University of Guam

Chemical Hygiene Plan

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UNIVERSITY OF GUAM
UNIBETSEDÅT GUAHAN

Emergency Contact Numbers

DESIGNATED OFFICE	TELEPHONE
Emergency Assistance (24/7)	911
Department of Public Health and Social Services	735-7305
Guam Fire Department (Barrigada, 24/7)	734-2264
Guam Memorial Hospital Authority	647-2330
Guam Regional Medical City	645-5500
Guam Police Department (24/7)	472-8911
Poison Control Information Center	1 (800) 222-1222
University of Guam Plant Maintenance Office	735-2376 ext. 85
University of Guam Student Health Services	735-2225
University of Guam Safety and Security Office	735-2370
University of Guam Safety Administrator	482-8671
University of Guam Security On-Duty	888-2456
U.S. Naval Hospital	344-9340

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Chemical Hygiene Plan

Section 1. CHEMICAL HYGIENE PLAN

1.1. INTRODUCTION

University of Guam has developed this Chemical Hygiene Plan (CHP) to promote the safe operation of the University laboratories and facilities for students, faculty and staff, and to promote a culture of safety within the University. The University's safety program is based on the premise that every member of the community shares the responsibility for safety. As part of the community, it is important for laboratory personnel to be familiar with the health and safety guidelines that apply to their work and to conduct that work in the safest possible manner.

A CHP establishes a formal written program which sets forth procedures, equipment, personal protective equipment and good work practices that are capable of protecting laboratory personnel from the exposure of potential health hazards presented by hazardous chemicals used in a particular workplace. Components of a CHP must include standard operating procedures for safety and health, criteria for the implementation of control measures, measures to ensure proper operation of engineering controls, provisions for training and information dissemination, permitting requirements, provisions for medical consultation, designation of responsible personnel, and identification of particularly hazardous substances.

The information presented in this CHP is not intended to be all inclusive. Departments, divisions or other work units engaged in work with potentially hazardous chemicals that have unusual characteristics, or are otherwise not sufficiently covered in this CHP, must customize this document by adding additional sections addressing the hazards and how to mitigate their risks, as appropriate.

All laboratory personnel must know and follow the procedures outlined in this plan. All operations performed in the laboratory must be planned and executed in accordance with the enclosed procedures. In addition, each employee is expected to develop safe personal chemical hygiene habits aimed at the reduction of chemical exposures to themselves, colleagues and students.

This CHP complies with the Occupational Safety and Health Administration's (OSHA) laboratory health standard (Occupational Exposures to Hazardous Chemicals in Laboratories (CFR 1910.1450)). This CHP will be reviewed, evaluated and updated at least annually and is readily available to all employees, students, their representatives and any representative of the Assistant Secretary of Labor for OSHA.

1.2. CHEMICAL HYGIENE RESPONSIBILITIES

Responsibility for chemical health and safety rests at all levels including the:

President of the University, who has ultimate responsibility for chemical hygiene throughout the University and with the assistance of other program administrators will provide continuing support for chemical safety.

College Deans report to the President of the University. Deans that oversees departments or research centers with laboratories must appoint a representative for the college.

The Department Chairperson is responsible for chemical hygiene in the department/unit. Department chairpersons must report to the Chemical Hygiene Officer as changes occur, a list of authorized laboratory workers in their unit that are allowed to work in the laboratories.

Principal Investigator (PI): The PI has responsibility for implementation of the chemical hygiene plan in their laboratory, research grant or respective projects. The PI shall:

1. ensure that workers are trained and follow the chemical hygiene plan;
2. ensure that protective and emergency equipment is available, in working order, and that appropriate training has been provided;
3. ensure periodic laboratory inspections are performed;
4. know current legal requirements concerning regulated substances;
5. review and evaluate effectiveness of the CHP at least annually;
6. help project directors develop precautions and adequate facilities; and
7. determine the proper level of personal protective equipment and its availability.

Chemical Hygiene Officer (CHO) shall:

1. assist PI's and other laboratory employees with development and implementation of appropriate chemical hygiene procedure and practices, including providing consultation and information;
2. keep abreast of regulatory requirements concerning regulated substances and communicate any changes to PI's and laboratory employees;
3. review and evaluate effectiveness of the CHP at least annually and seek ways to improve the overall chemical hygiene program;
4. help project directors develop precautions and adequate facilities;
5. monitor waste disposal program;
6. ensure that appropriate training has been provided to employees;
7. ensure that workers know and follow the chemical hygiene rules; and
8. maintain overall responsibility for the laboratory operations.

Instructional Safety Committee (ISC) shall work closely with the CHO and is tasked with the responsibility to oversee and guide compliance with the CHP.

Instructor-in-Charge and Laboratory Supervisor shall:

1. monitor compliance with all safety regulations and practices within the individual laboratories or shops;
2. monitor that all students and employees receive appropriate training in the handling of hazardous chemicals and use of safety equipment;
3. respond appropriately to reports of unsafe conditions in the laboratory or shop;
4. ensure that all necessary safety equipment is available and in working order.

Laboratory employees, faculty and students are responsible for:

1. planning and conducting each operation in accordance with practices and procedures established in the CHP;
2. using equipment only for its designed purpose;
3. being familiar with emergency procedures including knowledge of the location and use of emergency equipment for the laboratory, as well as how to obtain additional help in an emergency
4. knowing the types of protective equipment available and using the proper type for each procedure; and
5. being alert to unsafe conditions and actions and calling attention to them so corrections can be made as soon as possible.

University of Guam Units and Research Centers that are required to implement the Chemical Hygiene Plan are as follows:

- Cancer Research Center
- Center for Excellence in Development Disabilities Education, Research and Service (CEDDERS)
- Center for Island Sustainability
- College of Natural and Applied Sciences (CNAS) Division of Natural Sciences
- College of Natural and Applied Sciences (CNAS) Division of Agriculture and Life Sciences
- Cooperative Extension and Outreach
- Guam Aquaculture Development and Training Center (GADTC)
- Guam Ecosystems Collaboratorium (EPSCOR)
- Guam/Micronesian Area Health Education Center (G/M AHEC)
- Marine Laboratory
- School of Nursing and Health Sciences
- Sea Grant Program
- Water and Environmental Research Institute (WERI)
- Western Pacific Tropical Research Center (WPTRC)

Any unit at University of Guam not listed above will also be required to implement the Chemical Hygiene Plan if laboratory work is conducted.

1.3. DEFINITIONS

ANSI: American National Standards Institute.

BSL-1: Biosafety Level 1.

BSL-2: Biosafety Level 2.

CDC: Centers for Disease Control and Prevention.

CHP: Chemical Hygiene Plan.

Health hazard: Any chemical that is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure; aspiration hazard or simple asphyxiant.

HEPA: High Efficiency Particulate Air.

Laboratory: A facility where the laboratory use of hazardous chemicals occurs. It is a "workplace where relatively small quantities of hazardous chemicals are used on a non-production basis".

Particularly hazardous substances: Chemicals that are a select carcinogen, a reproductive toxin, or a chemical having a high degree of acute toxicity.

Physical hazard: Any chemical which is classified as posing one of the following hazardous effects: explosives, flammables (gases, aerosols, liquids or solid), oxidizers (liquid, solid or gas), self-reactive; pyrophorics (gas, liquid or solids), self-heating, organic peroxides, chemicals corrosive to metal, gases under pressure, water reactives that emit flammable gases, or combustible dusts.

OSHA: Occupational Safety and Health Administration.

Permissible Exposure Limit (PEL): A legal limit for exposure of an employee to a chemical substance or physical agent.

PPE: Personal Protective Equipment.

Safety Data Sheet (SDS): A detailed informational document prepared by the manufacturer or importer of a hazardous chemical that describes the physical and chemical properties of the product.

Threshold Limit Value (TLV): An airborne concentration of a chemical substance in which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse effects.

Waiver of Liability: A legal document that a person who participates in an activity may sign to acknowledge the risks involved in his or her participation. By doing so, the institution attempts to remove legal liability from the institution or person responsible for the activity.

1.4. TRAINING AND INFORMATION

1.4.1. HAZARD INFORMATION

All faculty, staff and students will be apprised of the hazards presented by the chemicals in use in the laboratory. Persons shall receive training at the time of initial assignment to the laboratory, prior to assignments involving new exposure situations, and at a regular frequency as determined by the Chemical Hygiene Officer.

1.4.2. FORMS

Records shall be documented and maintained per Appendix A of this manual.

1.4.3. CHEMICAL SAFETY TRAINING

All faculty, staff and students who work in any laboratory where hazardous chemicals are stored or used must complete the required safety training awareness programs appropriate for the operations conducted in that laboratory. This training sha;; include methods of detecting the presence of a hazardous chemical, physical and health hazards of chemicals in the laboratory, and measures individuals can take to protect themselves from these hazards. The training shall present the details of the Chemical Hygiene Plan, and shall include:

- the contents of the OSHA laboratory standard, and its appendices;
- the location and availability of the Chemical Hygiene Plan;
- the permissible or recommended exposure limits;
- signs and symptoms associated with exposure to the chemicals;
- location and availability of reference materials on chemical hygiene;
- training shall be conducted by the Chemical Hygiene Officer or Principal Investigator.

1.5. PRIOR APPROVAL OF LABORATORY ACTIVITIES

1.5.1. PERMIT SYSTEM

A permit system shall be used for laboratory activities which present specific, foreseeable hazards. These activities include off-hours work, sole occupancy of building, hazardous operations and unattended operations.

1.5.1.1. OFF-HOURS WORK PROCEDURES

Laboratory personnel when working after hours in the lab shall inform the Chemical Hygiene Officer or the Principal Investigator of planned activities.

1.5.1.2. SOLE OCCUPANCY

At no time shall work be performed in the laboratory when the only person in the building is the laboratory personnel performing the work. Under unusual conditions, crosschecks, periodic security guard checks, closed circuit television, or other measures may be taken when permitted.

1.5.1.3. HAZARDOUS WORK

All hazardous operations are to be performed during a time when at least two personnel are present at the laboratory. At no time shall a laboratory personnel, while working alone in the laboratory, perform work which is considered hazardous. The determination of hazardous operations shall be made by the laboratory supervisor and subject to permit.

1.5.1.4. UNATTENDED OPERATIONS

When laboratory operations are performed which will be unattended by laboratory personnel (continuous operations, overnight reactions, etc.), the following procedures will be employed:

- The permit shall be utilized.
- The laboratory supervisor will review work procedures to ensure for the safe completion of the operation.
- An appropriate sign will be posted at all entrances to the laboratory.
- The overhead lights in the laboratory will be left on.
- Precautions shall be made for the interruption of utility service during the unattended operation (loss of water pressure, electricity, etc.).
- The person responsible for the operation will return to the laboratory at the conclusion of the operation to assist in the dismantling of the apparatus.

1.5.2. UNDERAGE PERSONNEL AND "NON-EMPLOYEE" VOLUNTEERS AND VISITORS

Any person under the age of 18 will generally not be allowed to work in a laboratory where hazardous processes take place, or hazardous chemicals are stored or used, unless approved by the Principal Investigator. All underage personnel must sign a

Waiver of Liability form specific to the laboratory in which the individual will be working in. Underage personnel, including primary and secondary grade school students or visitors, must be directly supervised by faculty, staff or graduate students at all times. No key or key access shall be granted to underage personnel. This policy also applies to “non-employee” volunteers and visitors of the University of Guam.

1.6. MEDICAL CONSULTATION AND EXAMINATION

University of Guam will provide all employees who work with hazardous chemicals an opportunity to receive medical attention. The opportunity for medical attention will be made available to employees under the following circumstances:

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory,
2. Medical surveillance programs will be stablished where exposure monitoring reveals an exposure level above the action level for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, and/or,
3. Whenever an event takes place in the laboratory such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure the employee will be provided an opportunity for medical consultation for the purpose of determining the need for medical examination.

These medical consultations and examinations shall be provided without cost to the employees, without loss of pay and at a reasonable time and place.

These medical consultations and examinations shall be administered by or under the direct supervision of a licensed physician. Employees seeking the opportunity of medical consultation shall see the Chemical Hygiene Officer.

1.7. RECORDKEEPING

Accident investigations will be conducted by the immediate supervisor with assistance from other personnel as deemed necessary. Accident reports will be submitted to the safety office. Exposure records for hazardous chemicals and harmful physical agents will be maintained for 30 years per 29 CFR 1910.20. Medical records for employees exposed to hazardous chemicals and harmful physical agents will be maintained for the duration of employment plus 30 years per 29 CFR 1910.20.

Inventory and usage records for high risk substances (amounts of substances on-hand, amounts used and names of workers involved) shall be maintained for 30 years. Records of inspections of equipment will be maintained for 30 years. Records of employee training will be maintained for 30 years.

1.8. ANNUAL CHEMICAL HYGIENE AUDIT

The Chemical Hygiene Officer and Principal Investigators will conduct an audit of all phases of the Chemical Hygiene Plan each year. Results will be provided to the ranking official and the laboratory managers. Supervisors and Principal Investigators are responsible for taking corrective action.

Section 2. STANDARD LABORATORY SAFETY PROCEDURES

2.1. GOOD WORK PRACTICES

2.1.1. GENERAL GUIDELINES

Each laboratory employee with the training, education and resources provided by supervision, shall develop and implement work habits consistent with this Chemical Hygiene Plan to minimize personal, student and coworker exposure to the chemicals in the laboratory. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized.

2.1.2. SUPERVISION

Departments that utilize and maintain teaching/research laboratories and workshops on campus or conduct related activities at off campus sites are responsible for implementing applicable safety programs to ensure that these work areas are in full compliance with regulatory requirements. Departments must ensure that proper supervision is provided during University of Guam affiliated activities. Qualified supervisors need to be University of Guam employees who have attended applicable safety training/awareness programs. Qualified supervisors can include faculty, staff, and graduate students.

“Non-employee” visitors and volunteers, including minors, are permitted in the laboratories when there is a legitimate business or education purpose. A responsible person must be appointed by the Principal Investigator to supervise all visitors or volunteers when they enter a laboratory to work, or for a visit. Refer to Section 1.5.2.

2.1.3. PERSONAL WORK PRACTICES AND HYGIENE

Laboratory supervisor must ensure that each employee knows and follows the rules and procedures established in this plan.

- All employees shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory supervisor. The supervisor must correct unsafe practices and or condition promptly.
- Long hair and loose-fitting clothing shall be confined close to the body to avoid being caught in moving machine/equipment parts.

- Use only those chemicals appropriate for the ventilation system.
- Avoid unnecessary exposure to all chemicals by any route.
- Do not smell or taste any chemicals.
- Encourage safe work practices in co-workers by setting the proper example. Horse play is strictly forbidden.
- Seek information and advice from knowledgeable persons, standards and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.
- Use engineering controls of personal protective equipment in accordance with Section 2.2.
- Inspect personal protective equipment prior to use, and wear appropriate protective equipment.

2.1.4. HOUSEKEEPING

Each laboratory worker is directly responsible for the cleanliness of his or her work space, and jointly responsible for common areas of the laboratory. Laboratory management shall insist on the maintenance of housekeeping standards.

The following procedures apply to the housekeeping standards of the laboratory:

- All spills on laboratory benches or floor shall be immediately cleaned and properly disposed of. Large spills will necessitate the implementation of the Emergency Action Plan per OSHA 1910.38 and 1910.120. Refer to Appendix F and Appendix G.
- The lab benches shall be kept clear of equipment and chemicals except those necessary for the work currently being performed.
- The work area shall be cleaned at the end of each operation and each shift.
- All apparatus shall be thoroughly cleaned and returned to storage upon completion of usage.
- All floors, aisles, exists, fire extinguishing equipment, eyewashes, showers, electrical disconnects and other emergency equipment shall remain unobstructed.
- All labels shall face front.
- Chemical containers shall be cleaned, properly labeled and returned to storage upon completion of usage.
- All chemical wastes will be disposed of in accordance with the waste disposal plan.
- Broken glassware shall be kept in the appropriate containers.

2.1.5. LABORATORY EQUIPMENT AND GLASSWARE

Each employee shall keep the work area clean and uncluttered. All chemicals and equipment shall be properly labeled in accordance with Section 2.1.6. At the completion

of each work day or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stored.

In addition, the following procedures shall apply to the use of laboratory equipment:

- All laboratory equipment shall be used only for its intended purpose.
- All glassware will be handled and stored with care to minimize breakage; all broken glassware will be immediately disposed of in the broken glass container.
- All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments shall implosion occur.
- Labels shall be attached to all chemical containers, identifying the contents and related hazards.
- Waste receptacles shall be identified as such.
- All laboratory equipment shall be inspected on a periodic basis as specified in Appendix B and replaced or repaired as necessary.

2.1.6. LABELING

All containers in the laboratory shall be labeled. This includes chemical containers and waste containers. The label shall be informative and durable, and at a minimum, will identify contents, source, date of acquisition, storage location and indication of hazard such as special storage requirements and incompatibilities.

Portable containers shall be labeled by the individual using the container.

Exemptions for labeling requirements shall be made for chemical transfers from a labeled container into a container which is intended only for the immediate use of the employee who performed the transfer.

The labeling program shall be periodically inspected by the Chemical Hygiene Officer to ensure that labels have not been defaced or removed.

2.1.7. CHEMICAL HANDLING

General precautions which shall be followed for the handling and use of all chemicals are:

- Skin contact with all chemicals shall be avoided.
- All employees shall wash hands prior to leaving the laboratory.
- Mouth suction for piping or starting a siphon is prohibited.
- Eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present is prohibited. Signs prohibiting these activities shall be posted.

- Storage, handling and consumption of food or beverages shall not occur in storage areas, refrigerators, glassware or utensils also used for laboratory operations.
- Risk determinations shall be conservative in nature.
- Any chemical mixture shall be assumed to be as toxic as its most toxic component.
- Substances of unknown toxicity shall be assumed to be toxic.
- Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure.
- The intent and procedures of this Chemical Hygiene Plan shall be adhered to continuously.
- In all cases of chemical exposure, neither the Permissible Exposure Limits (PELs) of OSHA or the Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded.
- The engineering controls and safety equipment in the laboratory shall be utilized and inspected with accordance with Section 2.2 of this plan.
- Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the Chemical Hygiene Officer. These special precautions are listed in Section 2.5.

2.1.8. CHEMICAL WASTE DISPOSAL

For the guidelines on the disposal of hazardous chemical waste from laboratory operations at University of Guam, refer to the University of Guam Hazardous Waste Disposal Guide. The general consideration of hazardous chemical waste disposal are as follows:

- Waste accumulated from individual laboratories shall be taken to a central waste disposal storage area and then removed from that area at regular intervals.
- Each container must be properly and clearly labeled (no abbreviations or chemical formulas).
- Incompatible chemicals shall be kept separate and different hazard classes segregated.
- Broken or leaking containers shall be repacked into non-leaking containers.
- Unknown chemicals are extremely difficult to dispose. Unknowns shall be packaged separately from other wastes.
- Outdates and obsolete chemicals shall be disposed and not stored. Ethers and other materials which degrade to unstable compounds shall be shelf dated for disposal 6 months after being opened, but no more than 12 months after purchase, even if unopened.
- All hazardous waste containers must be compatible with the materials to be contained.
- Accumulation periods for specific wastes must be adhered to.

- Waste disposal shall be in accordance with applicable local, state, and federal regulations.

2.2. PROTECTIVE CLOTHING AND LABORATORY SAFETY EQUIPMENT

2.2.1. GENERAL CONSIDERATION – PERSONAL PROTECTIVE CLOTHING/EQUIPMENT

The basic element of any personal protective clothing and equipment is the need to protect against the hazards in the workplace. Personal protective clothing and equipment must be provided at no cost to employees and students.

2.2.2. PROTECTION OF SKIN AND BODY

OSHA Standard 1910 Subpart (1910.132) requires the use of Personal Protective Equipment (PPE) in all labs where users are exposed to blood, chemical hazards, or mechanical irritants. Skin and body protection involve wearing protective garment and equipment over all parts of the body. PPE shall be selected on a task basis and checked to ensure it is in good condition prior to use.

2.2.2.1. PROTECTIVE CLOTHING AND EQUIPMENT

Personal protective clothing and equipment may include impermeable aprons, face shield, gloves and shoe covers.

Lab coats are highly recommended to be worn in the laboratory. Laboratory coats shall be changed immediately upon discovery of significant contamination.

Closed-toe shoes must be worn in the laboratory at all times. Sandals, perforated shoes and bare feet are prohibited. Safety shoes, per ANSI 47, are required where personnel routinely lift heavy objects.

Appropriate chemical-resistant gloves shall be worn based on the materials being handled, the specific hazard involved, and their suitability for the operation being conducted. Gloves shall be washed prior to removal from the hands to prevent skin contamination upon removal. Used gloves shall be inspected and washed prior to re-use. Non-disposable gloves shall be replaced periodically, depending on frequency of use and their resistance to the substances handled. Damaged deteriorated gloves shall be immediately replaced.

Thermal-resistant gloves shall be worn for operations involving the handling of heated materials and exothermic reaction vessels. Thermal-resistant gloves shall be non-asbestos and shall be replaced when damaged or deteriorated.

Table 1

Resistance to Chemicals of Common Glove Materials

Chemical	Natural Rubber	Neoprene	Nitrile	Vinyl
Acetaldehyde	G	G	E	G
Acetic Acid	E	E	E	E
Acetone	G	G	G	F
Acrylonitrile	P	G	N/A	F
Ammonium hydroxide (sat)	G	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
Benzene	P	F	G	F
Benzyl chloride	F	P	F	P
Bromine	G	G	N/A	G
Butane	P	E	N/A	P
Butyraldehyde	P	G	N/A	G
Calcium hypochlorite	P	G	G	G
Carbon disulfide	P	P	G	F
Carbon tetrachloride[1]	P	F	G	F
Chlorine	G	G	N/A	G
Chloroacetone	F	E	N/A	P
Chloroform[1]	P	F	G	P
Chromic acid	P	F	F	E
Cyclohexane	F	E	N/A	P
Dibenzyl ether	F	G	N/A	P
Dibutyl phthalate	F	G	N/A	P
Diethanolamine	F	E	N/A	E
Diethyl ether	F	G	E	P
Dimethyl sulfoxide[2]	N/A	N/A	N/A	N/A
Ethyl acetate	F	G	G	F
Ethylene dichloride[1]	P	F	G	P
Ethylene glycol	G	G	E	E
Ethylene trichloride[1]	P	P	N/A	P
Fluorine	G	G	N/A	G
Formaldehyde	G	E	G	E
Formic acid	G	E	G	E
Glycerol	G	G	G	E
Hexane	P	E	N/A	G
Hydrobromic acid (40%)	G	E	E	E
Hydrochloric acid (conc)	G	G	G	E
Hydrofloric acid (30%)	G	G	G	E
Hydrogen peroxide	G	G	G	E
Iodine	G	G	N/A	G
Methylamine	G	G	G	E
Methyl cellosolve	F	E	N/A	P
Methyl chloride[1]	P	E	N/A	P

Ethyol ethyl ketone	F	G	N/A	P
Methylene chloride[1]	F	F	G	F
Monoethanolamine	F	E	N/A	E
Morpholine	F	E	N/A	E
Napthalene[1]	G	G	E	G
Nitric acid (conc)	P	P	P	G
Perchloric acid	F	G	F	E
Phenol	G	E	N/A	E
Phosphoric acid	G	E	N/A	E
Potassium hydroxide (sat)	G	G	G	E
Propylene dichloride[1]	P	F	N/A	P
Sodium hydroxide	G	F	G	E
Sodium hypochlorite	G	P	F	G
Sulfuric acid (conc)	G	G	F	G
Toluene[1]	P	F	G	F
Trichloroethylene[1]	P	F	G	F
Tricesyl phosphate	P	F	N/A	F
Triethanolamine	F	E	E	E
Trinitrotoluene	P	E	N/A	P

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

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

[2]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.

2.2.2.2. PROTECTION OF THE EYES

Safety glasses meeting ANSI Z87.1 are required for all personnel and any visitors where chemicals are handled and a chemical splash hazard exists. Safety glasses, goggles and goggles with a face shield shall be worn in the laboratory based upon the physical state, the operation or the level of toxicity of the chemical used.

Contact lenses can increase the risk of eye injury if worn in the laboratory thus contact lenses are not recommended in the laboratory.

2.2.2.3. PROTECTION OF THE RESPIRATORY SYSTEM

Respirator usage shall comply with the OSHA Respiratory Protection Standard, 29 CFR 1910.134. Refer to Appendix H.

2.2.3. LABORATORY SAFETY EQUIPMENT

2.2.3.1. CHEMICAL (FUME) HOODS

The chemical fume hood is the primary means of controlling inhalation exposures to hazardous substances that emit vapors, fumes, gases and dusts by containing them within the hood and removing them as air flows out of the hood via the laboratory exhaust system. The clear sliding window, called a sash, shields workers from aerosols and prevents injury from splashes, fires, or minor explosions that may occur in the fume hood. As a general rule, the fume hood shall be used for all chemical procedures involving substances which are appreciably volatile and have a permissible exposure limit (PEL) less than 50 ppm.

When using a chemical fume hood, keep the following principles of safe operation in mind:

- Verify the fume hood is operating properly prior to usage. An inward flow of air can be confirmed by holding a piece of paper at the face of the hood and observing the movement of the paper.
- Keep the sash closed as much as practical when not manipulating chemicals or adjusting apparatus within the fume hood.
- When working in front of a fume hood, make sure the sash opening is appropriate. This can be achieved by lining up to arrows placed on the sash door and hood frame.
- Clean up spill immediately and dispose of waste solvents as hazardous chemical waste.
- Work at least 6 inches inside the fume hood to improve capture of contaminates.
- Leave the hood operating when it is not in active use if hazardous chemicals are contained inside the hood or if it is uncertain whether adequate general laboratory ventilation will be maintained when the hood is non-operational.
- Fume hoods are not intended for storage of chemicals. Materials stored in them shall be kept to a minimum. Stored chemicals shall not block vents or alter air flow patterns.
- The hood shall not be used as a means of disposal for volatile chemicals.
- Do not allow objects such as paper to enter the exhaust ducts. This can clog ducts and adversely affect their operation.

The chemical fume hood shall be checked if it is operational and has been certified within the last 12 months by the Chemical Hygiene Officer, but shall be inspected every 3 months by the laboratory supervisor. The hood face velocity shall be maintained between 75 and 125 feet per minute. A record of each inspection shall be maintained by the CHO. If the date on the certification sticker is more than 12 months, contact the CHO immediately for action.

2.2.3.2. EYEWASHES AND SAFETY SHOWERS

Whenever the eyes or body may be exposed to injurious corrosive chemicals, quick drenching or flushing of the eyes and body must be available for emergency use. All

laboratories in which bulk quantities of hazardous materials are handled shall have access to eyewash and safety showers. As with any safety equipment, these can only be useful if they are accessible, there:

- Keep all passageways to the eyewash and shower clear of any obstacle.
- The eyewash shall be checked routinely to be certain that water flows through it.
- Showers shall be checked routinely to assure that access is not restricted and that the pull chain/bar is within reach.
- The flow through the safety showers shall be tested periodically to ensure sufficient flow.

2.2.3.3. FIRE SAFETY EQUIPMENT

Fire safety equipment easily accessible in the laboratory must include a fire extinguisher and fire blankets.

2.3. CHEMICAL PROCUREMENT, DISTRIBUTION AND STORAGE

2.3.1. CHEMICAL PROCUREMENT

The decision to procure a chemical shall be a commitment to handle and use the chemical properly from initial receipt to ultimate disposal. The necessary information on proper handling of hazardous substances can be obtained from the Material Safety Data Sheets that are provided by the vendor. No container shall be accepted without an adequate identifying label. All chemical shipments shall be dated when received and opened. Chemicals utilized in the laboratory shall be those which are appropriate for the ventilation system (ANSI Z9.5 – 1992).

2.3.2. CHEMICAL STORAGE

- Carefully read the label before storing a hazardous chemical. The SDS will provide any special storage information as well as information on incompatibilities.
- Received chemicals shall be immediately moved to the designated storage area. Large glass containers shall be placed in carrying containers or shipping containers during transportation.
- The storage area shall be well illuminated. Large bottles shall be stored no more than two feet from ground level.
- Chemicals shall be segregated by hazard classification and compatibility in a well identified area, with local exhaust ventilation.
- Mineral acids shall be separated form flammable and combustible materials. Separation is defined as storage within the same fire area but separated by as much space as practicable or by intervening storage from incompatible materials.

- Acid-resistant trays shall be placed under bottles of mineral acids.
- Acid-sensitive materials such as cyanides and sulfides shall be separated from acids.
- Highly toxic chemicals or other chemicals whose containers have been opened shall be stored in unbreakable secondary containers (one inside the other).
- The storage area shall not be used as a preparation or repackaging area.
- The storage area shall be accessible during normal working hours.
- When chemical are taken from the storage area, they shall be placed in an outside container or bucket.
- Storage of chemicals at the lab bench or other work areas shall be limited to those amounts necessary for one operation or shift. The container size shall be the minimum convenient. The amounts of chemicals at the lab bench shall be as small as practical. Chemicals in the workplace shall not be exposed to sunlight or heat.
- Stored chemicals shall be examined at least annually by the Principal Investigators for replacement, deterioration and container integrity. The inspection shall determine whether any corrosion, deterioration, or damage has occurred to the storage facility as a result of leaking chemicals.

Periodic inventories of chemicals outside the storage area shall be conducted by the Principal Investigators. Unneeded items shall be properly discarded or returned to the storage area.

Storage of flammable substance shall be limited to quantities specified in Table 2 [CFR 1910.106].

Table 2
Maximum Allowable Size of Containers

Classification	1A	1B	1C	1D
Flash Point	< 73 °F	< 73 °F	73 – 100 °F	100 – 140 °F
Boiling Point	< 100 °F	> 100 °F	N/A	N/A
Flammability Potential	Extremely High	Very High	High	Moderate
NFPA Fire Rating	4	3	3	2
Maximum Container Size				
Glass	1 pint (500 mL)	1 quart (1 liter)	1 gallon (4 liters)	1 gallon (4 liters)
Metal or Approved Plastic	1 gallon	5 gallons	5 gallons	5 gallons
Safety Cans	2 gallons	5 gallons	5 gallons	5 gallons

Examples of Flammable Liquids Used	Ethyl ether Cyclohexane Acetaldehyde Pentane	Acetone Benzene Cyclohexane Ethyl alcohol Gasoline Hexane Isopropyl alcohol Methyl alcohol	Amyl acetate Chlorobenzene Xylene	Kerosene Diesel

2.3.3. CHEMICAL INVENTORY

Chemical inventory databases are particularly important in laboratories. It is not uncommon to have more than one researcher pursuing wholly different projects using a variety of different chemical materials. While these materials are usually in very small volumes (less than 500 milliliters or 500 grams), they are often experimental or highly hazardous in nature. The human health and environmental effects as well as the physical/chemical properties of these materials are frequently not well known. For these reasons, having a method to track all chemicals is critical.

The tracking method must allow rapid access to information regarding the chemical material in question. It shall be cross-referenced and standardized. Methods for entering information into the database must be standardized and adhered to. The following steps shall be followed to establish a university standard chemical formulary for each laboratory using chemical materials.

Adopting a standard, university-wide format which incorporates the following features is recommended:

1. Use of the American Chemical Society nomenclature
2. Use CAS number to cross-reference
3. Use of a database program which allows information to be sorted by:
    - Common name
    - Scientific name
    - CAS number
    - Storage and incompatibility considerations
    - Data of acquisition (and date of disposal); For materials such as ether, mandated disposal date shall automatically be flagged
    - Storage location
    - Hazard characteristics (toxicity, reactivity, corrosivity, flammability)
4. A yearly update of chemical inventories has to be filed with the Safety Officer.

2.4. CRITERIA FOR IMPLENTATION OF CONTROL MEASURES

All incidents involving hazardous chemical spills require prompt action by the responders and the victims in order to control chemical exposures to personnel and to minimize impacts to the environment and property.

2.4.1. AIR SAMPLING

Air sampling for evaluating employee exposure to chemical substances shall be conducted periodically or as specified by specific codes or regulations. Upon addition of new chemicals or changes in control procedures, additional air sampling will be considered to determine the exposures. Conduct air sampling if there is reason to believe that exposure levels for regulated substances that require sampling routinely exceed the action level, or in the absence of an action level, the PEL. Air sampling will be implemented when usage of highly toxic substances exceeds three times per week. The results of air sampling studies performed in the laboratory and other facilities are maintained and recorded on the form shown in Appendix E to this plan.

2.4.2. CHEMICAL SPILLS

If you are cleaning up a small spill yourself, make sure that you are aware of the hazards associated with the materials spilled, have adequate ventilation (i.e. open windows, chemical fume hood turned on) and adequate personal protective equipment shall be worn. The area where the spill occurred must be cleared of people.

For minors spills:

- Confine or contain the spill to a small area.
- For small amounts of inorganic acids or bases, use a neutralizing agent or an absorbent mixture (i.e. soda ash or diatomaceous earth). For small amounts of other materials, absorb the spill with a nonreactive material (i.e. vermiculite, dry sand, or towels).
- For large amounts of inorganic acids or bases, flush with large amounts of water (provided that the water will not cause a reaction or additional damage).
- Mop up spill, wringing out the mop in a sink or pail equipped with rollers.
- Carefully pick up and clean any cartons or bottles that have been splashed or immersed.
- Dispose of residues according to safe disposal procedures.

If the spill is too large for you to handle, is a threat to public health, safety or the environment, or involves a highly toxic or reactive chemical, call for assistance immediately. An incident report must be filed with the Safety Office within 10 working days.

2.4.3. LEAKING COMPRESSED GAS CYLINDER

If a leak is suspected, a flammable-gas leak detector or soapy water shall be used for verification. If leak cannot be stopped by tightening a valve gland or a packing nut, emergency action procedures shall go into effect and the supplier notified.

When the nature of the leaking gas or the size of the leak constitutes a serious hazard, personnel shall be evacuated and the fire department notified.

2.4.4. BASIC FIRST-AID

- For non-serious injuries (cannot be a life-threatening injury or exposure to the eyes), first-aid kits must be available and accessible in laboratories.
- After using the first-aid kit, report injuries to the supervisor or Principal Investigator and file an incident report with the Safety Office.

2.4.5. SAFETY AND EMERGENCY EQUIPMENT

- Telephone numbers of emergency personnel, supervisors and other workers as deemed appropriate shall be posted.
- All employees shall be trained in the proper use of fire extinguishers.
- All employees who might be exposed to chemical splashes shall be instructed in the location and proper usage of emergency showers and eyewashes. The eyewash and emergency shower shall be inspected weekly. These inspections shall be performed by the employees. Records of inspections shall be maintained.
- Location signs for safety and emergency equipment shall be posted.

2.5. SPECIAL PRECAUTIONS FOR OTHER HIGHER HAZARD CHEMICALS AND OPERATIONS

When laboratory procedures change to require the use of additional classifications of chemicals (allergens, embryotoxins, teratogens, carcinogens, etc.), additional special precautions shall be implemented as deemed necessary by the Principal Investigator or Chemical Hygiene Officer. The Activity/Task Hazard Evaluation Form (Appendix D) shall be utilized for all special activities. All questions regarding the use of this form shall be addressed to the Chemical Hygiene Officer.

2.5.1. WORKING WITH ALLERGENS (SPECIAL PRECAUTIONS)

Chemical allergens can cause an adverse reaction that can result in sensitization to a chemical. For those who develop a chemical allergy, sensitization usually evolves over time, and can range in severity from minor skin disturbances such as inflammation, itching, and redness, to life-threatening anaphylaxis. Suitable gloves to prevent hand contact shall be worn when exposed to allergens or substances of unknown allergen activity.

2.5.2. WORKING WITH EMBRYOTOXINS (SPECIAL PRECAUTIONS)

A teratogen (embryotoxic or fetotoxic agent) is an agent, which can cause abnormal fetal development without causing a lethal effect to the fetus or damage to the mother. Effects are not inherited. Examples of teratogens are lead, mercury and thalidomide. Women of child-bearing age will handle embryotoxins only in a hood with confirmed satisfactory performance and will use protective equipment to prevent skin contact as prescribed by the supervisor and Chemical Hygiene Officer.

Embryotoxins shall be stored in adequately ventilated areas in unbreakable secondary containers.

The supervisor, Principal Investigator and Chemical Hygiene Officer must be notified of spills and other exposure incidents. A physician shall be consulted when appropriate.

2.5.3. WORKING WITH CHEMICALS OF MODERATE CHRONIC OR HIGH ACUTE TOXICITY (SPECIAL PRECAUTIONS)

2.5.3.1. DEFINITIONS

Acute: Sudden effects that occur rapidly as a result of a single exposure or several exposures over a short period of time.

Chronic: Gradual effects that occur as a result of frequent exposure over a long period of time.

Toxicity: The ability of a substance to damage an organism including a description of the effect and the conditions or concentration under which the effect takes place.

2.5.3.2. PROCEDURES FOR CHEMICALS WITH MODERATE CHRONIC OR HIGH ACUTE TOXICITY

- Areas where these chemicals are stored and used are of restricted access and have special warning signs.
- A special hood with a minimum face velocity of 60 linear feet per minute or other containment device shall be used.
- Gloves and long sleeves will be used. Hands and arms shall be washed immediately after working with these chemicals.
- Two people must be present while working with these chemicals.

2.5.4. WORKING WITH CHEMICALS OF HIGH CHRONIC TOXICITY (SPECIAL PRECAUTIONS)

The following supplemental procedures are provided, in addition to those mentioned above, for work with substances of known high chronic toxicity:

- All transfer and work with these substances must be in a designated area – a restricted access hood, glove box or portion of the lab.
- Approval of the supervisor must be obtained before use.
- Vacuum pumps must have scrubber or high efficiency particulate absolute (HEPA) filters.
- Any contaminated equipment or glassware must be decontaminated in the hood before removing them from the designated area.
- For powders, a wet mop or vacuum with a HEPA filter shall be used for cleanup.
- The designated area must be marked with warning and restricted access signs.
- Containers shall be stored in a ventilated, limited access area in labeled, unbreakable, chemically resistant, secondary containers.

2.5.5. WORKING WITH ANIMALS AND CHEMICALS OF HIGH CHRONIC TOXICITY (SPECIAL PRECAUTIONS)

All individuals administering chemicals to animals must identify and understand the hazards of the chemicals used in their research, select the proper procedures, hazard controls, personal protective equipment, and provide protocol-specific training to protect those handling the chemicals.

The substance shall be administered by injection or gavage when possible rather than by diet. When diet is used, a caging system under negative pressure or under laminar air flow directed toward HEPA filters shall be used.

Procedures to be used to minimize contaminated aerosol from food, urine, and feces:

- HEPA filtered vacuum equipment for cleaning.
- Moisten contaminated bedding before removal from cage.
- Mix diets in closed containers in the hood.

2.5.6. WORKING WITH COMPRESSED GAS CYLINDERS (SPECIAL PRECAUTIONS)

Compressed gases require anticipating chemical, physical, and health hazards. Gases contained in cylinders may be from any of the hazard classes (flammable, reactive, corrosive, or toxic). The following guidelines will help ensure safe handling, use, and storage of compressed gas cylinders:

- Refer to Safety Data Sheet of the gas being handled or used.
- Secure all gas cylinders in an upright position.
- Only accept clearly labeled cylinders. Color codes do not constitute adequate labeling.
- Do not accept cylinders which are damaged or do not have a valve protection cap.

- Only Compressed Gas Association fittings and components are permitted for use with gas cylinders.
- Open cylinder valves slowly. Never force a gas cylinder valve. If the valve cannot be opened by the wheel or small wrench provided, the cylinder shall be returned.
- No attempt shall be made to transfer gases from one cylinder to another, to refill cylinders, or to mix gases in a cylinder in the laboratory (this excludes work involving Portable GC).
- Oxygen cylinders shall never be placed near highly combustible materials, especially oil and grease, or near stocks of carbide and acetylene or other fuel gas cylinders, nor near any other substance likely to cause or accelerate a fire. Systems and components used for other gases and purposes must never be used for oxygen or interconnected with oxygen. Never use grease on any part of an oxygen tank regulator.
- When cylinders are grouped together, they shall be conspicuously labeled on the neck area.
- Keep cylinders away from an electrical circuit.
- All cylinders are to be considered full unless properly identified as empty by the user. Empty cylinders shall be returned to the supplier and not accumulated.
- Always leave at least 25 PSIG minimum pressure in all “empty” cylinders.
- Do not leave an empty cylinder attached to a pressurized system.
- Always use a chained handcart to move and change cylinders.

2.5.7. WORKING WITH ETIOLOGIC AGENTS (SPECIAL PRECAUTIONS)

Etiologic agents are hazardous biological agents (viable microorganisms) or its toxin which may cause severe, disabling, or fatal human disease. The Centers for Disease Control and Prevention (CDC) regulates and permits the use and transfer of these agents. The agent risk group classifications are assigned into the appropriate biosafety level with associated safe practices and controls. This group of materials includes recombinant DNA, bloodborne pathogens, etc.

The CDC has specified Biosafety Levels for laboratories based on the combination of lab practices, safety equipment and laboratory facilities specifically appropriate for the operations performed, the agents handled, and the laboratory function. The various laboratory facilities at the University of Guam are categorized under the Biosafety Level 1 (BSL-1) or 2 (BSL-2) Programs.

Biosafety Level 1 (BSL-1) facilities:

1. handle viable microorganisms not known to cause disease in healthy adults. These agents are often used in undergraduate teaching laboratories and work with these agents may usually be performed on laboratory benches.
2. represents a basic level of containment that relies on standard microbiological practices with no special barriers.
3. require a sink for handwashing.
4. have posted biohazard warning signs indicating BSL-1 on entrances.

Biosafety Level 2 (BSL-2) facilities:

1. handle viable microorganisms associated with human diseases of varying severity at moderate-risk. These agents can be hazardous through various exposure routes, but not inhalation.
2. represents all BSL-1 practices, in addition to limiting access to the laboratory.
3. have posted biohazard warning signs indicating BSL-2 on entrances.
4. require an autoclave for decontamination of infectious waste.
5. require work to be done within a biological safety cabinet to protect users from aerosols or splashes that can cause infection.
6. require special practices such as decontamination of all infectious material prior to disposal and implementation of an accident/incident plan that details exposure assessment and methods to clean up spills.

The following guidelines will help ensure safe handling of etiologic agents:

- Treat all agents as potential pathogens or as infectious.
- Restrict microorganisms present in specimens or cultures to containers in which they are collected, grown, or studied.
- Sterilize equipment and materials and disinfect work areas before and after every use.
- Use a biological safety cabinet when working with microorganisms specified as BSL-2 or as instructed by the supervisor.
- Wash hands thoroughly with antibacterial soap before leaving the laboratory.
- All contaminated materials must be autoclaved and discarded into the biohazard (red) bags/containers.
- Do not pour biohazardous fluid down the sink.

Refer to the UOG Biosafety Manual for more information.

Appendices

A. CHEMICAL HYGIENE PLAN ORIENTATION AND TRAINING RECORDS

The following pages document training of staff, faculty and research assistants on:

- The UOG Chemical Hygiene Plan
- The hazards of the work or workplace
- Safety procedures
- Personal protective equipment
- Emergency procedures

Students must also receive training as applicable to their work or tasks, Training document shall specify the activity or task, the contents of the training, the trainer, and the signatures and names of the students. Records of this type of training shall be documented and maintained.

CHEMICAL HYGIENE PLAN ORIENTATION AND TRAINING RECORDS	Date:

- ☐ Introduction to operations where chemical and physical hazard are present – types of hazards encountered
- ☐ Required work practices
- ☐ Personal protective equipment
- ☐ Emergency procedures
- ☐ Detection of chemical hazards
- ☐ Location and availability of Chemical Hygiene Plan
- ☐ Labeling systems
- ☐ Reviewed the Chemical Hygiene Plan

Comments: _____
_____
_____
_____
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_____
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_____
_____
_____
_____
_____
_____

Completed By:	Date:
Employee's Signature:	Date:

B. FACILITY SAFETY EQUIPMENT INSPECTION RECORDS

Facilities and safety equipment shall be inspected on a routine basis, every month. Inspections shall be conducted by the Chemical Hygiene Officer. The inspection shall be conducted by a competent person who is familiar with the specific contents of the Chemical Hygiene Plan and if possible familiar with applicable OSHA regulations. Facilities may choose to develop site specific inspection checklists. All records of inspections shall be maintained in this manual. Explanations shall be provided in writing when a significant delay is expected in corrective actions.

FACILITY SAFETY EQUIPMENT INSPECTION RECORDS			Page: _____ of _____	
Department:				
Location/Room:				
Laboratory Manager:			Telephone:	
Purpose: "The purpose of this schedule is to assume that all laboratory safety equipment is inspected on a routine basis by competent personnel. Records in the form of inspection tags, stickers or logs will be maintained for all equipment."				
Equipment	Location	Date of Inspection	Condition	Inspector
Chemical Hygiene Officer:			Telephone:	

C. AIR MONITORING RECORDS

Air monitoring shall be conducted for activities or tasks which have the potential for exceeding safe concentration levels for a particular chemical. The Activity/Task Hazard Evaluation forms shall be referenced for determining the potential for exposure. OSHA permissible exposure limits and action levels shall also be referenced (29 CFR 1910.1000).

Air monitoring shall be conducted by an industrial hygienist and in accordance with industry accepted sampling methods. Results of air monitoring shall be posted within 15 days after results are available. Corrective actions and controls, if needed, shall be documented and implemented.

AIR MONITORING RECORD

Location:	Task/Activity:	Reference ID No.:
Date:	Prepared By:	Type of Sample: ___ Personal ___ Area ___ Other
Name:	Social Security No.:	Job Title:

SAMPLE COLLECTION

Sample Rate: _____ Barometric Pressure: _____
Sample Time: _____ Temperature: _____
Meter Reading: _____ Sample Pump ID: _____
Calibrator ID: _____ Calibration Date: Pre: _____
Volume of Air Sampled: _____ Post: _____

Comments: _____
_____
_____
_____

SAMPLE ANALYSIS

Contaminations	Concentration	Unit
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

DATA ANALYSIS

Exposure: _____ Priority: _____
Standard: _____ Employee Notification: ___ Yes ___ No
Source: _____ Sample Type: _____
Results: ___ Compliance ___ Non-Compliance ___ Other

D. ACTIVITY/TASK HAZARD EVALUATION

An Activity/Task Evaluation form must be completed for each project, laboratory activity, research and routine task which has potential to cause harm to human health or environment. These evaluations must be conducted by a competent person prior to the start of work or activity. The results of the evaluations must be conveyed to all individuals involved and documented as training records. Copies of this form shall be readily available or posted for easy reference.

ACTIVITY/TASK HAZARD EVALUATION	Page 1 of _____

1. Reference ID No.: _____ Date: _____
2. Location: _____ Time: _____
3. Activity/Task Description: _____
   _____
   _____
4. Chemical Substances: _____
5. Proposed Chemical Use (amounts, duration, etc.): _____
   _____
   _____
6. Proposed Engineering Controls (enclosures, ventilation systems, etc.): _____
   _____
   _____
7. Storage Requirements: _____
   _____

POTENTAIL HAZARDS AND REQUIRED CONTROLS

SAFETY				HEALTH				FIRE			
Hazards:				Hazards:				Hazards:			
Precautions	Y	N	NA	Precautions	Y	N	NA	Precautions	Y	N	NA
Provide Guards				Provide Guards				Provide Guards			
PPE				PPE				PPE			
Special Safety Training				Special Safety Training				Special Safety Training			
Special Safety Procedures				Special Safety Procedures				Special Safety Procedures			
Lockouts Required				Lockouts Required				Lockouts Required			
Unattended Operation				Unattended Operation				Unattended Operation			
Work Alone				Work Alone				Work Alone			
Sole Occupancy				Sole Occupancy				Sole Occupancy			
Special Consideration: PPE: Air Monitoring:				Special Consideration: PPE: Air Monitoring:				Special Consideration: PPE: Air Monitoring:			

Additional Comments:	
Approval of Chemical Hygiene Officer:	Name: Date:

E. OSHA OCCUPATIONAL EXPOSURE TO HAZARDOUS CHEMICALS IN LABORATORIES 29 CFR 1910.1450

Link: https://www.gpo.gov/fdsys/pkg/CFR-2010-title29-vol6/pdf/CFR-2010-title29-vol6-sec1910-1450.pdf

F. OSHA EMERGENCY ACTION PLANS 29 CFR 1910.38

Link: https://www.govinfo.gov/content/pkg/CFR-2012-title29-vol5/pdf/CFR-2012-title29-vol5-sec1910-38.pdf

G. OSHA HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE 29 CFR 1910.120

Link: https://www.govinfo.gov/content/pkg/CFR-2009-title29-vol5/pdf/CFR-2009-title29-vol5-sec1910-120.pdf

H. OSHA AIR CONTAMINANTS 29 CFR 1910.1000

Link: https://www.osha.gov/FedReg_osha_pdf/FED19890119.pdf

I. OSHA RESPIRATORY PROTECTION STANDARD 29 CFR 1910.134

Link: https://www.osha.gov/dte/library/respirators/major_requirements.pdf

J. REFERENCES AND RECOMMENDED READING

National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories. National Academy Press, Washington, D.C. 1981.

National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories. National Academy Press, Washington, D.C. 1983.

Northeastern University Office of Environmental Health and Safety, Laboratory Chemical Hygiene Plan, 12th Revision. Boston, Massachusetts. 2012.

Freeman, N.T., Introduction to Safety in the Chemical Laboratory, Academy Press, 1982.

Manufacturing Chemists' Association, Inc., Guide For the Safety In The Chemical Laboratory, D. Van Nostrand Company, Inc., 1954.

Green, Michael E., Safety In Working With Chemicals, MacMillan Publishing Co., Inc. 1978.

Pipitone, David A., Safe Storage of Laboratory Chemicals, Wiley & Sons., Inc. 1984.

Federal OSHA Standards:
Title 29 of the Code of Federal Regulations part 1910

1910.1001-1101	Standards Specific to a Containment
1910.1450	Occupational Exposure to Hazardous Chemicals in Laboratories
1910.134	Respiratory Protection

Guam OSHA Standards:
Chapter 6, Training
Chapter 10, Occupational Safety and Health Inspection Program
Chapter 13, Respiratory Protection Program
Chapter 14, Hazardous Material (Chemical) and Waste Management Program
Chapter 15, Handling Flammable and Combustible Liquids
Chapter 16, Occupational Noise Exposure Standard
Chapter 23, Fire Prevention, Fire Emergency Plans and Fire Reporting and Control Procedures
Chapter 24, Walking and Working Surfaces
Chapter 26, Materials Handling Standards
Chapter 29, Medical Surveillance Standard
Chapter 33, Compressed Gas Cylinders

NFPA Standards:

NFPA 30	Flammable and Combustible Liquids Code
NFPA 43A	Code for Storage of Liquid and Solid Oxidizing Materials
NFPA 43D	Code for Storage of Pesticide in Portable Containers
NFPA 45	Fire Protection Standard for Laboratories Using Chemicals
NFPA 70	National Electrical Code
NFPA 80	Fire Doors and Windows
NFPA 490	Storage of Ammonium Nitrate

ANSI Standards:

Z358.1-1981	Emergency Eyewash and Shower Equipment
Z9.5-1992	Laboratory Ventilation

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