THE GEORGE WASHINGTON UNIVERSITY
CHEMICAL HYGIENE PLAN

Updated August 17, 2017

Health & Emergency Management Services
Division of Safety & Security

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I. Chemical Hygiene Plan

Introduction

This Safety Manual has been developed to promote the safety of people working in George Washington University laboratories. The manual constitutes the University's "Chemical Hygiene Plan" required by the Occupational Safety and Health Administration's "Occupational Exposures to Hazardous Chemicals in Laboratories" CFR 1910.1450.

Each laboratory which uses hazardous materials is required to have a copy of this manual readily available to employees and students in the laboratory. It is important that each laboratory worker be familiar with the contents of this manual and procedures outlined within. Per the GWU Chemical Hygiene Policy affected Faculty, staff and students will maintain compliance.

Suggestions and/or comments for improving this manual are welcome and encouraged. Comments can be sent to the Health & Emergency Management Services, Phillips Hall Suite B-148, 801 22nd St. NW, Washington, DC 20052 (202) 994-4347 or email to safety@gwu.edu.

1.0 PURPOSE

The purpose of the Chemical Hygiene Plan is to promote the safety of people working in laboratories. The Plan was written in response to the federal Occupational Safety and Health Administration's (OSHA) Occupational Exposures to Hazardous Chemicals in Laboratories (the OSHA Lab Standard).The plan serves as the university's guidelines and standards for all full and part-time George Washington University employees who handle, store, or use hazardous chemical/biological agents in the laboratory and to inform them of their responsibility, as well as the University's responsibility to comply with the OSHA 29 CFR 1910.1450 Laboratory Standard.

2.0 SCOPE

The scope of this policy pertains to all employees engaged in the laboratory use of hazardous chemicals (definitions are provided in Section *5.*1).

This policy does not apply to:

2.1 George Washington University students. Laboratory safety training and information for students enrolled in the science curriculum will be administered by individual academic departments with the assistance of the Health & Emergency Management Services.

2.2 Laboratory procedures using chemically impregnated test media such as Dip-and Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip.

3.0 OVERVIEW OF THE OSHA LABORATORY STANDARD

Approximately twenty-five million workers, about one in four of the nation's workforce are exposed to one or more chemical hazards. There are an estimated 580,000 existing chemical products and hundreds introduced annually.

Because of the seriousness of the potential safety and health problems arising from chemical exposure and lack of information available to employees and employers, the Occupational Safety and Health Administration (OSHA) issued a standard in November of 1985 entitled Hazard Communication. The goal of the standard was to reduce the incidence of chemical source illnesses and injuries in the manufacturing industries.

OSHA has gone a step further to protect employees who work exclusively in laboratories with the introduction of the Laboratory Standard. The Laboratory Standard requires that all employers protect workers from intermittent exposure to a broad range of chemicals encountered by workers in laboratories. OSHA determined "that laboratories typically differ from industrial operations in their use and handling of hazardous chemicals and that a different approach than that found in OSHA's substance specific health standards is warranted to protect (laboratory) workers." The standard

applies to all laboratories that use hazardous chemicals including those found within the University System.

4.0 GOALS / OBJECTIVES

The goals of this police are listed below:

4.1 Ensure the safety and health of all employees engaging in the use of laboratory chemicals

4.2 Assure compliance with the OSHA Laboratory Standard

5.0 DEFINITIONS

5.1 Chemical Hygiene Officer

An employee who is designated by the employer, and who is qualified by training and experience, to provide technical guidance in the development and implementation of the provisions of the chemical hygiene plan.

5.2 Chemical Hygiene Plan

A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular work place and meets the requirements of paragraph (e) of the 1910.1450 Laboratory Standard.

5.3 Hazardous Chemical

A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

5.4 Permissible Exposure Limit

A legal standard issued by the Occupational Safety and Health Administration which is based on an average exposure weighted for an 8-hour work day.

5.5 Action Level

Action level means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

6.0 IMPLEMENTATION

It is the intent of the George Washington University to comply with the OSHA Laboratory Standard by establishing this comprehensive written program which includes provisions for; permissible exposure limits, employee information and training, medical examinations, hazard identification, recordkeeping and a chemical hygiene plan.

6.1 Procedures and Responsibilities

(Responsibility for chemical hygiene rests at all levels including:)

6.1.1 Chief Executive Officer who has the ultimate responsibility for chemical hygiene within the institution and must, with other administrators provide continuing support for institutional and chemical hygiene.

6.1.2 Chemical Hygiene Officer (CHO), Lab Manager, Safety Specialists (Health & Emergency Management Services) who will:

6.1.2.1 Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices.

6.1.2.2 Monitor use and disposal of chemical used in research and teaching laboratories.

6.1.2.3 See that appropriate audits are conducted in the laboratories.

6.1.2.4 Know the current legal requirements concerning regulated substances.

6.1.2.5 Health & Emergency Management Services conducts annual revision of the CHP.

6.1.3 Department Head who is responsible for chemical hygiene in the department

6.1.4 Laboratory Supervisor, Principal Investigator (PI), (primary person named on a grant, in charge of a class or research project), who has the overall responsibility to:

6.1.4.1 Ensure that workers know and follow the chemical hygiene rules.

6.1.4.2 Know the current legal requirements concerning OSHA regulated substances.

6.1.4.3 Determine the require levels of protective apparel and equipment. The personal protective equipment is available and that appropriate training is provided.

6.1.4.4 Provide regular, formal chemical hygiene / safety inspections including routine inspections of emergency equipment.

6.1.4.5 Ensure that training for use of any material being ordered is adequate.

6.1.5 Laboratory Worker who is responsible for:

6.1.5.1 Planning and conducting each operation in accordance with the laboratory's written chemical hygiene plan.

6.1.5.2 Practicing good personal and chemical hygiene habits.

6.2 Permissible Exposure Limits

OSHA has published a list of regulated substances and their permissible exposure limits in 29 Code of Federal Regulations part 1910 subpart Z. (The table Z is available at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9992). For laboratory uses of OSHA regulated substances the Laboratory Supervisor (LS) with the assistance of the Chemical Hygiene Officer (CHO), will assure that the laboratory employees exposures do not exceed the permissible exposure limits specified by OSHA.

The greatest potential for exposure generally occurs during transfer operations involving concentrated chemicals. These operations should be conducted in a laboratory fume hood. As provided for in the Laboratory standard, a laboratory employee may request monitoring and be notified of the results, in writing, within 15 days of the receipt of the results.

To file a formal request for monitoring: please send a monitoring form request email to Health & Emergency Management Services at safety@gwu.edu , complete the form and send it back to the Health & Emergency Management Services.

6.2.1 Initial Monitoring

The CHO will measure employees' exposure to any substance regulated by the Standard which requires monitoring if there is a reason to believe that exposure levels for that substance routinely exceed the action level, (or in the absence of an action level the PEL).

6.2.2 Periodic Monitoring

If initial monitoring discloses employee exposures over the action level (or in the absence of an action level the PEL), the CHO will assure compliance with exposure monitoring provisions of the relevant standard.

6.2.3 Termination of Monitoring

Monitoring will be terminated in accordance with the relevant standard.

6.2.4 Employee notification of Results

The CHO will within 15 working days after receipt of any monitoring results, notify the employee of these results in writing individually or by posting results in an appropriate location that is accessible to employees.

6.3 Employee Information

The CHO will provide employees with information and training to ensure that they are aware of the chemical hazards in their work area. Chemical hygiene training and information will be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training will be conducted annually or as the CHO sees fit.

The CHO and LS/PI will inform employees of:

6.3.1 The contents of the Laboratory Standard.
6.3.2 The location and availability of the University's Chemical Hygiene Plan.
6.3.3 Permissible exposure limits for OSHA regulated substances, or recommended exposure limits for other hazardous chemical where there is no applicable OSHA standard.
6.3.4 Signs and symptoms associated with exposures to hazardous chemicals in the laboratory.
6.3.5 The location of reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including material safety data sheets.

6.4 Training

Employees will be trained in the following:

6.4.1 Methods that may be used to detect the presence or release of a hazardous chemical such as personal monitoring, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released.

6.4.2 Physical and health hazards of chemicals in the work areas.

6.4.3 Measures an employee can take to protect themselves from these hazards including specific procedures outlined in the Chemical Hygiene Plan. These procedures will include appropriate work practices, emergency procedures and protective equipment.

6.5 Medical Program

The George Washington University will provide all employees who work with hazardous - chemicals an opportunity to receive a medical examination by a licensed physician at no cost to the employee when:

6.5.1 The employee exhibits signs or symptoms associated with exposure to a hazardous chemical in a laboratory.

6.5.2 A spill, leak, or explosion occurs resulting in the likelihood of a hazardous exposure, the affected employee will be given the opportunity for medical consultation.

6.5.3 Any employee who is routinely exposed above the action level, or in the absence of an action level, above the permissible exposure limit for which there are exposure monitoring or medical requirements.
To arrange for medical consultation or examination: Please send an email to request “Medical Examination" form from the Health & Emergency Management Services at safety@gwu.edu, complete and send it back to Health & Emergency Management Services.

6.5.4 Medically Relevant Information
The laboratory supervisor or his/her representative must provide the physician with the identity of the chemicals, description of exposure conditions and symptoms. The physician's opinion must be written and include any need for follow up, results, any increased risk and a statement that the employer has been notified of the previous items.

6.6 Hazard Identification

The chemical hygiene officer and the laboratory supervisor will ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

Health & Emergency Management Services maintains a master file of material safety data sheets (MSDS) or Safety Data Sheets (SDS) for all chemicals used on campus. These MSDS's or SDS’s should be readily available in all areas that use or store hazardous chemicals. MSDS or SDS can be found in electronic copy or three ring binders labeled "MATERIAL SAFETY DATA SHEETS" or “SAFETY DATA SHEETS”. These binders should be located in each laboratory and in any storeroom where chemicals are present.

6.7 Record Keeping

Health & Emergency Management Services will establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation or examinations.

7.0 CHEMICAL HYGIENE PLAN

7.1 General Principles for Work with Laboratory Chemicals

7.1.1 Minimize all Chemical Exposures

Precautions for handling all laboratory chemicals should be followed by workers. Exposure to chemicals can occur through inhalation, ingestion, skin absorption. Never smell or taste chemicals. Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices. Inspect all personal protective equipment prior to use.

7.1.2 Avoid Underestimation of Risk

Even for substances with no known significant hazard, exposure should be minimized. One should assume that any mixture will be more toxic than its most toxic component and that all substances of unknown toxicity are hazardous.

7.1.3 Control Exposure

Substitute less toxic materials whenever possible. Prevent substances from escaping into the working atmosphere by the use of hoods and other ventilation devices.

7.1.4 Observe PELs, TLVS

The Permissible Exposure Limits of OSHA and Threshold Limit Values of the American Conference of Governmental Industrial Hygienists should not be exceeded.

II. Laboratory Safety Guidelines

1.0 FIRE PREVENTION

Know the location of all fire extinguishers and pull stations in the laboratory. All extinguishers must be fully charged and easily accessible. Exit doors must be unobstructed.

Extinguishers are labeled according to the types fires they are designed to be used on: wood or cloth, flammable liquids, electrical, metal sources. Using the wrong type of extinguisher on a fire can make the fire much worse.

The following list identifies the type of fire extinguishers and what kinds of materials they are designed to extinguish.

Type (A) - ordinary combustibles, paper, cloth, wood and rubber.
Type (B) - flammable liquids, oils, gasoline, solvents and paints.
Type (C) - electrical equipment, wiring, fuse boxes, etc.
Type (D) - metals, combustible metals, magnesium, sodium.

Fire extinguishers are designed to put out small fires, not large ones. Once you have the appropriate extinguisher to put out a small fire, use the P.A.S.S. technique.

(P) PULL the pin

(A) AIM the extinguisher nozzle at the base of the fire.

(S) Squeeze or press the handle.

(S) SWEEP from side to side at the base of the fire.

IN THE EVENT OF A FIRE

1. Evacuate the area immediately.
2. Call the Fire Department (911) or GWPD (202) 994-6111.
3. Notify Fire Department of the chemicals involved (if known).
4. Only attempt to extinguish small fires.
5. Close door and windows to prevent the spread of fire.

2.0 EYE WASH AND SAFETY SHOWERS

Emergency eyewashes and safety showers are required by law where there is the potential of eye and/or body injury from exposure to hazardous chemicals, such as corrosive and flammable materials. When the body or eyes have been exposed to chemicals, it is extremely important that immediate attention is given to the victim. These safety devices can be most effective it the following rules are adhered to.

2.1 Eyewash and safety showers must be easily accessible and clearly marked.
2.2 For chemical exposures of the eyes, flush eyes in a constant stream of water for approximately 15 minutes.
2.3 Check victim's eyes for contact lenses and remove if possible. Do not stop flushing the eyes.

2.4 Forcibly hold eye open to wash thoroughly behind eyelids and have victim rotate eyes so that all surfaces are rinsed.
2.5 Continue flushing until medical team has arrived.
2.6 For chemical exposures of other body areas, get victim under the safety shower immediately.
2.7 Remove all contaminated clothing while victim is under shower.
2.8 Victim should remain under the shower until medical help arrives.

A copy of the Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) should be made available to the medical team upon arrival. The MSDS or SDS can be a helpful guide for the treatment that will be administered.

The laboratory supervisor should be responsible for routine flushing of all eyewash stations in his area for at least 30 seconds, on a weekly basis to verify proper operation and to eliminate the potential for microbial contamination.

3.0 COMPRESSED GASES

Cylinders of compressed gases should be handled as high energy sources and, therefore, should be considered a potential explosive. The following rules must be followed by all laboratory users.

1. All compressed gas cylinders must be restrained by straps, chains, or a suitable stand to prevent them from falling.
2. When moving or storing a cylinder, the protective cap must be in place in order to protect the valve stem.
3. Never lubricate, modify or tamper with a cylinder valve.
4. Incompatible gases, such as oxidizers and flammables (e.g., oxygen and propane) must never be stored together.
5. Never use a cylinder that cannot be identified positively.
6. When not in use, cylinder and bench valves should be closed tightly.
7. Do not expose cylinders to temperatures higher than 50 C. Some rupture devices on cylinders will release at about 65 C. Small cylinders such as lecture bottles, are not fitted with rupture devices and may explode if exposed to high temperatures.
8. Do not extinguish a flame involving a highly combustible gas until the source of gas has been shut off; otherwise, it can reignite, causing an explosion.
9. Cylinders of toxic, flammable, or reactive gases should be used in fume hoods only.
10. Under no circumstance should high-pressure gases be directed at a person.
11. Compressed gas or compressed air should not be used to blow away dust or dirt; the resultant flying particles are dangerous.
12. Cylinders must be labeled by contents and hazard.

4.0 PERSONAL PROTECTIVE EQUIPMENT

All rules for the use of personal protective equipment should be followed as required by the instructor, and will include the rules listed below. The lab manager, lab instructor and PI will be responsible for enforcing all rules.

4.1 Eye Protection

The University policy on eye protection requires that eye protective devices be worn by students, faculty, staff and visitors in laboratories where chemicals are stored or handled. The type of safety device will depend on the nature of the hazard and the frequency with which it is encountered. There are three basic type of eye and face protection which meet the OSHA laboratory requirements. They are: safety glasses (with side shields), goggles and face shields. It will be the responsibility of the laboratory supervisor and PI to determine the level of protection required and to enforce eye protection rules.

Ordinary prescription glasses do not provide adequate protection from injury to the eyes. The minimum acceptable eye protection requires the use of hardened glass or plastic safety spectacles. Safety spectacles are recommended for employees and students who require eye protection frequently and/or for long durations (more than two hours per day).

Goggles are usually not intended for general use. They are intended for wear when there is a danger of splashing chemicals or flying particles. Splash goggles that have splash proof sides are to be used when protection from harmful chemical splash is needed.

Goggles offer little protection for the face and neck. Full-face shields that protect the face and neck should be worn when maximum protection from flying particles and corrosive liquids is needed.

Contact lenses may be worn, with some exceptions, but do not function as protective devices.

(Additional information is available at http://www.cdc.gov/niosh/docs/2005-139/pdfs/2005-139.pdf, Contact Lens Use in a Chemical Environment.)

4.2 The following guidelines on personal protective equipment are offered for your safety.

4.2.1 When working in the laboratory, a lab coat should be worn, and may in fact be required by your PI or instructor.

4.2.2 Gloves should be worn to prevent absorption of chemicals into the skin. Be sure the gloves that you wear are protective against the chemical you are using.

(Additional information is available at https://www.osha.gov/Publications/osha3151.html ,Table 4 Chemical Resistance Selection Chart for Protective Gloves.)

4.2.3 Shoes that cover the entire foot must be worn whenever in the laboratory. Sandals and open toed shoes are prohibited.

4.2.4 Loose fitting clothes, neckties, long unrestrained hair and necklaces are safety hazards and should not be worn in the laboratory.

4.2.5 Laboratory personnel are urged to dress with potential laboratory hazards in mind. Clothing should protect as much of the body as possible.

5.0 BASIC FIRST-AID IN THE LABORATORY

The following is a list of basic first-aid procedures to be followed in the event of an accident or emergency in the laboratory. Immediate action is necessary to prevent more serious problems from occurring to the victim and assistance should be given to the medical team when they arrive.

FOR ALL EMERGENCIES CALL (911) OR The George Washington Police Department (GWPD) (202) 994-6111. In the case of lab emergencies involving injuries due to chemicals, exposures and/or spills. Health & Emergency Management Services should also be immediately notified (202) 994-4347.

1. Chemical exposures
    a. Inhalation: Remove victim from the contaminated area.
    b. Absorption: Remove contaminated clothing. Wash affected area with soap and water.
    c. Ingestion: Check chemical label or Safety Data Sheet (SDS) for specific instructions.

2. Burns
   Get victim under safety shower or use fire blanket if clothing is on fire. Keep the burned areas under the shower; clothing adhering to the flesh should not be removed.

3. Eye injury
   In cases where chemicals or dirt have entered the eyes, rinse eyes for 15 minutes at an eyewash station. Projectiles embedded in the eye should not be removed.

4. Puncture wound
   Never remove an object that is lodged into the body. Wash area with soap and water. Try to control bleeding.

5. Severe bleeding
   Cover wound with a clean cloth while applying direct pressure to the wound.

6. Electrical shock
   Turn off power source if possible. Remove victim from current by using a non-conducting object. Perform artificial respiration if needed and if trained to do so.

6.0 SAFETY DATA SHEETS (SDS)

Chemical manufacturers and suppliers are required to supply one copy of a Safety Data Sheets the first time they supply a given chemical. The SDS follow a uniform format and contain data on the chemical.

On campus, SDS's can be found in electronic copy or 3-ring binders labeled “SAFETY DATA SHEETS”. These notebooks should be located in each laboratory and in any storeroom where chemicals are stored. In addition to labs and storage areas, a master copy of all SDS's is retained in the Health & Emergency Management Services office.

7.0 GENERAL GUIDELINES FOR HANDLING CHEMICALS

The following rules and guidelines have been established to ensure a safe working environment and to prevent accidental exposures to chemicals being used in the laboratory.

1. All chemical containers in the lab should be clearly labeled. The label should include the date the bottle was opened.
2. All chemicals brought into the department are to be entered on the annual inventory list.
3. All SDS's are kept in each individual lab.
4. Smoking, drinking, and eating are prohibited in the laboratory due to danger of chemicals entering the mouth or lungs.
5. Treat all chemicals in the laboratory as toxic substances. Minimize your exposure to all chemicals.
6. Do not taste anything in the laboratory. This applies to food as well as to chemicals.
7. Do not place your mouth on any chemical equipment.
8. Avoid inhalation of vapors of any kind. Exhaust vapors through a hood. To test an odor, fill your lungs with air and cautiously sniff the vapors as you waft (fan) them from the source. Never inhale vapors directly from chemical substances.
9. Always wash before eating, drinking, smoking, or apply makeup.
10. Wash thoroughly before leaving the lab.
11. Set a designated area for "selected carcinogens", reproductive toxins, and high degree of acute toxicity. Use containment devices such as fume hoods or glove boxes and set up a procedure for the waste and decontamination.

8.0 GENERAL WORK PRACTICE

8.1 Working alone

Generally, it is prudent to avoid working in a laboratory building alone. Under normal working conditions, arrangements are to be made between individuals working in separate laboratories outside of working hours to cross check periodically. In addition, George Washington Police Department GWPD may be requested to check on the laboratory worker. The laboratory supervisor has the responsibility for determining whether the work requires special safety precautions, such as having two persons in the same room during a particular operation.

8.2 Housekeeping and hygiene practices in the lab

Safety in the lab is ultimately your job. Follow all instructions and safety guidelines.

1. Horseplay is prohibited.
2. Benchtops should be kept clear of any devices or materials not directly involved in the experiment in progress. This minimizes the chances of an accident and diminishes the severity of any accident that might occur.
3. All work surfaces should be cleared and wiped down with a damp paper towel immediately following use. This includes benchtops, fume hood work surfaces, sink drainboards, sinks, balance pans and scales. Leave the area cleaner than you found it.
4. Glassware should be rinsed immediately following use to prevent others from coming in contact with residues left in or on the glassware. All lab users are responsible for prompt and proper cleaning, drying and storage of glassware.
5. All spills must be cleaned up immediately to prevent further exposure.

6. All chemical containers must be secured immediately after use to prevent evaporation or accidental spills.

9.0 ELECTRICAL HAZARD

9.1 Laboratory supervisors should be familiar with the location of circuit breakers and how to disconnect the electrical service to the laboratory in case of a fire or accident.

9.2 Eliminate wiring that is frayed or worn or stretched across the floor where someone could trip over it. Do not use unlabeled panel boards, electrical outlets with open (or missing) cover plates, and extension cords.

9.3 All electrical outlets should carry a grounding connection requiring a three pronged plug. All electrical equipment except glass-cloth heaters should be wired with a grounding plug.

9.4 All electrical equipment should be inspected periodically for faulty wiring.

10.0 CHEMICAL STORAGE

Storage of chemicals should be minimized. Chemicals should be ordered in quantities that are likely to be consumed within a year or less. Many chemicals have a short shelf life. Some chemicals such as ethers and secondary alcohols oxidize to explosive peroxides in as short as three months after the container is first opened.

10.1 Fume hoods must not be used as permanent storage areas. Fume hoods must not be cluttered with chemicals to prevent accidental spills.

10.2 Chemicals should be stored in reactivity groups so that two chemicals that might react are not stored next to each other.

10.3 All chemicals in storage should be contained in tightly closed, sturdy, appropriate containers. The container must be clearly labeled with the name, grade and supplier of the chemical, and contain the date the material was first opened.

10.4 Large containers should be stored on low shelves, preferably in a tray large enough to contain the contents in the event of a spill or container rupture.

10.5 All flammable materials must be stored in approved flammable storage cabinets. Only minimum quantities of flammable liquid in use should be kept outside of flammable storage cabinet.

10.6 All storage areas should be secure. They should not be located in heavily traveled areas, and should be in separate areas other than laboratories whenever possible. They must be accessible only to those few individuals who have a need for the chemicals and who have had the proper training in the use of all of the materials in that storage area.

11.0 FUME HOODS

A key to safety handling of chemicals in the laboratory is a good, properly installed hood system. The National Academy of Sciences' Report "Prudent Practices for Handling Hazardous Chemicals in Laboratory" provides extensive information on laboratory ventilation and recommends that in a laboratory where workers spend most of their time working with chemicals.

Fume hoods serve to exhaust toxic, offensive, or flammable vapors from the laboratory and, with the hood sash closed, to provide a physical barrier between the worker and the chemical reaction. Apparatus used in hoods should be fitted with condensers, traps, or scrubbers to contain or collect waste solvents or toxic vapors. The hood should not be a means of disposing of chemicals.

Operations where flammable gas, toxic vapors, or noxious odors are given off should be performed under fume hoods.
Equipment should be placed as far back in the hood as possible and activities carried out at least 6 inches from the edge of the hood. Never put our head inside the hood while working with chemicals.

The EPA Performance Requirements for Laboratory Fume Hoods document includes criteria for chemical fume hoods operating at an average face velocity of 100 fpm for typical chemical fume hoods, and 60 fpm for low-velocity chemical fume hoods.

The fume hoods at The George Washington University are adjusted to draw between 65 to 100 LFPM. The hoods are tested annually and the results of the measured air flow are posted on each hood face.

If you encounter a fume hood not working properly, immediately contact the Health & Emergency Management Services (202) 994-4347 and do not attempt to use the hood.

12.0 BIOLOGICAL LABORATORY SAFETY

Persons working with infectious agents or materials must be trained in the proper procedures required for safe handling of these materials. Departmental chairs should insure that appropriate training is provided for all laboratory personnel working with infectious agents. All safety procedures shall be used in conjunction with facility design, engineering features and safety equipment to ensure laboratory personnel safety.

Laboratory personnel must be informed of any special hazards and signs that are present in the work area. The Office of Laboratory Safety (OLS) is responsible for radiation safety, biosafety and laser safety.

The following standard safety practices should be followed by all laboratory personnel.

1. Access to the laboratory shall be restricted by the instructor/PI when work with infectious agent is in progress.
2. Laboratory doors shall remain closed at all times when experiments are in progress.
3. Lab coats and gloves shall be worn by all workers to avoid skin contamination with infectious agents.
4. Eating, drinking, smoking, and application of cosmetics is strictly prohibited in the laboratory.
5. All infectious waste shall be decontaminated and disposed of properly.
6. All working surfaces shall be decontaminated at the end of each lab and immediately after any spill of viable material.
7. Laboratory personnel must wash thoroughly after handling infectious agents prior to leaving the laboratory.

III. Hazardous Chemical Waste Disposal Policy

1.0 PURPOSE

1.1 This policy is to serve as a guide for laboratory researchers, professors, students, and other university personnel who generate hazardous waste and to inform them of their responsibilities in the disposal of hazardous waste. It also formalizes the existence of a university waste management program.

1.2 Employees must become familiar with the hazardous waste disposal program. Such familiarization will develop cooperation and assistance, which are essential in making the hazardous chemical waste disposal operation reliable and efficient.

2.0 SCOPE

The scope of this policy pertains to the disposal of hazardous chemical waste, as defined in Section 5.0. This policy does not include the disposal of radioactive waste nor the disposal of non-hazardous solid waste. Disposal of these materials is administered by the Office of Laboratory Safety (OLS) and the Facilities respectively.

3.0 OVERVIEW OF HAZARDOUS WASTE (BACKGROUND INFORMATION)

The George Washington University is an institution that provides teaching, research and service activities which may generate any or all of the hazardous waste listed in the Resource Conservation and Recovery Act (hereinafter referred to as "RCRA"). Through RCRA, congress required the Environmental Protection Agency (hereinafter referred to as "EPA"), to organize a "cradle to grave• management system of hazardous waste.

In its first act of regulation in 1980, contained in Parts 260 through 271 Title 40 of the Code of Federal Regulations, the EPA began regulating only companies that generated large quantities (in excess of one thousand (1,000) kilograms (kg.)) of hazardous waste per month (hereinafter referred to as Large Quantity Generators - "L.Q.G."). In 1984, Congress amended the regulations to begin regulating generators of one hundred (100) to one thousand (1,000) kg of waste per month (hereinafter referred to as Small Quantity Generators - "S.Q.G."). Although less stringent than regulations for L.Q.G. regulations for S.Q.G. have certain legal requirements to comply with. The District of Columbia Government of Consumer and Regulatory Affairs adopted the federal EPA regulations in 1984 and finalized its adoption and rules governing hazardous waste in the District of Columbia in July of 1987.
These regulations now qualify any business within the District of Columbia that generates less than 100 kg of hazardous waste per month as a CESQG. Therefore, an establishment that generates any hazardous waste is now regulated.

4.0 GOALS

4.1 Protect the health and safety of employees and students.

4.2 Assure compliance with applicable regulations: The hazardous waste policy at The George Washington University will comply with federal E.P.A., Department of Transportation and District of Columbia regulations.

4.3 Reduction of hazardous waste: Efforts will be made to reduce of the volume of waste that is generated and transported off- site.

5.0 DEFINITIONS

5.1 Department of Consumer and Regulatory Affairs: The District of Columbia government agency responsible for the administration and enforcement of the District's Hazardous Waste Regulations, 20 DCMR Chapter 40.

5.2 Department of Transportation (DOT): The federal agency responsible for policy concerning the transportation of hazardous waste.

5.3 Environmental Protection Agency (EPA): The federal agency responsible for regulations concerning the generation, handling, and disposal of hazardous (non-radioactive) chemical wastes.

5.4 Flash Point: The minimum temperature at which a liquid gives off vapors in sufficient concentration to form and ignitable mixture with air.

5.5 Generator: Any person or department within the University which produces hazardous waste.

5.6 Hazardous Waste Generator: A hazardous waste generator is any person or site whose processes and actions create hazardous waste (see 40 CFR 260.10). Generators are divided into three categories based upon the quantity of waste they produce:

5.6.1 Large Quantity Generators (LQGs) generate 1,000 kilograms per month or more of hazardous waste, more than 1 kilogram per month of acutely hazardous waste, or more than 100 kilograms per month of acute spill residue or soil.

5.6.2 Small Quantity Generators (SQGs) generate more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month.

5.6.3 Conditionally Exempt Small Quantity Generators (CESQGs) generate 100 kilograms or less per month of hazardous waste, or 1 kilogram or less per month of acutely hazardous waste, or less than 100 kilograms per month of acute spill residue or soil.

5.7 Hazardous Waste: Any waste included in the "listed hazardous waste as specified in Part 261, 40 CFR of the EPA regulations or if it displays a hazardous characteristic of a corrosive, reactive, flammable or toxic.

5.8 Acute Hazardous Waste: Chemical that can cause serious harm from a single or short duration of exposure. (Example include: carbon disulfide, fluorine, mercury fulmate, and arsenic trioxide).

5.9 Manifest: A required form which is used for shipping hazardous waste. The manifest must have the name and address of the generator, the hazard class, and the types and quantities of hazardous waste to be shipped off-site.

6.0 PROCEDURES AND RESPONSIBILITIES

6.1 Health & Emergency Management Services

Health & Emergency Management Services provides the service of the waste evaluation, contractor procurement and in-house compliance of the removal or reduction of hazardous waste at The George Washington University. Waste that cannot be reduced in-house will be stored in appropriate storage areas. Waste will then be transferred to an outside qualified hazardous waste

contractor. Health & Emergency Management Services will at the appropriate time initiate waste disposal process by requesting waste inventories from the various departments and coordinate a waste pick-up.

6.2 Departmental Waste Generator Procedures

Any department who generates hazardous waste must follow the procedures outlined below:

6.2.1 Containers

6.2.1.1 If possible, the same container in which the original material arrived in the laboratory should be used for disposal.

6.2.1.2 All containers of liquids must have a screw cap or lid and must not leak when inverted. Corks, plastic sheeting, cotton plugs, etc. are not acceptable stoppers for containers of hazardous waste liquids.

6.2.1.3 The outside of containers must be clean and free of chemical contamination.

6.2.1.4 All glass containers should be securely packaged to prevent breakage during transport.

6.2.1.5 Loose solid materials should be placed in a sealed container, box or carton lined with two plastic bags.

6.2.2 Waste Segregation

6.2.2.1 Solvents

The most cost-effective disposal for labpack solvents is to "bulk" them into *5* gallon containers (or the original cans they arrived in). This will eliminate large quantities of small containers. Compatible solvents include: alcohols, (methanol, ethanol, propanol, etc.) ethers, liquid ketones, water phenol, aniline, benzene, pyridine, toluenes, acetates, and halogenated solvents (i.e., methylene chloride, chloroform, and carbon tetrachloride). Waste solvent containers must be labeled with all constituents and approximate percentages, +/- 10%.

6.2.2.2 Heavy Metals

Heavy metals such as arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver are difficult to dispose of if in large concentrations in flammable solvents due to EPA's Land disposal restrictions (Land Bans). all hazardous waste disposal facilities must incinerate flammable solvents and are regulated on how much metal they can burn. Therefore, it is extremely important to keep the above listed heavy metals out of organic solvents otherwise, it may not be accepted for disposal.

6.2.3 Waste Container Labels

All waste containers must be labeled with the following information:

1. Name of the material
2. Volume, weight, or percentage of mixture
3. The date accumulation began
4. The words “Hazardous Waste”

6.2.4 Waste pick-ups by Health & Emergency Management Services will be scheduled as necessary.

7.0 EMPLOYEE SAFETY AND HEALTH

7.1 Departments

Employee safety and health must be maintained at all times. When pouring waste into a container prior to pick-up, employees should perform this procedure inside an operating chemical fume hood. Employees should wear the proper personal protective equipment for the activity.

7.2 Housekeeping Personnel

Housekeeping personnel are not authorized to handle hazardous waste. All non-hazardous waste must be clearly labeled as non-hazardous waste before it is put into the trash. Also, sharp items such as needle from a syringe should place in a sharps container. Non-contaminated broken glass can go in a regular sturdy box marked broken glass for the dumpster.

IV. Hazardous Waste Classification

1.0 WHAT IS HAZARDOUS WASTE?

To properly understand "hazardous waste" in relation to identifying potential hazardous waste streams, "solid waste" must be defined. Solid waste is defined as any discarded material that is abandoned by being disposed of, burned or incinerated, recycled or considered "waste-like." A solid waste can physically be a solid, liquid, semi-solid, or container of gaseous material.

Hazardous waste is defined as a "solid waste", or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

1. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed: or
2. cause, or contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness.

2.0 DETERMINE WHETHER YOUR WASTE IS HAZARDOUS

It is the responsibility of the person or business that generates a waste to determine if that waste is hazardous by using the criteria outlined in Chapter 41 of Title 20 DCMR. There are two ways a waste can be identified as hazardous: it may be defined by its hazardous characteristic, which is defined in Title 20 DCMR. Section 4102, or it mav be a LISTED waste as listed in Title 20 DCMR, Section 4103.

2.1 Hazardous Waste mixtures:

In general, mixing a hazardous waste with a nonhazardous waste will result in the entire volume be regulated as a hazardous waste. This includes mixing liquids with liquids and liquids with solids. For example, adding a teaspoon (more or less) of an acutely listed hazardous solvent to a 55-gallon drum of water, could result in the entire drum of liquid being regulated as a hazardous waste. It is good management practice to keep hazardous and nonhazardous waste separated while in storage.

3.0 CHARACTERISTIC WASTE

If a waste possesses at least one of the four characteristics of ignitability, corrosivity, reactivity or EP toxicity, it is considered to be characteristic waste:

3.1 IGNITABILITY (D00I)

A solid waste that exhibits any of the following properties is considered a hazardous waste due to its ignitability:

3.1.1 A liquid waste which has a flashpoint of less than or equal to 140 degrees Fahrenheit (60 degrees C) as determined by the Pensky-Martens Closed Cup flash point test. Kerosene, petroleum naphtha and petroleum based lacquer. thinner are examples of commonly used solvents which would be considered ignitable hazardous waste.

3.1.2 A non-liquid which is capable of causing a fire through friction, absorption of water or spontaneous chemical change and when ignited burns so vigorously that it creates a hazard.

3.1.3 An ignitable compressed gas as defined in 49 CFR 173, Department of Transportation Regulations.

3.2 CORROSIVITY (D002)

A solid waste that exhibits any of the following properties is considered a hazardous waste due to its corrosivity:

3.2.1 An aqueous waste with a pH less than or equal to 2 or greater than or equal to 12.5 is considered to be a corrosive hazardous waste.

3.2.2 A liquid waste that corrodes steel at a rate of .25 inch per calendar year. at the standard set temperature of 55 degree C.

Examples of corrosives include battery acids, paint and varnish removers, and industrial degreasing solutions.

4.0 REACTIVITY (D003)

A waste is considered to be a reactive hazardous waste if it is normally unstable, reacts violently with water, or generates toxic gases when exposed to water or other materials. Examples are cyanide, plating waste, waste bleaches and explosives.

5.0 TOXICITY (D004 – D043)

To determine the toxicity of hazardous waste a representative sample of the material must be subjected to the Extraction Procedure (EP) toxicity test. If the waste contains one of the contaminants listed below at or in excess of the concentration given then it is considered a toxic hazardous waste. For more information on maximum concentrations for the toxicity characteristic go to http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol27/xml/CFR-2012-title40-vol27-sec261-24.xml

By definition, EPA determined that some specific wastes are hazardous. These wastes are incorporated into lists published by the Agency. These lists are organized into three categories:

1. **The F-list** (non-specific source wastes). This list identifies wastes from common manufacturing and industrial processes, such as solvents that have been used in cleaning or degreasing operations. Because the processes producing these wastes can occur in different sectors of industry, the F-listed wastes are known as wastes from non-specific sources. Wastes included on the F-list can be found in the regulations at 40 CFR §261.31 .

2. **The K-list** (source-specific wastes). This list includes certain wastes from specific industries, such as petroleum refining or pesticide manufacturing. Certain sludges and wastewaters from treatment and production processes in these industries are examples of source-specific wastes. Wastes included on the K-list can be found in the regulations at 40 CFR §261.32 .

3. **The P-list and the U-list** (discarded commercial chemical products). These lists include specific commercial chemical products in an unused form. Some pesticides and some pharmaceutical products become hazardous waste when discarded. Wastes included on the P- and U-lists can be found in the regulations at 40 CFR §261.33 .

For more information on listed waste go to
http://www.epa.gov/osw/hazard/wastetypes/listed.htm

6.0 EXCLUSIONS
The following waste streams are not solid wastes and have been excluded from District of Columbia Hazardous Waste regulations:

1. Domestic sewage
2. Industrial wastewater, discharges subject to the Clean Water Act
3. Nuclear sources covered by the Atomic Energy Act
4. Irrigation return flows
5. Waste samples for laboratory analysis
6. Extraction ores
7. Drilling fluids
8. Photographic waste, in which chromium is exclusively trivalent chromium.
9. Fly ash, bottom ash waste, slag waste, and flue gas emission control waste from the combustion of coal or other fossil fuels
10. Used oil that has not been mixed with hazardous waste
11. Spent lead batteries that will be recycled

V. Chemical Spill Emergency Plan

1.0 PURPOSE

For the purpose of this plan, a chemical emergency shall be defined as any spill, explosion or release of a hazardous substance that may harm human life or the environment.

The purpose of this plan is to minimize hazards to George Washington University students, faculty, staff, the general public, and the environment from any unplanned sudden released of hazardous chemicals. The plan will be consulted primarily by the Emergency Coordinators; however, all George Washington University personnel involved in the transportation, handling, storage, disposal and the management of hazardous chemicals should be familiar with the contents of this plan. The plan will also be distributed to University faculty, staff members and local response authorities who may be involved in a chemical emergency.

The provisions of this plan should be carried out immediately whenever there is a fire, explosion, or release of hazardous waste which would threaten human life or the environment.

The Chemical Spill Emergency Plan will be reviewed annually by the Hazardous Materials Committee for the purpose of updating changes and to ensure that the Emergency Telephone Contact List is accurate.

2.0 EMERGENCY PROCEDURES FOR UNIVERSITY PERSONNEL

- 2.1 Report any spill or leak of a hazardous substance immediately to the George Washington Police Department (GWPD) dispatcher at the emergency number (202) 994-6111.
- 2.2 When calling in a chemical emergency, the caller must provide the following information to the dispatcher:
  - 2.2.1 Name and telephone number of the reporting person
  - 2.2.2 Name and address of accident location
  - 2.2.3 Time and type of incident (e.g., spill, fire, explosion)
  - 2.2.4 Name and quantity of material(s) involved, if known
  - 2.2.5 Extent of injuries, if any
  - 2.2.6 Possible hazards to human health (e.g., toxic vapors)
  - 2.2.7 Damage to property or environment
- 2.3 Notify the department head or chairman of the area(s) that are affected by the chemical release. Evacuate all personnel from the immediate work and/or laboratory area. Chemical release has the potential to affect large areas in the building. The internal fire alarm should be sounded.
- 2.4 Persons involved with the spill should remain near the scene and direct people away from the spill until one of the Emergency Coordinators arrives to assess the situation.
- 2.5 Consult the Spill Prevention, and Control Plan (Section 4.0) for more detailed information about chemical emergencies.

3.0 PROCEDURES FOR EMERGENCY COORDINATORS

GWPD officers routinely respond to all emergencies occurring on campus, therefore, they will be designated as "Emergency Coordinators" (EC) in the event of a chemical emergency. The shift sergeant will be responsible to make an assessment of the situation and notify the proper response personnel in the event the Health & Emergency Management Services Manager or Safety Specialist are not available to respond to the emergency. During the B shift working hours (7:00a.m. to 3:00p.m.), the Health & Emergency Management Services Manager and the Safety Specialist will be the primary Emergency Coordinators. Anytime other than the B shift working hours the shift sergeant will be designated as the primary Emergency Coordinator. (The Safety Manager or safety specialist can always be reached by (202) 994-4347 for information during an emergency.

3.1 Notification

The Emergency Coordinator shall contact the District of Columbia Fire Department Hazardous Materials Team in the event of any chemical spill, unless a properly trained and experienced person (e.g., laboratory professor, safety personnel) can safely handle the spill. The Emergency Coordinator has the final authority to call in the Hazardous Materials Team if it is deemed necessary. The Emergency Coordinator must remain at the spill site to advise assisting agencies on the character, amounts and source to extent known to local authorities.

3.2 Evacuation

The Emergency Coordinator shall insure that persons in the immediate vicinity of a chemical spill are evacuated from the immediate work area, and if there is a substantial hazardous chemical release into the air, consideration should be given to evacuating the entire building by activating the internal fire alarm. The Emergency Coordinator is also responsible for keeping persons away from the spill and not allowing students, faculty, or staff to return to a building until it is safe for re-entry.

3.3 Assessment

The Emergency Coordinator will to the best of his or her knowledge whenever possible identify the character, source, amount, and real extent of any released hazardous materials. This may be done by observing a chemical label on a container or reviewing campus records. The (EC) shall to the best of knowledge, assess possible hazards to human health or the environment that may result from the release. During an emergency, the Emergency Coordinator shall take all reasonable measures to ensure that further releases do not occur, recur or spread to other hazardous chemicals 'On campus. These measures may include, where applicable, stopping operations, or containing released chemical materials.

4.0 SPILL PREVENT AND CONTROL (SPC) PLAN

The following are guidelines for spill control and safety precautions in the event of a chemical incident in which there is potential for a significant release on campus.

4.1 Chemical Identification

Individuals directly involved with the spill or personnel responding to an emergency should attempt to identify to the best of their ability the chemical spilled without causing harm to themselves. It is very important to determine what chemical is involved in a spill because each chemical has its own physical hazards, health effects, levels of toxicity, incompatibilities and

clean up procedures. The District of Columbia Fire Department's Hazardous Materials Team can handle the cleanup of a spill more effectively, and in a timely manner when the identity of a chemical is known.

The most obvious means of identifying a spilled chemical is locating the container from which it came from and read the label. All containers should be labeled with the chemical's name, name and address of the manufacturer, physical and health hazards, and recommended personal protective equipment. Labels are a quick source of important information about a chemical. More detailed information about a chemical can be found on the Safety Data Sheet (SDS). SDS can be found in 3-ring binders labeled "Safety Data Sheets." These notebooks should be located in each laboratory and in any stockroom where chemicals are stored. In addition to labs and storage areas, master copies of all SDS are retained in the Health & Emergency Management Services.

Follow all warnings and precautions listed on an SDS in the event of a chemical spill or release.

4.2 Spill Control

If the identity of a chemical spilled is not known and if the toxic effects and health hazards related to the chemical are unknown; University personnel should not attempt to handle the spill. Spills of unknown materials should be left the District of Columbia Fire and Emergency Medical Service (EMS) Department which has been designated as the primary emergency authority (telephone 911 or (202) 994-4347). Spills should only be attempted to be contained/controlled by individuals who are experienced and properly trained in chemical handling (e.g., laboratory personnel, safety personnel).

Non-ignitable, low toxicity liquids or solids not generating dangerous gases can be handled by laboratory personnel and representatives of Health & Emergency Management Services (based on their level of training and experience) if the volume is sufficiently small. Inert absorbent or neutralizing solids should be used to prevent the spread of liquids. Absorbent material should be spread around the periphery of the spill and the center of the spill. Persons should not attempt to handle spills unless they are properly trained and have the proper personal protective equipment such as, chemical resistant gloves, chemical aprons, impermeable suits, and multiple cartridge chemical respirators.

When spills occur in laboratories and interior building spaces, affected areas should be ventilated when possible. This can be done by opening windows and doors in the affected area.

4.3 Personal Contamination

In the case of any chemical exposure, prompt medical attention should be sought immediately by dialing the campus emergency number, (202) 994-6111 or (911) or Health & Emergency Management Services (202) 994-4347. If a chemical is spilled on the body, all contaminated clothing should be removed and the affected areas should be flooded with cold water. Safety

showers are located in chemical laboratories and should be utilized when a chemical is spilled on the body. If a chemical gets into the eyes, the eyes should be flushed with tepid water for at least 15 minutes. Emergency eyewash stations can also be found in chemical laboratories.

5.0 ARRANGEMENTS WITH LOCAL AUTHORITIES

The Director of Health & Emergency Management Services shall meet on a yearly basis with the representatives of the District of Columbia Fire Department's Hazardous Materials Team as needed to familiarize them with the following:

5.1 The layout of campus hazardous chemical usage and storage area.
5.2 Lists of hazardous chemicals being used and stored by location.
5.3 Inspection of storage and usage sites.
5.4 Updated Emergency Coordinator contact lists.

In addition, the Director of Health & Emergency Management Services will coordinate the treating, storing and disposal of recovered waste resulting from a spill with either an EPA authorized contractor of the District of Columbia Hazardous Materials Team immediately following the emergency.

6.0 STORAGE, USAGE, AND RECEIVING FACILITIES

The following areas listed below are identified as areas where potential chemical spills may occur.

1. Corcoran Hall - 725 21st St. NW (Physics) - chemical storage rooms and laboratories.
2. Bell Hall - 2029 G St. (Biology, Geology) - Chemical storage rooms and laboratories.
3. Lisner Hall - 2023 G St. –Chemical storage room and laboratories.
4. Samson Hall – 2036 H St. – Chemical storage room and laboratories.
5. Tompkins Hall - 725 23rd St. (Engineering) - Chemical storage rooms and laboratories.
6. Science & Engineering Hall (SEH) – Chemical storage rooms and laboratories throughout building.
7. Support Building - 2025 F St. (Physical Plant) - Chemical Storage areas.

7.0 EMERGENCY TELEPHONE NUMBERS

The following numbers should be used in the event of a chemical emergency. All calls should be directed to the University Police Emergency number. The University Police Dispatcher will notify the appropriate response personnel.

Emergency Response Personnel	Telephone Number
GWPD	(202) 994-6111
Health & Emergency Management Services	(202) 994-4347
D.C. Fire & EMS Department	(9) 911
Metropolitan Police	(9) 911

VI. OSHA Permissible Exposure Levels for Hazardous Chemicals

For more information on Table Z, go to:
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9992

VII. Appendixes

APPENDIX 1

REQUEST FOR MEDICAL CONSULTATION

Name of Employee: _____ Soc. Sec. #: _____
Telephone #: _____ Title: _____ Dept.: _____
Supervisor: _____ Bldg./Room #: _____
Reason for request for medical consultation or examination: _____
_____

Name of chemical to which employee was or may have been exposed: _____

Description the nature of the exposure and date of occurrence: _____
_____
_____

Description of the signs and symptoms experienced: _____
_____
_____

_____ _____

Employee Signature Date

Return to: Health & Emergency Management Services, Philips Hall Suite B-148, 801 22nd St. NW, Washington, DC 20052 (202) 994-4347 or email to safety@gwu.edu

REQUEST FOR MONITORING

Name of Employee: _____ Soc. Sec. #: _____
Telephone #: _____ Title: _____ Dept.: _____
Supervisor: _____ Bldg./Room #: _____
Reason for request for medical consultation or examination: _____
_____

Name of chemical for which monitoring is requested: _____

Description of operations for which monitoring is requested: _____
_____
_____

Description and time of which monitoring is requested: _____
_____
_____

_____ _____

Employee Signature Date

Return to: Health & Emergency Management Services, Philips Hall Suite B-148, 801 22nd St. NW, Washington, DC 20052 (202) 994-4347 or email to safety@gwu.edu

GENERAL CLASSES OF INCOMPATIBLE CHEMICALS

Compounds listed under Section A should not be combined with those listed under Section B.

A	B
Acids	Bases, metals
Oxidizing agents Chlorates Chromium trioxide Dichromates Halogens	Reducing agents
Halogenating agents	Ammonia, anhydrous
Hydrogen peroxide Nitric acid	Carbon
Nitrates Perchlorates	Metals
Organic acyl halides Organic anhydrides	Metal hydrides
Organic halogen	Nitrites
Organic nitro compounds Oxalic acid	Organic compounds
Phosphorus	Phosphorus
Phosphorus pentoxide Sulfides, inorganic	Silicon Sulfur
Sulfuric acid (cone.)	Organic hydroxy and amino compounds Bases, hydroxy and amino compounds Group IA & IIA metals, aluminum Strong bases
	Mercury, silver & salts
	Oxidizing agents, strong bases Alcohols, bases, water
	Acids
	Bases, potassium permanganate, water

WATER REACTIVE CHEMICALS

The following lists contains some common laboratory chemicals that react violently with water. In addition, these chemicals should only be stored and handled in such a way that they do not come in contact with liquid water or water vapor.

Alkali metals
Alkali metal hydrides
Alkali metal amides
Metal Alkyls, such as litium alkyls and aluminum alkyls
Grignard reagents
Halides of nonmetals such as BC13, BF3, PC13, PC15, SiC14 S2C12
Inorganic acid halides such as POC13, SOC12, S02Cl2
Anhydrous metal halides such as A1C13, TiC14, ZrC14, SnC14
Phosphorus pentoxide Calcium
carbide
Organic acid halides and anhydrides of low molecular weight

APPENDIX 5

PERIOXIDE FORMING CHEMICALS

Peroxides are sensitive heat, friction, impact and light and are prone of explosion. The following organic structures are in approximate order of decreasing hazard.

Ethers and acetal with hydrogen atoms
Olefin with allyic hydrogen atoms
Chloroolefins and fluoroolefins
Vinyl halides, esters and dienes
Vinylacetylenes with hydrogen atoms
Alkylacetylenes with hydrogen atoms
Alkylarenes that contain tertiary hydrogen atoms
Alkanes and cycloakanes that contain tertiary hydrogen atoms
Acrylates and methacrylates

APPENDIX 6

PYROPHORIC CHEMICALS

Many members of the following readily oxidized classes of common laboratory chemicals ignite spontaneously in air. Pyrophoric chemicals should be stored in tightly closed containers under an inert atmosphere or for some, an inert liquid, and all transfers and manipulations of them must be carried out under an inert atmosphere or liquid.

Grignard reagents, RMgX
Metal alkyls and aryls, such as RLi, RNA, R3Al, R2Zn
Metal carbonyls such as Ni(C0)4, Fe(CO)S, Co2(C0)8
Alkali metals such as Na, K
Metal powers such as Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr
Nonmetal hydrides such as B2H6 and other boranes, Ph3, AsH3
Nonmetal alkyls such as R3B, R3P, R3As
Phosphorus (white)

APPENDIX 7

LABORATORY SAFETY CHECKLIST
(Inspections to be made on a monthly basis)

Instructor: _____ Bldg. / Room #: _____

- Areas under the sinks ☐ Inspection made by: _____
- Chemical labels and closed container ☐ Signature: _____
- Secondary containment ☐
- Chemical storage by classification ☐
- Fume hoods ☐
- Fire extinguishers ☐
- Personal protective equipment ☐
- Compressed gas ☐
- Broken glass (proper disposal) ☐
- Tubing (proper condition) ☐
- Guards on equipment ☐
- Electrical wiring ☐
- Eyewash / safety showers ☐
- Amount of chemicals in lab ☐
- Refrigerators ☐
- General housekeeping ☐

HAZARDOUS MATERIAIS CHARACTERISTICS

Biohazards:	Infectious agent(s), or part thereof, presenting a real or potential risk to the well- being of man, other animals, or plants, directly through infection or indirectly through disruption of the environment.
Carcinogen: Combustible liquid: Corrosive:	Substance that has been shown to cause cancer.
Flammable:	A liquid having a flashpoint at or above 100 (37.S C).
Mutagen: Oxidizer: Reactive:	Chemicals which may cause burns on contact with skin and which have a pH value less than or equal to 2, or greater than or equal to 12.5.
Teratogen:	Chemicals characterized by a flashpoint below 100 and a vapor pressure not exceeding 40psi at 1.
Toxic Substances:	Substance that causes the development of mutations (step-wise changes in the structure or function of cells).
	Chemicals that readily yield oxygen to stimulate the combustion of organic matter. Examples are oxygen chlorates, permanganates, inorganic peroxides and nitrates.
Sensitizer:	Chemicals which have the potential to be violently reactive including those which may be heat, shock, light or pressure sensitive, and all substances designated as explosives.
	Substance capable of causing production of abnormal embryonic development.
	A material is toxic if it has shown through experience or testing to pose a hazard to human health or the environment because of carcinogenicity, acute toxicity, chronic toxicity, bioaccumulative properties or persistance in the environment. This includes an acute LD50 (lethal dose to 50% of a test population).
	A substance that may cause no reaction in a person during initial exposures, but afterwards, further exposures will cause an allergic response to the substance.

RESISTANCE TO CHEMIC OF COMMON GLOVE MATERIALS

(E = Excellent, G = Good, F = Fair, P = Poor)

https://www.osha.gov/Publications/osha3151.html
Chemical and Liquid – Resistant Gloves
Table 4:Chemical Resistance Selection Chart for Protective Gloves

Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials. Should swelling occur, the user should change to fresh gloves and allow the swollen gloves to dry and return to normal.

(b) No data on the resistance to dimethyl sulfoxide of natural rubber, neoprene, nitrile rubber, or vinyl materials are available; the manufacturer of the substance recommends the use of butyl rubber gloves.

APPENDIX 10

Select Carcinogen List

The OSHA Laboratory Standard 29 CPR 1910:1450 defines select carcinogen as those chemicals which are:

Regulated by OSHA as carcinogens, for more information go to
https://www.osha.gov/SLTC/carcinogens/;
Listed by the National Toxicology Program (NTP) as "known to be carcinogens";
http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf
Listed by the International Agency for Research on Cancer Monographs (IARC)
http://monographs.iarc.fr/ENG/Classification/
in Group 1 (carcinogenic to humans); and,
Listed by NTP as reasonably anticipated to be carcinogens or by IARC in Group 2A (probably carcinogenic to humans) or in Group 2B (possibly carcinogenic to humans)
For more information on Group 1, 2A and 2B go to
http://monographs.iarc.fr/ENG/Classification/ClassificationsGroupOrder.pdf
and causes statistically significant tumor incidence in experimental animals.

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