Laboratory Health, Safety and Environment Management System (Lab HSE-MS)

Department of Chemical Engineering
University of the Philippines Diliman

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Abbreviations

UPD – University of the Philippines Diliman
DChE – Department of Chemical Engineering
DLC – Department Laboratory Committee
HSE-MS – Health, Safety & Environment Management System
OSHA – Occupational Safety & Health Administration
WMS – Waste Management System
PPE – Personal Protective Equipment
SC – Supplies Coordinator
PCO – Pollution Control Officer

I. Introduction

The Lab HSE-MS is a structured and documented set of activities designed to ensure and demonstrate that the UPD-DChE Laboratory complies with the minimum requirements of HSE standard for laboratory safety management. The HSE-MS shall be implemented, maintained and updated thru various reviews, monitoring activities and periodic evaluations. The HSE-MS will serve as the Chemical Hygiene Plan as per OSHA Laboratory Safety Standard.

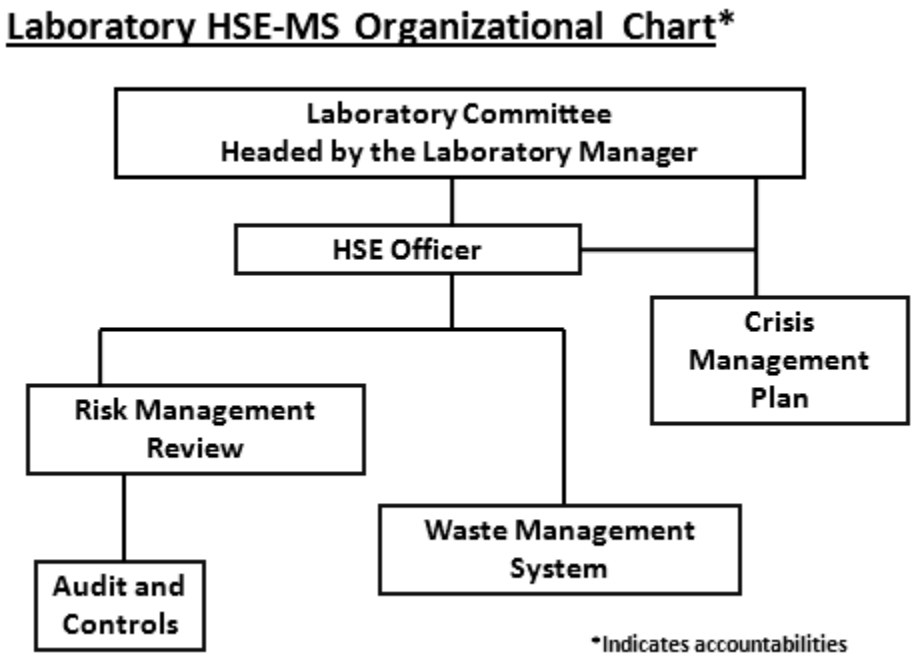
II. Policy & Objectives

UPD-DChE is committed to provide a safe environment for its faculty, staff, researchers, students and visitors. The objectives of the HSE-MS are as follows:

1. To implement HSE standards that will address laboratory safety management practices.
2. To manage the risk of injury or illness to those who will work in the laboratory by ensuring that they have the proper training, necessary information, and adequate support to work safely in the laboratory.
3. To minimize the risk of environmental hazards by implementing safe handling practices and an appropriate waste management plan.
4. To safeguard laboratory resources from unauthorized access, misuse, and representation.
5. To ensure compliance with the local laws and regulations in managing safe laboratory operations.

III. Organizational Structure

A. Organizational Chart



B. Roles & Accountabilities

Roles	Accountabilities
Laboratory Manager	The laboratory Manager as head of the Laboratory Committee is the owner of the Lab HSE-MS.
	Is accountable for HSE policies and directions of the UPD-DChE Laboratory and for leading the laboratory committee in the discharge of its governance role. The Laboratory Manager reports to the Chair of the DChE.
	Ensures implementation and monitoring of Lab-HSE MS audit and review 1. Provides operational management risk guidance. 2. Monitors whether HSE risks have been assessed and controls have been established 3. Reviews and approves corrective actions as endorsed by the HSE officer. 4. Endorses (to DChE) the recommendations made based on the results of audits and reviews. 5. Frequency - annually
	Implements and monitors Chemical Inventory. Inventory task to be assigned to Laboratory Staff Frequency – semi annually
	Implements and monitors Equipment Inventory Inventory task to be assigned to Laboratory Staff Frequency – semi annually
	Implements and monitors Preventive Maintenance Program of all laboratory equipment. This shall be coordinated with the faculty in charge of equipment. Frequency – semi-annually
	Implements housekeeping and utilities' maintenance.
	Ensures incidents /accidents are investigated and documented accordingly.
	Is the head of the Crisis Management Team accountable for the Emergency Preparedness and Response Plan
	Approves all request on equipment use, chemicals use, extension services and use of all facilities.
	Approves and signs all documents released by the Laboratory.
	Ensures adequate trainings are provided to faculty, lab staff and students.
HSE Officer	Responsible and accountable for the implementation, maintenance, review and update of the Lab HSE-MS.
	Conducts yearly audit and review 1. Ensures HSE risks have been identified and

	assessed 2. Ensures controls have been established. 3. Recommends corrective actions.
	Ensures Laboratory Safety Training is in-place for faculty, staff and students. Ensures records of training are documented.
	Ensures all MSDS are maintained and updated.
	Ensures all safety and emergency signs are prominently posted on the walls.
	Ensures all chemical reagents, waste and other materials are properly labeled.
	Serves as the link on HSE matters between 1. The members of the Laboratory Committee and the DChE. 2. DChE and the students.
	Ensures all protective equipment (ie. emergency shower, eye wash station, fire extinguishers, fume hoods, general ventilation) are inspected and properly maintained. Frequency of inspection: every 3 months.
	Ensures strict implementation on the use of PPE
	Owner of the Waste Management System Implements and maintains WMS plan. As Waste Management Officer, he/she: 1. Acts as the Pollution Control Officer (PCO). 2. Serves as the focal point of the WMS. 3. Coordinates the disposal of hazardous wastes resulting from laboratory operations.
	Head of the Emergency Preparedness and Response Plan ensures trainings are in place.
Lab Faculty	Teaches chemical engineering laboratory subjects. Should lead by example and wear personal protective equipment; follow and enforce safety rules, procedures, and practices; and demonstrate safety behavior and promote a culture of safety.
	Ensures HSE-practices (as part of HSE-MS) are strictly implemented during his/her class by 1. Conducting trainings on safe laboratory practices before classes begin. 2. Having an understanding of the hazards involved in the specific course. 3. Strictly implementing laboratory safety procedures. 4. Being alert on the possible hazards and accidents that may occur during classes for immediate preventive action. 5. Supervising the students throughout the laboratory class.

Laboratory Technicians	Conducts inventory of chemicals. Maintain records of inventory. 1. Act as Supplies Coordinator (SC) in receiving, recording, storage, distribution and inspection of chemical reagents. 2. Ensure proper segregation and storage
	Conducts inventory of equipment. Maintain records of inventory Coordinate with the Lab Manager and Faculty in charge of equipment for the implementation of Equipment Preventive Maintenance, Inspection and Calibration
	Conducts inspection of utilities and facility 1. Inspect fume hoods, ventilation, emergency showers, eye wash station and fire extinguishers periodically. Maintain record of inspections. 2. Inspect compressed gas cylinders. 3. Maintain good housekeeping and other utilities' maintenance.
	Assists HSE officer in the implementation of WMS.

IV. Risk Management: Hazards of Chemicals

A. Chemical & Hazard Identification

1. Chemical Hazards Classification

The following are the general categories of classifying hazardous chemicals prescribed by the *OSHA Hazard Communication Standard (29 CFR 1910.1200) Appendix A-Health Hazard Definitions (Mandatory)*.

a. Carcinogen
   Substances regulated by OSHA as carcinogens.
b. Corrosive
   Chemicals that cause visible destruction of living tissue by chemical action at the site of contact.
c. Highly Toxic
   Chemicals that can cause injury by direct chemical action with body tissues.
d. Irritant
   Chemicals that cause an inflammatory effect on living tissue by chemical action.
e. Sensitizer
   Chemicals that cause allergic reactions.
f. Flammable
g. Explosive

The Appendixes C to E of the School Chemistry Laboratory Safety Guide by NIOSH (attached) may be also used in the identification of hazardous chemicals used for educational purposes:

h. Substances with Greater Hazardous Nature than Educational Utility
i. Substances with Hazardous Nature but with Potential Educational Utility
j. List of Incompatible Chemicals

2. Chemical Inventory Control
   Refer to the DChE's *Chemical Storage System & Inventory*.

3. Labels
   Chemical suppliers are mandated by law to provide their chemicals with labels bearing the complete name of the product as well as a summary of the principal hazards associated with their contents. The labels should be kept intact (do not remove or deface) until the container has been completely emptied. For waste labels, refer to the DChE's *Laboratory Waste Management System*.

4. MSDS
   All chemicals received in the laboratory should be accompanied by an MSDS. MSDS files should be maintained and updated and ensure that they are readily accessible to the faculty, staff and students. MSDS can also be sourced from the web, trade magazines, any reference books on chemicals safety and handling or contact directly the manufacturer.

B. Health Hazard of Chemicals

The chemicals used in the laboratory have a wide range of physical, chemical and toxicological properties as well as physiological effects. The risks inherent with the use of laboratory chemicals must be well understood prior to its use in an experiment. The health risk of a chemical is a function of exposure and the inherent toxicity of the substance.

It is vital that all laboratory workers (faculty, students and staff) be trained in certain basic principles of toxicology and proper recognition of the major classes of toxic and corrosive materials. The laboratory should have an inventory of all the chemicals stored as well as its accompanying MSDS, as this will help determine what protective measures are to be taken.

1. Routes where Chemicals Enter the Human Body and its Effects
   a. Inhalation
      Chemicals in the form of vapors, gases, fumes, dusts and mists can enter through the nose and mouth, and these can be absorbed through the mucous membranes of the nose and lungs. Unlike the skin, chemicals can easily enter the lungs.
   b. Skin & Eye Contact
      Chemicals are absorbed through burn, chapped or cracked skin. Once the skin is penetrated, the chemical enters the blood stream and is carried to all parts of the body. Note that organic chemicals are much more likely to penetrate the skin (and can enter into the bloodstream quickly) than inorganic chemicals.
      Dermal exposure to various substances can cause irritation and damage to the skin (rashes) and/or eyes. The effects of dermal exposure can range from mild effects to permanent damage, depending on the substance and the length of exposure.
      Skin contact with chemicals should be avoided as a cardinal rule.
   c. Ingestion
      Chemicals can enter human body through contaminated objects such as hands or food that come in contact with the mouth. Toxic chemicals that enter the gastrointestinal tract (consists of mouth, esophagus, stomach and large and small intestines) is absorbed into the blood stream which may cause systemic injury.
   d. Injection
      Exposure to chemicals by mechanical injury from sharp objects (e.g. broken glass or metal, syringes) contaminated with chemicals.

2. Determining Chemical Exposure
   Periodic air monitoring and medical examinations of the laboratory workers can help facilitate the early detection of any chemical exposure in the laboratory. For safety precautions, the use of PPE is mandatory when working in the laboratory. Likewise, ventilation and disposal facilities should be periodically maintained and upgraded.

C. Laboratory Safety & Controls
   As per *OSHA Regulation Part Number 1910 Subpart Z – Toxic and Hazardous Substances Standard Number 1910.1450 – Occupational exposure to hazardous chemicals in laboratories, Appendix A,* the following recommendations are given in controlling chemical exposure in the work place:

1. Controlling Chemical Exposures
   a. General Principles for Work with Laboratory Chemicals
      It is prudent to minimize all chemical exposures by adopting general precautions for handling all laboratory chemicals, rather than specific guidelines for particular chemicals.
   b. Never underestimate the risk
      Even for substances of 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 toxic.
   c. Provide adequate ventilation
      The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices.
   d. Institute a chemical hygiene program (or HSE-MS) where an audit program is in-place
      A mandatory chemical hygiene program designed to minimize exposures is needed; it should be a regular and a continuing effort, not merely a standby or short-term activity. Its recommendations should be followed in academic teaching laboratories as well as by full-time laboratory staff.

2. Laboratory Facilities
   a. Design
      The minimum facilities required in the laboratory as prescribed by the *OSHA Laboratory Standard (29 CFR 1910.1450)* are the following:
      i. Appropriate general ventilation system where air intakes and exhaust located so as to avoid intake of contaminated air.
      ii. Adequate, well-ventilated stockrooms, reagents room.
      iii. Fume hoods and sinks in good working condition.
      iv. Emergency showers and eye wash station
      v. Segregated area for waste disposal

      Building and fire codes require the installation of the following devices in the work place:

      vi. Emergency exits
      vii. Fire extinguishers at every strategic location
      viii. First-aid kit
      ix. Smoke Detectors and Chemical Sensors
      x. Fire alarm

b. Maintenance
   Chemical-hygiene related equipment such as fume hoods, exhaust fans, etc, should undergo preventive maintenance and be modified if inadequate. Maintain records of evaluations and repairs.

c. Usage
   The physical facilities available in the laboratory must be adequate to accommodate the scale of the experiments conducted.

d. Utilities (Electrical and Mechanical)
   i. Shut–off device should be known to all faculty and lab staff.
   ii. Laboratories should have an abundant number of electrical supply outlets to eliminate the need for extension cords and multi-plug adapters.
   iii. Electrical panels should be placed in an accessible area not likely to be obstructed.

e. Ventilation
   i. General laboratory ventilation should provide a source of air for breathing and for input to local ventilation devices; it should not be relied on for protection from toxic substances released into the laboratory; ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day; direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building.
   ii. Any modifications of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be inadequate.
   iii. Quality and quantity of ventilation should be evaluated on installation, regularly monitored (at least every 3 months), and reevaluated whenever a change in local ventilation devices is made.

f. Fume hood
   i. The primary safety device in a laboratory that can prevent exposure to airborne substances. It is a ventilated enclosure wherein vapors, gases and fumes are contained.
   ii. A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with chemicals
   iii. Each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use. If this is not possible, work with substances of unknown toxicity should be avoided or other types of local ventilation devices should be provided.
   iv. Fume hoods should be properly maintained and periodically calibrated and should be used according to its specifications in order to provide adequate containment.

D. Chemical Management
   1. Acquisition of Chemicals
      Prior to the procurement of chemicals, information regarding its proper handling, storage and disposal must be known to all persons involved. Containers of the received chemicals must have adequate identifying label. Chemical containers that have been tampered with or lacks labels should be rejected.

2. Inventory & Control of Chemicals

   Database system that records all the chemicals in the laboratory, along with information essential for their proper management. A good inventory system can reduce procurement costs, reduce storage risk, eliminate unnecessary purchases, and minimize disposal expenses.

   To facilitate the inventory process, each entry in the database must correspond to a single container of a chemical rather than just the chemical itself. The data fields required for the inventory are:

   a. Name of substance as printed in the container.
   b. Molecular formula.
   c. Chemical Abstract Service (CAS) registry number.
   d. Common name of chemical (if applicable).
   e. Source (i.e. chemical supplier and/or manufacturer).
   f. Size of container.
   g. Hazard classification (carcinogen, toxic, flammable, etc.).
   h. Date received (Expiration Date).
   i. Location of storage.
   j. Amount of chemical in container.
   k. Type of container.
   l. Name of person who acquired the chemical.

   A "cradle-to-grave" chemical tracking system should track chemicals from the time they are purchased (receipt of chemicals) through the time they are used and discarded. A regularly scheduled inventory and inspection should be conducted to purge any inaccurate data in the system and dispose of outdated, unneeded, or deteriorated chemicals. A tracking system can be set up by (1) a logbook system organized by chemical name or (2) by creating a computer-based system. A lab-technician should be designated for chemical and hazardous materials inventory control. He will act as supplies coordinator (SC). Duties of the supplies coordinator should include:

   a. Receipt and acceptance of chemicals.
   b. Maintenance of chemical inventory logs. Assigned inventory numbers.
   c. Distribution of chemicals for used in the laboratory experiments and analysis. Establish system for batch ticket/job order if necessary.
   d. Performs periodic inspection of the chemical inventory to ensure material container integrity has not been breached and material shelf like has not been exceeded.
   e. Container labeling and segregation.
   f. Keep accurate, up to date records of the use of each chemical in the system.
   g. General Rules for Chemical Storage and Segregation.
   h. Basic storage area guidelines.
   i. Avoid storing materials and equipment on top of cabinets.
   j. Avoid storing heavy objects in high places.
   k. Keep exits, passageways and areas under of tables free of stored material.
   l. Label all containers appropriately.
   m. Place user's name and date of purchase on all procured materials to facilitate inventory.
   n. Provide specific areas of storage for each chemical and return chemical to that location after use.
   o. Avoid storing chemicals in laboratory hoods.

p. Store volatile chemicals in a ventilated cabinet.
q. Store chemicals inside a closeable cabinet or on a sturdy shelf with a front-edge lip to prevent accidents and chemical spills; a ¾-inch front edge lip is recommended.
r. Secure shelving to the wall or floor.
s. Ensure that all storage areas have doors with locks.
t. Ventilate storage areas adequately.
u. Do not expose stored chemicals to direct heat or sunlight.
v. Observe precautions regarding storage of incompatible chemicals.
w. Store flammable liquids in approved flammable liquid storage cabinets.
x. Container Requirements.
y. Provide vented cabinets beneath fume hoods for storage of hazardous materials.
z. Use chemical storage refrigerators ONLY for storing chemicals.
aa. Seal containers to minimize escape of vapors.
bb. Use corrosion –resistant containers.
cc. Label all materials in a refrigerator.
dd. If a material is transferred from the original (manufacturer's) container to another container, the new container must be labeled accordingly. In-house containers including tanks and pipes must contain labels that display.
ee. Identify of the chemical, compound or mixture.
ff. An appropriate hazard warning.
gg. Storage and Segregation System.
hh. Separate chemicals into compatible groups.

3. Storage of Chemicals

a. Common combustible materials such as paper, wood, corrugated cardboard cartons and plastic laboratory ware, if allowed to accumulate, can create a significant fire hazard in the laboratory. Combustible materials not stored in metal cabinets should be kept to a minimum. Store large quantities of such supplies in a separate room, if possible.
b. Store acids in a dedicated acid cabinet. Nitric acid should be stored alone unless the cabinet provides a separate compartment for nitric acid storage.
c. Store highly toxic chemicals in a dedicated, lockable poison cabinet that has been labeled with a highly visible sign.
d. Stored chemicals should be examined periodically (at least annually) for replacement, deterioration and container integrity.
e. Compressed Gas Cylinders
Compressed gases can be hazardous because each cylinder contains large amounts of energy and may also have high flammability and toxicity potential.

i. Make sure the contents of the compressed gas cylinder are clearly stenciled or stamped on the cylinder or on a durable label.
ii. Never use cylinders with missing or unreadable labels.
iii. Check all cylinders for damage before use.
iv. Be familiar with the properties and hazards of the gas in the cylinder before using.
v. Wear appropriate protective eyewear when handling or using compressed gases.
vi. Use the proper regulator for each gas cylinder.
vii. Do not tamper with or attempt to repair a gas cylinder regulator.
viii. Never lubricate, modify, or force cylinder valves.
ix. Open valves slowly using only wrenches or tools provided by the cylinder supplier directing the cylinder opening away from people.

x. Check for leaks around the valve and handle using a soap solution, “snoop” liquid, or an electronic leak detector.
xi. Close valves and relieve pressure on cylinder regulators when cylinders are not in use.
xii. Label empty cylinders “EMPTY” or “MT” and date the tag; treat in the same manner that you would if it were full.
xiii. Always attach valve safety caps when storing or moving cylinders.
xiv. Transport cylinders with an approved cart with a safety chain; never move or roll gas cylinders by hand.
xv. Securely attach all gas cylinders (empty or full) to a wall or laboratory bench with a clamp or chain, or secure in a metal base in an upright position.
xvi. Store cylinders by gas type, separating oxidizing gases from flammable gases by either 20 feet or a 30-minute firewall that is 5 feet high.
xvii. Store gas cylinders in cool, dry, well-ventilated areas away from incompatible materials and ignition sources.
xviii. Do not subject any part of a cylinder to a temperature higher than 125 °F or below 50 °F.
xix. Store empty cylinders separately from full cylinders.

E. Personal Protective Equipment

Selected gear to protect the wearer from hazardous substances, PPEs should complement and support engineering controls that reduce hazard risks. PPEs only protects the wearer, does not protect anyone else. Fire extinguishers, safety showers and eyewash stations should be conspicuously labeled. All protective equipment should be inspected periodically (preferably every 3-6 months). Eyewash should be inspected at intervals of not less than 3 months.

1. Personal Clothing
   a. Clothing exposing large areas of skin is prohibited in the laboratory. Unrestrained long hair and loose clothing such as neckties and baggy pants are also inappropriate for these may catch fire or get caught in equipment.
   b. Jewelry and other accessories that could be damaged or trap chemicals close to the skin must be removed prior to working in the laboratory.
   c. Laboratory gown should be worn at all times inside the laboratory, buttoned, with sleeves rolled down.
   d. Aprons made of special materials should be worn when doing high-risk activities.
2. Foot Protection
   a. Only close-toed shoes are allowed to be used in the laboratory
   b. Sandals and slippers are prohibited.
3. Eye & Face Protection
   a. Chemical splash goggles should be worn by all personnel in the laboratory
   b. Full length shields that fully protect the face and throat must be worn when handling highly explosive or highly hazardous chemicals.
4. Hand Protection
   a. Gloves appropriate to the hazard must be worn at all times.
   b. Proper protective gloves must be worn when handling hazardous or toxic materials, corrosive materials, rough or sharp objects and very hot or very cold objects.
5. Respirators

   May only be used when engineering controls such as ventilation or fume hood are not functioning well.
6. Emergency Showers

Easily accessible drench-type safety showers. Location should be within 100 feet or 10 seconds travel time from the chemical use areas.

7. Eyewash Station
   Location should be within 100 feet or 10 seconds travel time from the chemical use areas.
8. Sand & Wood Shavings
   For neutralization of spills.
9. Fire Extinguishers
   Appropriate fire extinguishers to manage chemical fire (dry chemical and carbon dioxide). Fire extinguishers appropriate for the chemicals and equipment in use should be placed near the entrance of each laboratory, mechanical and electrical room.
10. Emergency Lights
    Flash lights, emergency lights and neon stickers to guide laboratory users during power outages.
11. Smoke Detector, Fire Alarms & Megaphone
12. Fumehood

V. Standards, Procedures & Document Control

A. Basic Rules & Procedures for Working with Chemicals & Equipment

The following general rules and procedures for working with chemicals and equipment should be followed in the laboratory at all times. These general rules and procedures' purpose is to ensure safe and preventive operation during laboratory hours. It will include conduct, experiment procedures, housekeeping, hygiene, chemical & equipment handling, waste disposal and personal protective equipment.

1. Conduct
   a. Do not work alone, especially when procedures are dangerous.
   b. Do not perform any unauthorized experiments.
   c. Be vigilant to unsafe conditions and ensure that these are corrected.
   d. Avoid horse playing. Do not do anything that may distract, shock, confuse and startle anyone.
   e. Do not eat, drink or smoke in the laboratory.
   f. Do not sit on the laboratory table benches.

2. Experiment Procedures
   a. Study experiment procedures beforehand and be familiar with possible complications and hazards. Make sure that preventive steps are taken to avoid these situations.
   b. Do not leave experiment operations unattended. If it is absolutely necessary to leave a running experiment, leave the lights on, place a sign to indicate the specific hazards and provide for containment in an event of failure.
   c. Consult the lab technician for safety precautions if necessary.

3. Housekeeping
   a. Always keep work areas clean and uncluttered.
   b. Label all chemical reagents, working mixtures and wastes during experimentation.
   c. Clean up work areas after each experiment and place reagents, equipment, glassware and wastes in their proper designations.
   d. Keep the floor area dry and free of clutter.
   e. Keep all paths to exits and doorways open.
   f. Dispose of broken glassware in designated containers immediately.
   g. Dispose all wastes according to the segregation rule.

4. Hygiene
    a. Always wash your hands before and after experiments to avoid contamination or ingestion of chemicals.
    b. Never bring food or drinks into the laboratory.
    c. Never use laboratory glassware for eating or drinking.
    d. Do not apply cosmetics in the laboratory.
    e. Avoid touching your face, eyes and mouth after handling chemicals.

5. Chemical Handling
    a. Skin contact with any chemical should be avoided.
    b. Before using any chemical, check the label to verify if it is the correct substance.
    c. Label all chemicals removed from their original containers.
    d. When labeling containers, include the contents, concentration, hazard, date and name of the user.
    e. Use a spatula when transferring a solid reagent from its container.
    f. Do not use metals with peroxides (metal decompose explosively with peroxides).
    g. Hold containers away from the body when transferring chemicals.
    h. Do not return excess reagents into their original containers. Provide a separate container and label appropriately.
    i. Use the fume hood for toxic or volatile chemicals. Place the chemicals and equipment at least 6 inches within the fume hood.
    j. Keep your head and body out of the fume hood.
    k. Never carry bottles or chemical containers which are too heavy for you.
    l. Do not heat chemicals directly in an open flame.

6. Equipment Handling
    a. Read the instructions on how to operate any equipment before using it.
    b. Ask the lab technician or instructor's assistance in using the equipment.
    c. Inspect the equipment before using and report any damages present.
    d. Report any malfunctions or visible damages on the equipment immediately.
    e. Turn off all power sources of the equipment after use.
    f. Ensure that all wires and plugs are neatly and securely positioned to avoid any accidents and delays in the experiment. Place wires along the walls or tape securely on the floor.

7. Waste Disposal
    a. Design all experiments to minimize chemical wastes generated.
    b. Log all wastes in a waste logbook provided by the laboratory and in a waste logbook provided by your research group.
    c. Properly label waste jars/containers according to the waste disposal plan.
    d. Never throw chemical wastes in the sink.
    e. Never leave chemical wastes unlabelled.
    f. Refer to the Laboratory Waste Management Plan for specific waste disposal plans.

8. Personal Protective Equipment
    a. The required PPE in the laboratory are the following: lab gown, closed shoes, long pants and goggles. Use gloves and face masks when handling chemicals which are toxic, corrosive or volatile.
    b. Always wear the required PPE in the laboratory when performing or observing experiments.

c. Skirts, jewelry, shorts & slippers are not allowed in the laboratory.
d. Do not wear contact lenses in the laboratory.
e. Secure long hair with a tie and fold loose long sleeves when working in the laboratory.
f. Remove all protective equipment before leaving the laboratory.

B. Spills & Accidents

For any possible spills, accidents or other incidents, this section aims to address a general emergency plan starting from prevention, the incident itself, immediate action (including alarms, evacuation, medical care), clean-up and the incident report.

1. Prevention
   a. Lab technicians, lab instructors and other faculty shall be trained in first aid and emergency response prior to the start of the academic year.
   b. Laboratory instructors will give a basic course on first aid and emergency response to their classes before any laboratory activity.
   c. Walk-thru activities and emergency drills shall be conducted for laboratory classes.
   d. Area monitors assigned for each laboratory class will constantly check for potential hazards and remedy these.
   e. A written plan for emergency responses, basic first aid manual, MSDS database and a list of emergency contact numbers shall be made available at all times in the laboratory.
   f. Fire alarms, eye wash stations, emergency showers and fire extinguishers shall always be made available and ensured to be in working condition.

2. Immediate Action
   a. An alarm switch is situated in the middle of the main laboratory for in any case of emergency.
   b. Emergency plans specific for the situation shall be employed.
   c. The lab technician and faculty present will be in charge of turning off the main switches and equipment.
   d. For chemical spills, students should avoid the area and immediately inform the laboratory instructor and technician.

3. Clean-Up
   a. Ensure that plans for chemical spills are done to avoid prolonged exposure.
   b. Materials used to clean up the spill should also be classified as hazardous.

4. Incident Report

   An incident report should submitted by the adviser/lab instructor/lab technician involved with accounts from other persons involved.

C. Purchasing & Receiving of Chemicals

This section provides the general procedure in purchasing chemicals to ensure ease in accounting, storage and minimization of waste and cost. Steps will begin from prior to the start of the academic school year up until the end of the academic year. The basic procedure in receiving purchased chemicals will also be presented afterwards.

1. Initial Purchase for the Academic Year
   a. Any chemical purchase should not exceed quantities that will be used within 1 academic school year.

b. The initial purchase for the academic year is done before the start of any laboratory classes for the academic year.
c. The initial purchase of chemicals should ideally be enough for the entire school year to avoid small purchases during the school year.
d. The amount of chemicals purchased should be based on chemical usage from the previous year, updated laboratory procedures and research group requirements.
e. A list of all chemicals to be purchased, complete with amounts and purpose, should be made by the laboratory committee and be submitted for approval to the laboratory manager and department chairman.

2. Purchases During the Academic Year
   a. Purchasing chemicals in the middle of the school year will be done mainly for MS students, research groups, laboratory services and undergraduate thesis groups.
   b. Any group that requires chemicals to be purchased by the department should fill a Request for Chemicals form and have it approved by the lab technician, their adviser and department chairman.
   c. Any purchase during the school year should not exceed quantities for use over the present school year.

3. Semestral Break Purchases
   a. Purchases during the semestral break should be enough for use during the 2nd semester to avoid small purchases during the 2nd semester.
   b. Any group that requires chemicals to be purchased by the department should fill a Request for Chemicals form and have it approved by the lab technician, their adviser and department chairman.

4. End of Academic Year Purchases
   a. At the end of each academic year, the laboratory committee shall account for all the chemicals purchased, used and remained. This will be submitted to the laboratory manager and department chairman.
   b. The accounting will be used as a basis for purchasing in the following school year.

5. Receiving of Chemicals
   a. Receiving of chemicals should be done by the lab technician.
   b. Before signing any form of receipt, check the chemicals as they are received:
      i. If it matches the delivery form (same identity & quantity).
      ii. If it is tampered or if the container is damaged.
      iii. Confirm with the person who requested for the chemical.
   c. Ensure that the materials are properly labeled.
   d. Unless specifically designated, store the chemicals in a safe location in the reagent room.
   e. Chemicals received should be accompanied by an updated MSDS.

D. Preventive Maintenance, Inspection & Calibration

Equipment should be regularly checked for calibration, malfunctions and damages. To facilitate this, all equipment should have a logbook for users to sign in and comment on the state of the equipment. Laboratory staff and faculty will then monitor this to determine whether the equipment requires repair or maintenance, aside from the equipment's usual regular maintenance.

E. Medical Program
   1. Faculty and laboratory staffs are required to have annual physical and medical examinations to ensure their health and proper conditions in the laboratory.
   2. Faculty and laboratory staffs are required to be trained in first aid and be familiar with nearby hospitals and emergency contact numbers.

F. Waste Disposal Plan
   For waste disposal, refer to the *Laboratory Waste-Management System (Lab-WMS),* Department of Chemical Engineering, University of the Philippines Diliman.

G. Reporting Accidents & Injuries
   1. All incidents, injuries or near misses with significant actual/potential consequence shall be investigated and reported to the HSE Officer. A proper documentation shall be raised by the reporter.
   2. A team will be formed by the Lab Manager to conduct an incident investigation.
      a. The team will investigate, assess and prepare a recommendation report.
      b. The report will be submitted to the Lab Manager for discussion with the DChE Faculty.
      c. All accidents or near-misses should be carefully analyzed with the results properly documented and available for faculty who might benefit from it.

H. Security Policies
   Safeguarding of Laboratory resources from unauthorized access, misuse or representation is the duty of all faculty and staff. They have the responsibility to take reasonable precautions against theft or misuse of resources that could threaten the public.

   1. Secure exterior doors after normal operating hours.
   2. Question the presence of unfamiliar individuals in the laboratory and report all suspicious activity immediately to the Lab Manager.
   3. Research or other activities involving the use of laboratory place, materials and equipment without the knowledge and approval of the Lab Manager is strictly prohibited.
   4. Request for the use of laboratory facilities beyond the normal operating hours shall be pre-approved by the Lab Manager. See Appendix for Laboratory Permit Request Form.
   5. Violation of this security policy may result in disciplinary action in accordance with the University Rules.
   6. Visitor's Pass/ID Guidelines

   Those who are not ChE Faculty members, lecturers, administrative staff, research staff, will not be allowed to enter DChE Laboratory premises without a Visitor's ID/Pass. The latter may be obtained from the Dept's secretary's office at Room MH 223 between 8:00am to 4:30pm.

   1. Allowable purpose of visits: brief inquiry, visitors' tour accompanied by DChE faculty members and official group tour given prior permit. Al laboratory permit should be requested from the Laboratory Manager.
   2. Short laboratory tours of visitors of college or university administration offices do not need Visitor's ID/Pass. They are to be accompanied by a member of the DChE faculty.
   3. Visitor's Pass must be requested from the Lab Manager by the concerned ChE faculty prior to the visit and will be given to the DChE Secretary's office upon approval by the Lab Manager.
   4. DChE Secretary's office will issue a visitor's ID. In exchange, the visitor will present a valid ID.

5. A visitor's pass is valid only for a day. Visitors should be advised to return their ID/Pass to DChE Secretary's office before they leave the Laboratory premises. They should have their visitor's slip/form signed/validated/acknowledged by the DChE person whom they have visited or had business with.
6. A logbook maintained by the DChE secretary should contain the following information of the visitors, (i) name of visitor (ii) purpose (iii) person to be visited (iv) office and address of visitor (v) type of ID left in exchange for the Pass and (vi) date and time IN and OUT.

I. Crisis Management Plan

This is a preparedness plan to be implemented in the event of an emergency situation. The main component of the plan is the Emergency Response Procedure.

1. Emergency Situations
   Fire, chemicals spills, injuries, accidents, explosions and other medical emergencies.

2. Crisis Management Organization

3. Roles & Responsibilities during Crisis Management

Roles	Responsibilities
Crisis Manager (Laboratory Manager)	The Laboratory Manager will be designated as the Crisis Manager. Coordinates and communicates with UP Admin, HSE Officer, Lab Faculty and Research Heads during emergencies. Upon the approval of UP Admin –the Lab Manager will manage external communication (i.e. public, media) Mobilize the First Aid Team.

Emergency Response Lead (HSE Officer)	Follows command from the Crisis Manager The HSE Officer will lead the implementation of the Emergency Response Plan and coordinates with the Crisis Manager accordingly. Coordinates with Fire Department and UPD Police. Implements the emergency plan through the support of Lab Faculty, Lab Technicians, Volunteer Faculty and Research Heads Identify evacuation site and communicate accordingly.
Lab-Technicians	Follow command from the HSE Officer. Secure important documents and coordinates with Lab Faculty.
Lab Faculty	Follows command from Lab Manager and HSE Officer Coordinates with Lab Technicians in securing all important lab documents.
Research Heads	Follow command from Lab Manager and HSE Officer Ensure his/her research laboratory's important experiments, documents and equipment will be secured.
Volunteer Faculty	Follows command from Lab Manager and HSE Officer.
Research Assistants	Follow command from their own Research Head
First Aid Team	Proactively perform their duties as first – aiders. Coordinates with UP Infirmary or the nearest hospital.

J. Emergency Response Procedures
   1. General & Initial Response
      a. Assess the overall situation.
      b. Evacuate the area.
      c. Ask for assistance.
      d. Secure important documents.
      e. Follow specific emergency procedures for fires, spills, etc. Refer to the attached reference Chemical Safety: Protecting Ourselves and our Environment.

VI. Implementation, Monitoring & Corrective Actions

A. Training and Communication
   1. All faculty, staff and students are required to attend basic laboratory safety training to be given by the HSE officer. The training provides an overview of laboratory safety practices, managing risk from chemical hazards, emergency preparedness and proper waste disposal.
   2. Outsiders who will be required to work in the laboratory for more than 4 hours should be given a briefing on laboratory safety practices.
   3. Frequency of Training
      The training and education program should be regular and a continuing activity.
   4. All trainings shall be approved by the Lab Manager.
   5. Trainings to be Attended
      Participants for the trainings below shall be nominated by the DLC. After the training, the participants shall be responsible in training the faculty, lab-staff and students.
      a. Laboratory Safe Practices
      b. Safe handling of Chemicals
      c. First Aid Treatment
      d. Basic Fire Fighting (i.e. proper use of fire extinguishers)
      e. Laboratory Waste Management
      f. Equipment Training

6. Trainings to be conducted by the Laboratory (usually led by the HSE Officer).
    a. Basic Lab Safety Procedures for Students and Visitors. The training for students should be conducted at the start of each semester. This is usually led by the HSE Officer.
    b. Trainings sponsored by students' organizations shall seek approval first from the Lab Manager.
    c. Equipment training is to be conducted by the faculty in charge of specific equipment.

B. Audit and Review
    1. Perform Audit *(See Appendix for Audit Form)*
    2. Recommend Corrective Actions and Improvement
    3. An audit process shall be in place to review and verify effectiveness of the management system (HSE-MS). It shall include audits and reviews by auditors independent of the process or facility audited.

        a. Lead Auditors
        Faculty members that do not handle any laboratory subjects.
        b. Sub-Auditors
        Class of HSE or any other class that teaches HSE.
        c. Schedule
        Once at year, preferably during the first semester.
        d. Documents
        See Appendix for Audit Form. This can be modified as "fit for purpose".

    4. Audit follow up shall be timely, thorough and auditable.
    5. Audit findings recommend corrective actions and improvement.
    6. Audit results and findings shall form an integral part of any proposal for improvement, replacement or abandonment.

C. Management Review
    1. Approve Corrective Actions
    Audit findings and recommendations shall be submitted to the DLC for review and endorsement to DChE Faculty for approval.
    2. Implement Corrective Actions
    Once approved by the DChE Faculty, the Department Chair will issue a memo for implementation.

VII. References

The following references were used and compiled to compose this HSE-MS document:

1. Chemical Storage System & Inventory & the Chemical Management, Department of Chemical Engineering, University of the Philippines Diliman
2. Chemical Safety: Protecting Ourselves and our Environment (2004) Harry J. Elston, Midwest Chemical Safety
3. OSHA STANDARD 1910.1450 (Laboratory Standard), US Department of Labor.
4. OSHA Hazard Communication Standard (1910.1200), US Department of Labor.
5. Laboratory Waste-Management System (Lab-WMS), Department of Chemical Engineering, University of the Philippines Diliman
6. Prudent Practices in the Laboratory: Handling and Disposal of Chemicals by the Committee of National Academy of Sciences (1995) 'Prudent Practices for Handling, Storage and Disposal of

Chemicals in Laboratories', National Research Council, National Academy Press, Washington D.C.
7. School Chemistry Laboratory Safety Guide, Safe Lab (2006) Department of Health and Human Services, Center for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH)

VIII. Appendix

A. Audit Form *(Attached)*

B. Laboratory Permit Request Form

Chemical Engineering Laboratory Permit Request

College of Engineering, University of the Philippines Diliman

This form is to be filled in 3 copies. Regular laboratory hours are from 8:00AM-5:00PM on weekdays. Work beyond these hours requires supervision from laboratory staff or faculty. This form is to be submitted at least 3 working days before the date of laboratory work. Refer to equipment calendar for scheduling of equipment use.

Date:	
Name(s) & Contact Number:	
Program of Study:	
Title of Experiment:	
Date & Time of Experiment:	
Location of Experiment:	
Equipment:	
Hazardous Chemicals Involved:	
Supervisor if past working hours:	
Adviser's Endorsement:	
Lab Manager's Approval:	
	Dr. Richard Chu