necessary limited to, a particular reaction, a reaction system or use of a particular chemical or biological material. If available, a copy of the written procedure may be attached to satisfy this requirement.

_____

_____

_____

_____

_____

_____

_____

_____

Select Agents

If Select Agents will be used, please review Appendix B of the CHP and follow the instructions provided therein. Attach a copy of the CHO's approval letter to this document. If Select Agents will not be used, please indicate N/A here. _____

Hazardous Chemical Usage

Attach a list of all chemicals (if any) anticipated to be used during this project. If hazardous chemicals will not be used, please indicate N/A here. _____

Radiation Usage

Attach a list of all radioactive sources or materials needed to complete this project. If radioactive materials are not required, please indicate N/A here. _____

Animal Usage

Attach a protocol for the use of animals in the proposed research. Please clearly indicate all species that will be used. If animals will not be used please, indicate N/A here. _____

	Question	Answer *Yes* or *No*
1.	Have all hazards associated with the materials, equipment and procedures to be used been identified and addressed?	_____
	Summarize the hazards that may be encountered, including, toxicity, flammability, pressure, vacuum, temperature extremes, noise, explosive, etc.	
2.	Are written procedures available for the proposed project?	_____
3.	Are current copies of the most recent SDS(s) for the material(s) to be used available?	_____
	The information on the SDS should be reviewed with all individuals who will be involved in this procedure. The SDS must be readily available.	
4.	Have all individuals been trained on the written procedures?	_____
5.	Has the potential for emergency situations been addressed (e.g., runaway reaction, loss of temperature control, etc.)?	_____
6.	Are shutoffs for bottled gases or other critical valves/shut-offs located where they can readily and safely be reached and closed?	_____

	Question	Answer *Yes* or *No*
7.	Are specific emergency shutdown instructions posted and visible?	
	Post emergency shutdown procedures for all overnight and unattended operations. Ensure a Caution Sign is posted on the laboratory door.	
8.	Is appropriate protective equipment (e.g., gloves, goggles, face shields, lab coats, etc.) available and being used?	
	For assistance with selecting proper protective equipment, refer to Appendix F.	
9.	Are all individuals familiar with what to do in the event of accidental contact (e.g., inhalation, ingestion, skin contact)?	
	This information is available on the SDS.	
10.	Are all individuals familiar with what to do in the event of a spill or other emergency?	
	This information may be found on an SDS. Additional information may be obtained by contacting Facilities Services.	
11	Are the least hazardous materials and minimum practical quantities being used?	
12.	Is appropriate safety equipment available and in working order (e.g., fume hoods, glove boxes, etc.)?	

If any question above is answered "NO" or if additional comments need to be added, please attach a separate sheet.

List all chemicals to be used during this experiment. Include information such as chemical name, CAS No., location of storage, frequency of use and quantity to be procured.

Describe the control procedures and personal protective equipment to be utilized to protect worker safety.

Describe the decontamination procedures for surface, materials, instruments, equipment, etc.

Describe what wastes will be generated and how they will be managed/disposed.

Describe any procedures specific to this experiment that must be performed in case of incident, fire, spill, injury or emergency.

Describe any monitoring procedures specific to this experiment that must be performed to protect worker health and safety.

Describe any monitoring procedures specific to this experiment that must be performed to detect environmental contamination.

Signature of Principal Investigator: _____

Date: _____

AUTHORIZATION

_____ _____

Chemical Hygiene Officer Date

SAFETY TRAINING CERTIFICATION FORM

Name of Laboratory Worker: _____
Date of Employment: _____
Department of Employment: _____

I. NYIT Safety Training Program

The laboratory worker has completed the NYIT Safety Training Program as follows:

A. NYIT Safety Training Program – standard group session (must be completed every year year.)

Signature of CHO: _____ Date: _____

Signature of CHO: _____ Date: _____

Signature of CHO: _____ Date: _____

B. NYIT Safety Training Program – individual session (valid until next available standard group session)

Signature of CHO: _____ Date: _____

Valid until: _____

II. Research Laboratory Training Program

The laboratory worker has completed the Research Laboratory Training Program:

Signature of PI: _____ Date: _____

Signature of PI: _____ Date:

Signature of PI: _____ Date: _____

III. Teaching Laboratory Training Program

The laboratory worker has completed the Teaching Laboratory Training Program:

Signature of Dept. Chair*: _____ Date: _____

Signature of Dept. Chair*: _____ Date: _____

Signature of Dept. Chair*: _____ Date: _____

* In lieu of Departmental Chair, a delegate (e.g., laboratory manager, instructor) may sign.

NEW YORK INSTITUTE OF TECHNOLOGY - NYIT CAMPUS
CHEMICAL HYGIENE PLAN
HAZARDOUS MATERIAL USAGE FOR
EXTERNAL COLLABORATIVE RESEARCH AT NYIT

Definitions:

- The term "investigator" for the purposes of this policy refers to a laboratory worker working in a research laboratory at NYIT.
- "Hazardous Materials" are identified as follows:
  - Radioactive Materials are any form of ionizing and non-ionizing radiation including X-Rays that are regulated by NRC or OSHA.
  - Select Agents are biological agents and toxins that have been determined to have the potential to pose a severe threat to both human and animal health, to plant health, or to animal and plant products.by the CDC or the USDA.
  - Hazardous Chemicals are any chemicals defined as hazardous by the following reference sources: NYSDEC, USEPA, OSHA and/or NIOSH. A thorough list of reference works is provided in Appendix B to OSHA's Laboratory Safety Standard 1910.1450.

Standard Operational Procedures:

- Investigators who intend to use hazardous materials at NYIT purchased by an external collaborator must first notify and obtain approval from the Principal Investigator, the Departmental Chair and the CHO.
- The investigator must present a research plan detailing how the hazardous materials will be purchased (obtained), used and disposed. The "Research Safety Review and Approval Checklist" following this form must be completed along with any additional requirements that are identified in the Safety Review.
- Budgetary information is required in the research plan including what funds will be provided for the purchase, usage, handling and disposal of the materials.
- Once the materials have been approved, the investigator is responsible for complying with all institutional policies outlined in the CHP.

Visiting Researcher/Exogenous Materials Safety Review

This form must be completed prior to initiating a collaborative research project involving a visiting collaborative researcher or utilizing hazardous materials that are not directly purchased by NYIT. This checklist must be completed by the Laboratory Supervisor and Principal Investigator.

Name of Proposal or Project: _____

Location where work will be performed: _____

Principal Investigator: _____

Department: _____

Start Date ____/____/____ End Date ____/____/____

List all individuals who will be working on this project and who have been trained in this procedure. Please attach a Certificate of Insurance for each visiting collaborating researcher.

_____

_____

_____

_____

_____

_____

General

Provide a brief description of the activity that will be carried out. Activities can include, but are not necessary limited to, a particular reaction, a reaction system or use of a particular chemical or biological material. If available, a copy of the written procedure may be attached to satisfy this requirement.

_____

_____

_____

_____

_____

_____

Select Agents

If Select Agents will be used, please review Appendix B of the CHP and follow the instructions provided therein. Attach a copy of the CHO's approval letter to this document. If Select Agents will not be used, please indicate N/A here. _____

Hazardous Chemical Usage

Attach a list of all chemicals (if any) anticipated to be used during this project. If hazardous chemicals will not be used, please indicate N/A here. _____

Radiation Usage

Attach a list of all radioactive sources or materials needed to complete this project. If radioactive materials are not required, please indicate N/A here. _____

Animal Usage

Attach a protocol for the use of animals in the proposed research. Please clearly indicate all species that will be used. If animals will not be used please, indicate N/A here. _____

Budgetary Information

If funding is external via grant or collaborative research, please attach a statement of cost allocations for purchasing, handling, use and disposal of hazardous materials. If funding is internal, please indicate N/A here. _____

	Question	Answer *Yes* or *No*
1.	Have all hazards associated with the materials, equipment and procedures to be used been identified and addressed?	_____
	Summarize the hazards that may be encountered, including, toxicity, flammability, pressure, vacuum, temperature extremes, noise, explosive, etc.	
2.	Are written procedures available for the proposed project?	_____
3.	Are current copies of the most recent SDS(s) for the material(s) to be used available?	_____
	The information on the SDS should be reviewed with all individuals who will be involved in this procedure. The SDS must be readily available.	
4.	Have all individuals been trained on the written procedures?	_____

	Question	Answer *Yes* or *No*
5.	Has the potential for emergency situations been addressed (e.g., runaway reaction, loss of temperature control, etc.)?	
6.	Are shutoffs for bottled gases or other critical valves/shut-offs located where they can readily and safely be reached and closed?	
7.	Are specific emergency shutdown instructions posted and visible?	
	Post emergency shutdown procedures for all overnight and unattended operations. Ensure a Caution Sign is posted on the laboratory door.	
8.	Is appropriate protective equipment (e.g., gloves, goggles, face shields, lab coats, etc.) available and being used?	
	For assistance with selecting proper protective equipment, call Facilities Services.	
9.	Are all individuals familiar with what to do in the event of accidental contact (e.g., inhalation, ingestion, skin contact)?	
	This information is available on the SDS.	
10.	Are all individuals familiar with what to do in the event of a spill or other emergency?	
	This information may be found on an SDS. Additional information may be obtained by contacting the EH&S Office.	
11	Are the least hazardous materials and minimum practical quantities being used?	
12.	Is appropriate safety equipment available and in working order (e.g., fume hoods, glove boxes, etc.)?	

If any question above is answered "NO" or if additional comments need to be added, please attach a separate sheet.

Signature of Principal Investigator: _____

Name of Principal Investigator: _____ Date: _____

AUTHORIZATION

Chemical Hygiene Officer: _____ Date: _____

NEW YORK INSTITUTE OF TECHNOLOGY - NYIT CAMPUS
CHEMICAL HYGIENE PLAN
PROCUREMENT PROCEDURES FOR THE ACQUISITION OF MATERIALS IDENTIFIED AS SELECT AGENTS

In response to the Anthrax attacks throughout the United States in the fall of 2001, President Bush signed the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. This law placed more stringent registration requirements and safeguards on colleges and universities and many other institutions throughout the nation. The Centers for Disease Control (CDC) and the United States Department of Agriculture (USDA) have compiled a list of "Select Agents" that are covered under this law. Strict registration requirements are now in-place for all researchers who possess, transfer or use select agents. Civil and criminal penalties for using, possessing or transferring Select Agents to unregistered persons may result in penalties and fines of up to $500,000 and five years in jail.

NYIT strives to provide a safe learning and working environment for all individuals engaged in research at its campus. NYIT also seeks to comply fully with all federal regulations affecting work at the campus.

In response to the federal requirements, NYIT has designated the Chemical Hygiene Officer to serve as the Responsible Facility Official (RFO) for overseeing all activities involving select agents at the campus. The RFO will not work with, use or procure Select Agents. Instead, the RFO will coordinate registration of all activities utilizing Select Agents. All researchers must obtain clearance to commence work from the RFO prior to initiating work.

Researcher shall not engage in any activity involving the possession, transfer or use of any select agent listed in 42 CFR Part 72 Appendix A (Health and Human Services, Centers for Disease Control), 7 CFR Part 331.3 (Department of Agriculture) or 9 CFR Part 121.3 (Animal and Animal Products) at NYIT without first securing the necessary approvals and addressing security and safety issues through the RFO. The RFO will issue approval on behalf of NYIT. The most current version of the above-referenced CFR titles can be found at www.access.gpo.gov/ecfr.

A researcher wishing to obtain approval for the use of Select Agents must first contact the RFO. The RFO will in turn request the following information from the researcher:

- All personnel who will use or have access to the Select Agents.
- Security equipment and dates of installation.
- All safety equipment to be used and maintenance contracts.
- Description of the research project and expected duration.
- Any other relevant materials necessary to complete the federal application.

The RFO will then contact the federal government to obtain approval on behalf of the researcher. Following federal government approval and once the employees are granted clearance, the investigator may then obtain Select Agents for on-site research.

The investigator is required to keep a current inventory of all Select Agents he/she has in stock and submit a copy to the RFO. The RFO must also be notified when stocks of Select Agents are sent for disposal.

All purchases of Select Agents must be processed through the CHO. All disposal of Select Agents must be coordinated through the CHO and the EH&S Office.

If nonexempt Select Agents are discovered at NYIT that have not been properly registered with the federal government and the RFO, the Select Agents shall be secured by the RFO. The RFO will secure the materials by whatever means are appropriate until such time that formal approval by the federal government can be obtained and NYIT is satisfied that the work can be carried out in a safe manner.

APPENDIX F

PERSONAL PROTECTION EQUIPMENT PROGRAM

Contents

1.0 Purpose

The Personal Protective Equipment program has been developed to provide New York Institute of Technology (NYIT) CHANGE TO NYIT THROUGHOUT DOCUMENT employees with the necessary information to identify workplace hazards that require the use of personal protective equipment (PPE), and the proper selection and use of PPE. A secondary purpose is to comply with the Occupational Safety and Health Administration (OSHA 29 CFR 1910.132) standard. It states: Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

OSHA requires the use of PPE to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. OSHA also requires that a hazard assessment of the workplace be performed to determine the need for PPE.

2.0 Roles and Responsibilities

2.1 Environmental Health and Safety Director

- Provide administrative support for this program.
- Ensure the PPE program is implemented and maintained at New York Institute of Technology.
- Provide technical information and assist managers/supervisors in implementing an effective PPE program in their workplace.
- Review and revise the PPE program, as needed for compliance with applicable regulations.
- Conduct a hazard assessment of the potential hazards of their employee's work activities and work areas. Where engineering and/or administrative controls cannot be used to adequately control the hazard, proper PPE must be identified and selected.

- Assist in training where it is needed.

2.2 Managers/Supervisors

- Ensure that employees are aware of and understand the limitations, precautions, use and maintenance of PPE, and strictly enforce the use of PPE.
- Must make PPE readily available to employees who need it and provide training.
- Provide training for PPE instruction, as needed.

2.3 Employees

- Comply with this program and safety recommendations provided by managers/supervisors.
- Conduct assigned tasks in a safe manner and wear all assigned PPE.
- Before using any PPE, each employee must be properly trained to understand the proper selection, use, limitations and precautions to be used with PPE.
- Understand the hazards associated with each job and ensure that the proper controls and PPE are in place prior to starting work.
- Report any unsafe or unhealthy work conditions and job related injuries or illnesses to the manager/supervisor immediately.

3.0 Hazard Assessment

PPE devices alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering, work practice and administrative controls. When engineering, work practice and administrative controls are not feasible or do not provide sufficient protection, New York Institute of Technology must provide PPE to their employees and ensure its use.

A hazard assessment must be conducted to identify physical and health hazards in the workplace. The purpose of the assessment is to identify activities, tasks or equipment that create physical and health hazards that can be minimized by the use of appropriate PPE. When conducting a hazard assessment, a task is investigated and the hazards and the potential hazards associated with the task are determined. See Appendix A for hazard assessment procedures and Appendix

B for a personal protection selection chart.

4.0 PPE Selection

Once the hazards of the workplace have been identified, the Director of Environmental Health and Safety must determine the appropriate PPE to provide protection against the hazards identified during the assessment. The general procedure for the selection of PPE is to:

- become familiar with the potential hazards and the type of PPE that is available;
- compare the hazards associated with the environment; i.e., impact velocities, masses, projectile shape with the capabilities of the available protective equipment;
- select the PPE which ensures a level of protection greater than the minimum required to protect employees from the hazards; and
- fit the user with the PPE and give instructions on care and use of the PPE. Ensure that end users are made aware of all warning labels for and limitations of their PPE.

The fit and comfort of PPE should be taken into consideration when selecting appropriate items for the workplace. PPE that fits well and is comfortable to wear will encourage employee use of PPE. If PPE does not fit properly, it can make the difference between being safely covered or dangerously exposed. It may not provide the level of protection desired and may discourage employee use.

OSHA requires that many categories of PPE meet or be equivalent to standards developed by the American National Standards Institute (ANSI). Any new equipment procured must meet the cited ANSI standard. Existing PPE stocks must meet the ANSI standard in effect at the time of its manufacture or provide protection equivalent to PPE manufactured to the ANSI criteria. For employees who provide their own PPE, the New York Institute of Technology must ensure that any employee-owned PPE used in the workplace conforms to New York Institute of Technology's criteria, based on the hazard assessment, OSHA requirements and ANSI standards. OSHA requires PPE to meet the following ANSI standards:

- Eye and Face Protection: ANSI Z87.1-2010 (USA Standard for Occupational and

Educational Eye and Face Protection).

- Head Protection: ANSI Z89.1-2009.
- Foot Protection: ANSI Z41.1-1991.

For hand protection, there is no ANSI standard for gloves but OSHA recommends that selection be based upon the tasks to be performed and the performance and construction characteristics of the glove material.

Additional information to assist with selecting the appropriate PPE may also be obtained from:

- the manufacturers of PPE
- SDS for chemicals
- product descriptions

4.1 Eye and Face Protection

Employees must use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. Employees must use eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g. clip-on or slide-on side shields) are acceptable. For employees who wear prescription lenses while engaged in operations that involve eye hazards, eye protection must be worn to incorporate the prescription in its design, or wear eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses. New York Institute of Technology ensures that affected employees use equipment with filter lenses that have a shade number appropriate for the work being performed for protection from injurious light radiation.

4.2 Fall Protection

In general, employees must be protected from falls of 6 feet or more. This can be accomplished by a variety of methods. Engineering controls are preferred, such as approved railing systems. Where engineering controls are not possible, an OSHA-approved full-body harness system that is properly secured may be needed.

4.3 Foot Protection

Foot protection is required to be worn when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards. Foot protection must comply with ANSI requirements and provide both impact and compression protection. In some work situations, metatarsal protection should be provided, and in other special situations electrical conductive or insulating safety shoes would be appropriate. Safety shoes or boots with impact protection are required for carrying or handling materials such as packages, objects, parts or heavy tools, which could be dropped; and, for other activities where objects might fall onto the feet. Safety shoes or boots with compression protection are required for work activities involving skid trucks (manual material handling carts) around bulk rolls (such as paper rolls) and around heavy pipes, all of which could potentially roll over an employee's feet. Safety shoes or boots with puncture protection would be required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal etc., could be stepped on by employees causing a foot injury.

4.4 Hand Protection

Appropriate hand protection is required when affected employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes. The selection of the appropriate hand protection is based on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified. It is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be reused. It is also important to know the performance characteristics of gloves relative to the specific hazard anticipated; e.g., chemical hazards, cut hazards, flame hazards, etc. Before purchasing gloves, request documentation from the manufacturer that the gloves meet the appropriate test standard(s) for the hazard(s) anticipated. Other factors to be considered for glove selection in general include the degree of dexterity required, the duration, frequency, and degree of exposure of the hazard, and the physical stresses that will be applied.

With respect to selection of gloves for protection against chemical hazards:

- The toxic properties of the chemical(s) must be determined; the ability of the chemical to cause local effects on the skin and/or to pass through the skin and cause systemic effects;
- Generally, any "chemical resistant" glove can be used for dry powders;
- For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymeric materials; and,
- Employees must be able to remove the gloves in such a manner as to prevent skin contamination.

4.5 Head Protection

All head protection (helmets) is designed to provide protection from impact and penetration hazards caused by falling objects. Head protection also provides protection from electric shock and burn. When selecting head protection, knowledge of potential electrical hazards is important. Class A helmets, in addition to impact and penetration resistance, provide electrical protection from low-voltage conductors (they are proof tested to 2,200 volts). Class B helmets, in addition to impact and penetration resistance, provide electrical protection from high-voltage conductors (they are proof tested to 20,000 volts). Class C helmets provide impact and penetration resistance (they are usually made of aluminum which conducts electricity), and should not be used around electrical hazards. Employees are required to wear a protective helmet when working in areas where there is a potential for injury to the head from falling objects.

4.6 Hearing Protection

When information indicates that any employees' exposure may equal or exceed an 8-hour time weighted average of 85 decibels (dB), New York Institute of Technology would include them in its current monitoring program. Employees who are exposed to noise in excess of 85 dB are required to wear approved hearing protection in the form of earmuffs or earplugs. Most cutting and grinding operations, for example, requires the use of hearing protection. Feasible and effective engineering controls are preferred, e.g., enclosures/wrappings,

absorbing materials, vibration isolation and structural dampening.

4.7 Protective Clothing

The minimum requirements for body protection when working in an area with potential for exposure to chemical splashes, flying particles and dusts, hazardous plants, etc. includes full length pants and/or a protective coat (lab coat). Clothing made of cotton, wool or flannel is best suited for construction work, especially electricians. Avoid wearing synthetic fabrics such as nylon and rayon as these materials burn readily and can melt causing severe burns. Welders should take extra precautions to protect against hot slag, molten metal and sparks by wearing Kevlar, leathers, gauntlets and other special clothing.

4.8 Respiratory Protection

Any operation that generates harmful airborne levels of dusts, fumes, sprays, mists, fog, smoke, vapors, or gases or that may involve oxygen-deficient atmospheres requires the use of effective exposure controls. This must be accomplished, where feasible, by effective engineering control measures (e.g., enclosure or confinement of the operation, local exhaust ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible or while they are being instituted, appropriate respiratory protection must be used. Disposable dust masks may be provided for protection against nuisance dust only.

5.0 Cleaning, Inspection, Maintenance, and Storage

It is important that all PPE be kept clean and properly maintained. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision. PPE should be inspected, cleaned, and maintained at regular intervals so that PPE provides adequate protection to the wearer. PPE should also be inspected before and after use. It is also important to ensure that contaminated PPE which cannot be decontaminated is disposed of in a manner that protects employees from exposure to hazards.

PPE should be stored in a clean, dry area, and in accordance with the manufacturer's recommendations. PPE should not be stored in a location where it is exposed to airborne contaminants, direct sunlight, or temperature extremes.

6.0 Training

Prior to conducting work requiring the use of personal protective equipment, managers/supervisors must train their employees to know:

- When PPE is necessary;
- What type is necessary;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of the PPE and;
- Proper care, maintenance, useful life, and disposal.

Upon completion of the training, employees must be able to demonstrate the above mentioned information. Any type of training format can be used as long as a hands-on session is incorporated. The manager/supervisor must document the training of each employee required to wear or use PPE by preparing a certification containing the name of each employee trained, the date of training and a clear identification of the subject of the certification. The Environmental Health and Safety office is available to provide assistance with training.

6.1 Retraining

If the manager/supervisor believes that a previously trained employee is not demonstrating the proper understanding and skill level in the use of PPE, that employee should receive retraining. Other situations that require additional or retraining of employees include the following:

- changes in the workplace render previous training obsolete
- changes in the type of required PPE that make prior training obsolete
- inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.

7.0 Payment for PPE

Protective equipment, including personal protective equipment (PPE), must be provided by the New York Institute of Technology at no cost to employees. New York Institute of Technology is not required to pay for non-specialty safety-toe protective footwear (including steel-toe shoes or steel-toe boots) and non-specialty prescription safety eyewear, provided that New York Institute of Technology permits such items to be worn off the job-site.

When the New York Institute of Technology provides metatarsal guards and allows the employee, at his or her request, to use shoes or boots with built-in metatarsal protection, New York Institute of Technology is not required to reimburse the employee for the shoes or boots.

New York Institute of Technology is not required to pay for:

- The logging boots required by 29 CFR 1910.266(d)(1)(v);
- Everyday clothing, such as long-sleeve shirts, long pants, street shoes, and normal work boots; or
- Ordinary clothing, skin creams, or other items, used solely for protection from weather, such as winter coats, jackets, gloves, parkas, rubber boots, hats, raincoats, ordinary sunglasses, and sunscreen.

The New York Institute of Technology must pay for replacement PPE, except when the employee has lost or intentionally damaged the PPE.

Where an employee provides adequate protective equipment he or she owns, New York Institute of Technology may allow the employee to use it and is not required to reimburse the employee for that equipment.

Appendix A: Hazard Assessment Procedures

In order to assess the need for PPE the following steps should be taken:

A. The hazard assessment should begin with a walk-through survey of the facility to develop a list of potential hazards in the following basic hazard categories:

(a) Impact

(b) Penetration

(c) Compression (roll-over)

(d) Chemical

(e) Heat

(f) Harmful dust

(g) Light (optical) radiation and

(h) Biological

B. During the walk-through survey the following should also be observed:

(a) Sources of motion; i.e., machinery or processes where any movement of tools, machine elements or particles could exist, or movement of personnel that could result in collision with stationary objects;

(b) Sources of high temperatures that could result in burns, eye injury or ignition of protective equipment;

(c) Types of chemical exposures;

(d) Sources of harmful dust;

(e) Sources of light radiation, i.e., welding, brazing, cutting, furnaces, heat treating, high intensity lights;

(f) Sources of falling objects or potential for dropping objects;

(g) Sources of sharp objects which might pierce the feet or cut the hands;

(h) Sources of rolling or pinching objects which could crush the feet;

(i) Layout of workplace and location of co-workers;

(j) Any electrical hazards; and

(k) Biologic hazards such as blood or other potentially infected material.

In addition, injury/accident data should be reviewed to help identify problem areas.

C. When the walk-through survey is complete, organize and analyze the data so that it may be efficiently used in determining the proper types of PPE required at the worksite. Select PPE that will provide a level of protection greater than the minimum required to protect employees from hazards. The workplace should be periodically reassessed for any changes in conditions, equipment or operating procedures that could affect occupational hazards. This periodic reassessment should also include a review of injury and illness records to spot any trends or areas of concern and taking appropriate corrective action. The suitability of existing PPE, including an evaluation of its condition and age, should be included in the reassessment. Documentation of the hazard assessment is required through a written certification that includes the following information:

- Identification of the workplace evaluated;
- Name of the person conducting the assessment;
- Date of the assessment; and
- Identification of the document certifying completion of the hazard assessment.

Appendix B: Personal Protection Selection Chart

Eye and Face Protection:

Type of Work / Source	Hazard	Minimum Requirements / PPE
IMPACT-chipping, drilling, riveting, hammering, sanding, woodworking, grinding	Flying particles, sand, dirt	Direct-vent goggles, safety glasses with side shields, face shield with clear lens worn with goggles or spectacles
HEAT-Furnace operations, casting, hot-dipping, welding	Hot sparks, splashes from molten metals, high temperature exposure	Face shields, goggles, safety glasses with side shields, reflective face shields
CHEMICAL-chemical handling, transfer, degreasing plating, custodial, construction	Splash, irritating mists, vapors, gas, skin burns, absorption toxicity	Goggles, eyecups and cover types, face shield, special purpose goggles
DUST-woodworking, buffing, dusty conditions	Nuisance dust	Goggles, eyecups and cover types
LIGHT/RADIATION-welding, electric arc, welding gas, cutting, torch brazing, torch soldering, glare, lasers	Optical radiation, poor vision, thermal exposure, acoustic, photochemical	Welding helmets or welding shields, spectacles with shaded or special purpose lenses, protective eyewear with an optical density for the specific application

** Face shields should only be worn over primary eye protection

Foot Protection:

Type of Work / Source	Hazard	Minimum Requirements / PPE
IMPACT-carrying or handling materials such as packages, parts, or heavy tools	Falling objects, hard edge objects, weighing 10 pounds or more, at waist level should be considered a hazard	Safety shoes or boots complying with ANSI Z41-1991

COMPRESSION-manual and powered material handling equipment, heavy tools	Rolling or pinching equipment and objects	Safety shoes or boots complying with ANSI Z41-1991
PUNCTURE-construction and demolition activities	Stepping on nails, tacks, screws, large staples, scrap metal or broken glass	Safety shoes or boots with puncture resistant soles
ELECTRICAL- construction and maintenance of electrical equipment/service	Electrical shock and electrocution	Electrical insulating safety shoes
CHEMICAL- chemical handling and transferring, custodial, construction and maintenance operations	Splash, skin burns and absorption toxicity	Impervious rubber boot or bootie covering the shoe. Pant leg or lab coat should pass over top of boot/shoe to prevent chemical from entering

Hand Protection:

Type of Work / Source	Hazard	Minimum Requirements / PPE
SHARP TOOLS/MATERIALS-cutting, dissecting, dicing, butchering, handling sharp or ragged objects	Lacerations from blades, knives, glass, sheet metal, and splinters from rough lumber, severe abrasions.	Leather, wire mesh or stitch gloves, cut-resistant rubber gloves
THERMAL HEAT-cooking, welding, soldering, brazing, foundry work, steam line/furnace repair, autoclaves	Thermal heat, burns	Leather gloves, flame-retardant gauntlet gloves, chemical treated cloth gloves
EXTREME COLD-handling cold materials, cryogenic research	Frostbite	Permeable or impervious non-insulated gloves, permeable or impervious insulated gloves

ELECTRICAL-electrical utility installation and repair	Electrical shock and electrocution	Rubber insulated voltage rated gloves, other gloves rated for electrical work
CHEMICAL-chemical handling and transferring, custodial, construction and maintenance operations	Glove permeation and degradation causing dry skin, dermatitis, burns, irritation or ulceration	Gloves composed of chemically resistant material. Refer to the SDS

Head Protection:

Type of Work / Source	Hazard	Minimum Requirements / PPE
IMPACT/PENETRATION-construction, repair, demolition	Overhead hazards, falling objects	Type A, B, C protective helmets
ELECTRICAL-electrical utility and repair	Electrical shock and electrocution	Class A protective helmet (2,200 volts) Class B protective helmet (20,000 volts)
ENTANGLEMENT-rotating machinery	Hair becoming tangled in moving parts	Caps or other protecting hair covering

Hearing Protection:

Type of Work / Source	Hazard	Minimum Requirements / PPE
NOISY EQUIPMENT-High speed tools, heavy mobile equipment and frequent use of mechanized equipment	Noise induced hearing loss	Ear plugs, ear muffs with the appropriate Noise Reduction Rating

Protective Clothing:

Type of Work / Source	Hazard	Minimum Requirements / PPE
Chemical research, working from heights, handling sharp equipment	laceration, burn, abrasion, chemical and fall hazards	Chaps, aprons, lab coats, protective sleeves, knee pads, coveralls, safety vests, welding coats, and personal fall restraint and arrest systems.

Respiratory Protection:

Type of Work / Source	Hazard	Minimum Requirements / PPE
Employees exposed to activities creating dusts, mist, fumes and vapors	Oxygen deficient atmospheres, irritants, carcinogens, sensitizers and other health effects	air-purifying respirators (half and full face), supplied air respirators (SCBAs, air-line) and

APPENDIX G

LABORATORY INSPECTION POLICY

NEW YORK INSTITUTE OF TECHNOLOGY - NYIT CAMPUS
CHEMICAL HYGIENE PLAN
LABORATORY INSPECTION POLICY

Annual Laboratory Audit

In the interest of employee and community safety, NYIT has embarked upon a regular program of inspecting its laboratories to ensure proper compliance with all applicable state and federal regulations. In particular, attention is focused on EPA, OSHA and NFPA regulations. Each laboratory will be inspected once per year.

Each inspection will consist of an initial inspection and, if necessary, a follow-up inspection. A representative of the Department controlling the laboratory must be in attendance. If the laboratory is used for research, it is preferred that the Principal Investigator who has been given charge of the laboratory be present as well. A checklist (attached) will be used for the inspection, a copy of which will be distributed to each faculty member prior to the initial inspection for their reference. The CHO will conduct the inspections and note any violations observed during the inspection.

Following the initial inspection, the CHO will issue a report with copies forwarded to the Department, Principal Investigator (if applicable) and the Dean's office. The person responsible for the laboratory will use the initial inspection report as a guide for abatement of deficiencies and is required to make all necessary arrangements to abate the deficiencies. If the report calls for a written notification of abatement only, an e-mail from the faculty member in charge of the laboratory stating that the problem has been corrected will suffice. If a follow-up inspection is required, it will be scheduled no later than two weeks, unless otherwise agreed upon among the parties involved, to verify that the deficiencies are corrected or that proper steps have been made to abate the problem.

If proper steps have not been made, a follow-up report will be issued by the CHO and, in addition to the above referenced parties, the Environmental Safety and Health Manager will be given copies with an order to abate.

Copies of the checklist are available in the CHO's office.

Laboratory Fume Hoods

The American National Standards Institute (ANSI) Standard for Laboratory Ventilation ANSI/AIHA Z9.5-2003 establishes minimum requirements and best practices for laboratory ventilation systems to protect personnel from overexposure to harmful or potentially harmful airborne contaminants generated within the laboratory setting. Included within the standard are design guidelines for use by laboratory design professionals as well as work practices, routine annual performance test requirements and recommended preventative maintenance practices.

A copy of this standard is attached. Pages 87 through 110 of the standard provide a comprehensive audit checklist which can be used to assess and document compliance with the standard.

In addition to the above, ANSI and the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) have developed the ANSI/ASHRAE 110-1995 Method of Testing Performance of Laboratory Fume Hoods. This method provides procedures for conducting face velocity grid tests, flow visualization or smoke tests, and tracer gas containment tests, all of which can be used as part of a comprehensive performance test program for laboratory fume hoods. A copy of this document is attached.

Emergency Eye Wash and Shower Equipment Requirements

The following is a list of requirements for emergency showers, eye washes and face washes as specified in the 2009 ANSI Z358.1 standard.

Plumbed Shower

A plumbed shower is an emergency shower permanently connected to a source of potable water. The following is a list of specifications for plumbed showers:

1. Heads

    a. Positioned 82” to 96” from floor;
    b. Spray pattern with a minimum diameter of 20” at 60” above the floor;
    c. Flow rate of 20 gallons per minute at 30 pounds per square inch (psi);
    d. The center of the spray pattern shall be located at least 16 inches from any obstruction; and
    e. Water temperature shall be tepid (60° to 100° F).

2. Valves

    a. Activate in 1 second or less;
    b. Stay-open valve (no use of hands); and
    c. Valve remains on until the user shuts it off.

3. Installation

    a. Shower shall be located in an area that requires no more than 10 seconds to reach;
    b. Shower location shall be in a well-lit area and identified with a sign; and
    c. Shower shall be located on the same level as the hazard.

4. Maintenance and Training

    a. Showers must be activated weekly to verify correct operation. Test date shall be recorded on weekly testing sheet. See attached weekly eye wash/shower testing sheet;
    b. All employees who might be exposed to a chemical splash shall be trained in the use of the equipment; and
    c. All showers shall be inspected annually to make sure they meet with ANSI Z358.1 requirements. See attached annual shower compliance checklist.

Eye Washes

The following list of specifications pertains to plumbed eye washes, defined as an eye wash unit permanently connected to a source of potable water, and gravity-feed eye washes, defined as an eye wash device that contains its own flushing fluid and must be refilled or replaced after use.

1. Heads

    a. Positioned 33” to 45” from floor;
    b. Positioned 6” from wall or nearest obstruction;
    c. Flow rate of 0.4 gallons per minute for 15 minutes, for plumbed units shall provide flushing fluid at 30 psi;
    d. Flow rate of 0.4 gallons per minute for 15 minutes for gravity-fed units; and
    e. Water temperature shall be tepid (60° to 100° F).

2. Valves

    a. Activate in 1 second or less; and
    b. Stay-open valve (no use of hands).

3. Installation

    a. Eye wash equipment shall be located in an area that requires no more than 10 seconds to reach;
    b. The location of the eye wash unit shall be in a well-lit area and identified with a sign; and
    c. Eye wash equipment shall be on the same level as the hazard.

4. Maintenance and Training

    a. Plumbed eye wash units shall be activated weekly to verify correct operation. Test date shall be recorded on weekly testing sheet. See attached weekly eye wash/shower testing sheet;
    b. Gravity-feed units shall be maintained according to the manufacturer’s instructions;

c. All employees who might be exposed to a chemical splash shall be trained in the use of the equipment; and
d. All eye wash equipment shall be inspected annually to make sure they meet ANSI Z358.1 requirements. See attached annual eye wash compliance checklist.

Eye/Face Wash

The following list of specifications pertains to eye/face wash units which are designed to flush both the eyes and the face.

1. Heads

   a. Positioned 33" to 45" from floor;
   b. Positioned 6" from wall or nearest obstruction;
   c. Large heads to cover both eyes and face or regular size eye wash heads plus a face spray ring;
   d. Flow rate of 3 gallons per minute for 15 minutes; and
   e. Water temperature shall be tepid (60° to 100° F).

2. Valves

   a. Activate in 1 second or less; and
   b. Stay-open valve (no use of hands).

3. Installation

   a. Eye/face wash equipment shall be located in an area that requires no more than 10 seconds to reach;
   b. The location of the eye/face wash unit shall be in a well-lit area and identified with a sign; and
   c. Eye/face wash equipment shall be on the same level as the hazard.

4. Maintenance and Training

   a. Plumbed eye/face wash units shall be activated weekly to verify correct operation. Test date shall be recorded on weekly testing sheet. See attached weekly eye wash/shower testing sheet;
   b. Gravity-feed units shall be maintained according to the manufacturer's instructions;
   c. All employees who might be exposed to a chemical splash shall be trained in the use of the equipment; and
   d. All eye/face wash equipment shall be inspected annually to make sure they meet ANSI Z358.1 requirements. See attached annual eye/face wash compliance checklist.

Drench Hoses

A drench hose is a flexible hose connected to a water supply used to irrigate and flush eyes, face and body areas. The following is a list of specifications for drench hoses.

1. Heads

    a. Flow rate of 3 gallons per minute; and
    b. Water temperature shall be tepid (60° to 100° F).

2. Valve

    a. Activate in 1 second or less.

3. Installation

    a. Assemble per the manufacturer's instruction; and
    b. The location of the drench hose shall be in a well-lit area and identified with a sign.

4. Maintenance and Training

    a. Activate weekly to verify correct operation. Test date shall be recorded on weekly testing sheet. See attached weekly eye wash/shower testing sheet;
    b. All employees who might be exposed to a chemical splash shall be trained in the use of the equipment; and
    c. All drench hose equipment shall be inspected annually to make sure they meet ANSI Z358.1 requirements. See attached annual drench hose compliance checklist.

NEW YORK INSTITUTE OF TECHNOLOGY - NYIT CAMPUS
CHEMICAL HYGIENE PLAN
LABORATORY AUDIT CHECKLIST

Building and Room No.: _____ Date: _____

I. HOUSEKEEPING

Yes	No	N/A	
☐	☐	☐	Is the laboratory in a disorderly condition?
☐	☐	☐	Is there evidence of chemical spills?
☐	☐	☐	Are the floors in need of a cleaning?
☐	☐	☐	Are bench tops cluttered with unused equipment or lab-ware?
☐	☐	☐	Are the emergency shower/eyewash stations blocked?
☐	☐	☐	Is there evidence of eating or drinking in the laboratory?
☐	☐	☐	Are tripping hazards present?

Comments:

_____
_____
_____
_____

II. CHEMICAL USE AND STORAGE

Yes	No	N/A	
☐	☐	☐	Have employees received Right-to-Know training for chemicals used?
☐	☐	☐	Are chemicals stored according to hazard class?
☐	☐	☐	Are secondary containers labeled with identity and hazard class information?
☐	☐	☐	Are copies of the SDSs readily available for the chemicals in use?
☐	☐	☐	Are outdated chemicals kept beyond their usefulness?
☐	☐	☐	Are refrigerators/freezers properly labeled/used for the storage of flammables?
☐	☐	☐	Are shelves/cabinets for chemical storage in good condition?
☐	☐	☐	Are flammables stored in the flammable storage cabinet?
☐	☐	☐	Are acids and bases stored separately?
☐	☐	☐	Are volatile chemicals with PELs <100 ppm restricted to use in hood?
☐	☐	☐	Are compressed gas cylinders properly secured and labeled?

Comments:

_____

_____

_____

_____

List the type and number of gallons of flammable solvents stored outside of a flammable solvent cabinet:

Acetone (1A) _____ Ethyl Ether (1A) _____

Hexane (1A) _____ Pentane (1A) _____

Methanol (1A) _____ Toluene (1B) _____

Note any instances of incompatible storage:

_____

_____

_____

_____

III. HAZARDOUS WASTE

A. Hazardous Waste Generated in this Area:

Waste Description	Generation Rate (units)

Yes	No	N/A	
☐	☐	☐	Have all processes been evaluated for proper waste disposal methods?
☐	☐	☐	Do procedures indicate a proper disposal method for all products?
☐	☐	☐	Are wastes transferred to the proper containers?
☐	☐	☐	Are waste containers properly labeled as to their contents and hazards?
☐	☐	☐	Are containers of wastes properly stored in the satellite area?

Comments:

_____

_____

_____

_____

IV. PERSONAL PROTECTIVE EQUIPMENT

Is staff using/wearing the following personal protective equipment?

Yes	No	N/A	
☐	☐	☐	Lab coat
☐	☐	☐	Safety glasses
☐	☐	☐	Safety goggles, when necessary
☐	☐	☐	Gloves compatible with the chemicals in use
☐	☐	☐	Apron
☐	☐	☐	Respirator
☐	☐	☐	Are lab coats/gloves removed prior to leaving the laboratory?

Comments:

_____

_____

_____

_____

V. HOODS

Yes	No	N/A	
☐	☐	☐	Are hoods cluttered with material or equipment?
☐	☐	☐	Are hoods being used to store chemicals that are not in use?
☐	☐	☐	Have the hoods been recently calibrated (face velocity)?
☐	☐	☐	Are the hoods being used properly by staff?
☐	☐	☐	Are the slots/baffles blocked by equipment or chemicals?
☐	☐	☐	Are equipment/processes placed 6 inches from the face of the hood?

Comments:

_____

_____

_____

VI. EMERGENCY PROCEDURES

Yes	No	N/A	
☐	☐	☐	Has staff been trained in emergency procedures?
☐	☐	☐	Are emergency procedures posted?
☐	☐	☐	Are emergency response phone numbers displayed near the phone?
☐	☐	☐	Are exits marked?

VII. SAFETY EQUIPMENT

Yes	No	N/A	
			Are spill cleanup procedures and kits available for the following materials in use?
☐	☐	☐	– Solvents
☐	☐	☐	– Acids/Bases
☐	☐	☐	– Broken Glass/sharps
☐	☐	☐	– Other (list) _____
☐	☐	☐	Are emergency safety showers/eyewash stations readily available?
☐	☐	☐	Are appropriate fire extinguishers readily available?
☐	☐	☐	Has the fire extinguisher been recently inspected? If so, list date of inspection: _____
☐	☐	☐	Is a first aid kit available in the room?
☐	☐	☐	Is a fire blanket in the area?

Comments:

_____

_____

_____

_____

VIII. LABORATORY EQUIPMENT

Yes	No	N/A	
☐	☐	☐	Is equipment used within its designed purpose?
☐	☐	☐	Is apparatus properly secured/supported?
☐	☐	☐	Are fail safes in use when possible?
☐	☐	☐	Are all water/glassware connections secured?
			Do electrical plugs or cords show evidence of:
☐	☐	☐	– frayed cords
☐	☐	☐	– overloaded cords (warm to the touch)
☐	☐	☐	– altered or damaged plugs (ground removed)
☐	☐	☐	– extension cords in use

Comments:

_____

_____

_____

_____

IX. STANDARD OPERATING PROCEDURES

Yes	No	N/A	
☐	☐	☐	Are SOPs available for the process(es) being conducted?
☐	☐	☐	Are the SOPs reviewed or updated with new information?
☐	☐	☐	Are the staff following the SOPs as written?

Comments:

_____

_____

_____

X. BIOSAFETY

Source(s) of infectious waste: _____

Yes	No	N/A	
☐	☐	☐	Used needles are bent, not broken?
☐	☐	☐	All sharps are placed in labeled puncture-resistant containers?
☐	☐	☐	Are hands washed after glove removal/hand contact with infectious agents?
☐	☐	☐	Is PPE removed before leaving the work area?
☐	☐	☐	Is aerosolation, splashing or spraying kept to a minimum?
☐	☐	☐	Is eating, smoking or drinking prohibited in the laboratories?
☐	☐	☐	Is the appropriate PPE available and in use?
☐	☐	☐	Is the area posted with a BIOHAZARD symbol and the name of the infectious agent?
☐	☐	☐	Are warning labels affixed to containers of infectious waste?
☐	☐	☐	Have staff received training to work with infectious waste?
☐	☐	☐	Are work surfaces decontaminated after procedures, spills and at the end of the shift?

How is the infection waste disposed of?

_____

_____

_____

Comments:

_____

_____

_____

APPENDIX H

POLICY FOR THE DISPOSAL OF LABORATORY GLASSWARE, HAZARDOUS WASTE AND REGULATED MEDICAL WASTE

NEW YORK INSTITUTE OF TECHNOLOGY
CHEMICAL HYGIENE PLAN
POLICY FOR THE DISPOSAL OF LABORATORY GLASSWARE, HAZARDOUS WASTE AND REGULATED MEDICAL WASTE

Laboratory Glassware

The purpose of this policy is to ensure the safe disposal of all laboratory glassware, as well as prevent injuries to anyone who must handle discarded glass. This policy applies to all laboratory glassware, intact or broken, except for glassware contaminated with Regulated Medical Waste (RMW), which is covered under the RMW disposal procedures.

Procedure

Place all glassware, intact or broken, into a specially marked rigid container designed for this purpose. A properly labeled thick-walled, rigid cardboard container may be utilized. The container must be able to withstand penetration by the sharps contained within and must be lined with a leak-resistant liner (e.g., a polyethylene or polypropylene bag). The container must be sealed and clearly marked "BROKEN GLASS" to describe its contents.

Empty glass chemical containers do not need to be rinsed prior to placement in the glassware container or the trash container. Empty paper or plastic chemical containers should be placed in the trash container. The label on the chemical container should be defaced or removed prior to placement in the glassware container. The only exception is chemical containers that once stored any chemicals that could be classified as an acutely hazardous waste (P-listed waste). These containers must be rinsed three times with small amounts of a "suitable solvent" (triple rinsed) prior to discarding. The "suitable solvent" should be determined from the chemical's Safety Data Sheet (SDS). The rinsate should be collected for disposal as hazardous waste in accordance with NYIT's Hazardous Waste Management Program. Once rinsed, the container's label should be defaced or removed. Following this step, the container may be discarded as regular trash.

Seal full glass disposal containers prior to staging for disposal. Ordinary, uncontaminated, discarded glass, when packed in its special container, may be disposed of as regular trash. If a container of ordinary non-contaminated glass is so heavy or bulky that special handling is required, Custodial Services should be contacted for proper disposal. Do not place glass originating in the laboratory into a recycling container.

Hazardous Waste

The purpose of this policy is to ensure the safe disposal of all hazardous waste generated at NYIT. This policy applies to all hazardous waste which is covered under federal and state regulations.

All science laboratories (teaching and research) have the potential to generate hazardous waste and are required to follow this procedure.

Procedure

A Hazardous Waste Management Program has been established to discard chemical products. Waste chemicals are to be poured into properly labeled containers or bottles. The label includes a place for the chemical identity of the substance, its chemical form, and type of hazard posed. The waste generator completes the label. It is important that incompatible chemicals not be mixed together at any time. Waste bottles and containers will be collected by EH&S for proper disposal. Contaminated objects must be disposed of in similarly labeled containers. A copy of the Hazardous Waste Management Plan is available in the EH&S office.

As a Small Quantity Generator, NYIT may accumulate up to 55 gallons of hazardous waste, or 1 quart of acutely hazardous waste, in containers at or near any point of generation which is under the control of the operator of the process generating the waste without a permit or interim status, or without complying with the 180-day storage requirements provided that:

- The University complies with 6 NYCRR Section 373-3.9(b)-(d); and
- The containers are marked with the words "Hazardous Waste" and with other words that identify the contents of the container.

If NYIT accumulates more than 55 gallons of hazardous waste in a satellite accumulation area, the container holding the excess accumulation of hazardous waste will be marked with the date the excess amount began accumulating. Within 3 days of this date, the container must be removed from the satellite accumulation area. In addition, the quantities stored in satellite accumulation areas must be counted against the maximum storage quantities for the campus.

In order to properly manage hazardous waste generated at the NYIT Campus, satellite accumulation areas have been identified in each laboratory in each of the science departments. The satellite accumulation areas are designed to accommodate the temporary accumulation of used or spent chemicals. At the appropriate time, wastes are moved from the accumulation areas to the hazardous waste storage area located in each department. The transfer of chemicals typically occurs when the accumulation of hazardous waste reaches its capacity, or once per semester, whichever is sooner. The quantity accumulated in each satellite accumulation area will normally not exceed a few gallons and will never exceed 55 gallons of hazardous waste or 1 liter of acutely hazardous waste. Chemicals that have exceeded shelf life are also relocated to the respective hazardous waste storage areas to be classified, packaged and transported off-site for proper disposal.

Chemicals with expired shelf lives should continue to be stored within the appropriate storage rooms until arrangements can be made with a licensed transporter for the proper packaging ("lab packs") and transportation of the material to an off-site permitted commercial treatment, storage and disposal facility for proper disposal.

It is NYIT's responsibility to ensure that hazardous waste generated at its facility is properly classified and labeled prior to off-site shipment. However, the disposal contractor will typically assist with the completion of labels and associated paperwork for the off-site shipment.

Always consult with the appropriate Laboratory Manager or Environmental Safety and Health Manager prior to completing labels and associated paperwork to ensure that this procedure is properly implemented.

The NYIT Campus is responsible for determining which solid waste streams at the campus would be classified as hazardous waste. The first step is to determine whether the solid waste generated is a hazardous waste (6 NYCRR Part 371.2); that is, whether the waste exhibits the characteristic of ignitability, corrosivity, reactivity or toxicity (6 NYCRR Part 371.3), or if the waste is listed (6 NYCRR Part 371.4). If sufficient knowledge is not available to make this determination, NYIT must sample and analyze the waste in accordance with New York State requirements. A document entitled "Standard Operating Procedure for Making a Hazardous Waste Determination" is provided in NYIT's Hazardous Waste Management Plan and will be used for making all waste determinations at the campus.

Regulated Medical Waste

The purpose of this policy is to ensure the safe disposal of all regulated medical waste generated on the campus.

Procedure

Regulated Medical Waste (RMW) is generated in the Psychology (Animal Facilities), Biology, and Health Professions and Nursing (Medical Biology) Departments, as well as in the Health Clinic and the Athletic Department.

NYIT has its own contract with Approved Medical Waste, a fully licensed and permitted Regulated Medical Waste transportation and disposal company. When a Department requires a pickup of RMW, EH&S is contacted to schedule a pickup from the respective RMW storage area located on Campus, or from the laboratory or room where the RMW was generated. NYIT's unique customer identification number must be used when scheduling a pickup. All RMW bins must have an NYIT address sticker on it.

APPENDIX I

PURCHASE REQUISITION FOR CHEMICALS FORM

NEW YORK INSTITUTE OF TECHNOLOGY

Purchase Requisition for Chemicals

(Please Type or Print)

Instructions: *The requisition must be completely filled out and signed by approver before being submitted to Procurement Services.* ***PROCUREMENT IS NOT RESPONSIBLE FOR OBTAINING APPROVALS****. When completed, form can be faxed to* ***686-7433*** *or sent via mail to* ***NYIT Procurement Services.*** *After a PO is issued, a copy will be returned to the preparer.*

Chemicals MAY NOT be purchased with the NYIT Procurement Card (P-Card).

- *Dept. Reference #: Use your old dept. number + another 3 digit number and maintain a log of numbers used. Example: 583-001, 583-002, etc. Procurement will only be able to track a requisition with this number. Do not duplicate numbers.*
- *Category: refer the NYIT Item Category/Object Code matrix to identify the appropriate item category and object code.*
- *Description: be as complete as possible, including the supplier's model and item number, attach an additional sheet if necessary.*
- *UOM : enter unit of measure (each, dozen, case of xx, box of xx, etc..).*
- *Quantity: Number of items needed, based on UOM.*
- *Price: Consistent w/UOM. – Example: If ordering by dozen, price must be dozen price. Total Price: Calculate total price for each item.*

DEPT. REFERENCE #: _____ DATE (MM/DD/YYYY) _____

REQUESTOR: _____ PREPARER: (if different from requestor) _____

(Last Name) *(First Name)*

SHIP TO: _____ _____ _____

(Building) *(Room #)* *(Campus)*

SUPPLIER: _____ ADDRESS: _____

(If NEW Supplier, please provide complete address)

PHONE #: _____ FAX #: _____

Category	Description	UOM	Quantity	Price	Total Price	Account #	Object Code

	Yes	No
1. **SDS (Safety Data Sheet) provided to EH&S and Dr. Larry Stepp**	☐	☐
2. **Safety precautions reviewed**	☐	☐
3. **Safety precautions relayed to all laboratory personnel**	☐	☐
4. **Chemical meets OSHA's definition of highly toxic agent as defined by OSHA in 29 CFR 1910.1200**	☐	☐
5. **Is the chemical a radioactive agent?**	☐	☐

If yes is checked for 4 and/or 5 the chemical will need the approval of the Radiation and Chemical Safety Committee.

APPROVAL (Chair/Department Head): _____ _____

(Signature) *(Print)*

What is a "Highly Toxic Agent"

As defined by 29 CFR 1910.1200 Appendix A, a **highly toxic chemical** is a chemical that meets the following definition:

"Highly Toxic" A chemical falling within any of the following categories:

(a) A chemical that has a median lethal dose (LD(50)) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A chemical that has a median lethal dose (LD(50)) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

(c) A chemical that has a median lethal concentration (LC(50)) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

Or is listed on the following list:

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9761&p_table=standards

APPENDIX J

IBC BIOSAFETY PROTOCOL FORM for RECOMBINANT DNA and MICROORGANISMS in RESEARCH

NYIT College of Osteopathic Medicine

Institutional Biosafety Committee
Biosafety Protocol Form
For Recombinant DNA and Microorganisms in Research

PRINCIPAL INVESTIGATOR:

Submission Date: **Title:**

1. Briefly describe research in terms that a layman can understand.

2. List all persons who will be involved in the project including students and animal care personnel.

Last Name	**First Name**	**Status** (PI, technician, student, etc.)	**Experience with rDNA involving infectious agent (years)**	**Experience with rDNA involving non-infectious agent (years)**

3. Who will train individuals with little or no experience and those switching from non-infectious to infectious agents?

4. Does project involve use of infectious materials? If "**no**," indicate "no" in space below. If "**yes**," describe in the space below.

5. Describe the host cells in which recombinant DNA will be introduced.

6. Describe the vector to be used? If a helper virus is also to be used, it must also be described. If not, indicate "no helper virus required" in the space below.

7. Identify the DNA to be inserted including the genes encoded within the DNA. Identify the source of the DNA (mammalian, non-mammalian eukaryotic, prokaryotic, viral, synthetic).

8. Is the inserted DNA or vector derived from a pathogen or potential pathogen? If "yes," describe below. If "no," indicate "no" below.

9. Does the inserted DNA or vector encode a toxin or potential toxin? If "yes," describe below, and indicate whether the toxin can injure humans, other vertebrates, invertebrates, or plants. Also, include the LD_{50} of the toxin in ng/kg. If "no," indicate "no" below.

10. List the volume of material that will be cultured (liters).

11. Identify the risk group that encompasses your project.

- ☐ Risk Group 1- agents that are not normally associated with disease in healthy adult humans.
- ☐ Risk Group 2 – agents that are associated with human diseases which are rarely serious and for which preventive or therapeutic intervention are often available.
- ☐ Risk Group 3 – agents that are associated with serious or lethal human disease for which preventive or therapeutic interventions may be available (high individual risk but low community risk).

12. Identify equipment to be used in the project.

- Biosafety cabinet
- Ultracentrifuge

- Other equipment (name and location).

13. Describe decontamination procedures for equipment in #11.

14. Describe decontamination procedures for the lab in which the research will be done.

15. Identify location(s) where biohazard and other warning signs will be posted.

16. All waste containing recombinant DNA or recombinant DNA modified organisms must be processed as regulated medical waste, and disposed of accordingly.

    Confirm by checking box ☐

17. Describe how other hazardous wastes will be processed and stored in the lab prior to pickup for disposal.

18. List all hazardous chemicals and controlled substances to be used in the project. You may be asked to provide material data safety sheets (MSDS) for the chemicals and to consult with Environmental Health and Safety prior to the start of the research.

19. If the proposed research involves the use of vertebrate animals, provide the protocol number and approval date from your animal use application to the Institutional Animal Care and Use Committee. If yes, answer questions #18 and #19. If vertebrate animals are not to be used, indicate “no vertebrate animal use.”

20. Does the project involve whole vertebrate animals in which the animal's genome has been altered by stable introduction of recombinant DNA or DNA derived from it into the germ-line (transgenic animals)?

No ☐

Yes ☐

21. Does the research involve viable recombinant DNA modified microorganisms or viruses tested on whole vertebrate animals?

No ☐

Yes ☐

Responsibilities of Principal Investigator

1. The principal investigator's electronic signature on this proposal to the Institutional Biosafety Committee certifies:

   a. That the research described herein will be conducted in full compliance with all federal, state and local policies regulating recombinant DNA research including NIH guidelines at http://oba.od.nih.gov/rdna/nih_guidelines_oba.html. **A list of appropriate guidelines should be listed at the end of the protocol by the principal investigator**.

   b. That the principal investigator agrees to adhere to the guidelines in the New York Institute Technology Biosafety Manual.

   c. That the principal investigator is full cognizant of the details of the proposal and will conduct all aspects of the project as approved by the Institutional Biosafety Committee.

   d. That principal investigator will request the Institutional Biosafety Committee's approval before making any changes to the procedures in this approved protocol.

   e. That principal investigator will request the Institutional Biosafety Committee's approval before making any additions to personnel working on the project, and will notify the Committee of any deletions in personnel.

   f. That the principal investigator will ensure that the principal investigator and any person involved in any aspect of the project will not perform procedures for which the person has not been trained and/or certified or licensed (where required).

   g. That the principal investigator is aware of potential hazards, safe work practices, and necessary training as related to this project.

NYIT College of Osteopathic Medicine

2. **Principal Investigator's electronic signature**.

Action of Institutional Biosafety Committee

1. Containment level determined by the Institutional Biosafety Committee:

2. Reviewed and returned to principal investigator with comments for revision.

3. Approved

   a. Approved by vote of:

   b. Approval Date:

   c. Signature of IBC Chairman:

Principal investigator must list the guidelines to be followed by those engaged in the project in the space below.