

UNIVERSITY OF KANSAS - LAWRENCE CAMPUS

LABORATORY SAFETY MANUAL

PART II - Chemical Hygiene/Safety Plan

Section 3) Chemical Hygiene/Safety - Hazard Communication & Control

This chapter provides guidance on meeting the hazard communication and hazard control requirements of Chapter 3 of Part I and further detailed procedures for laboratories working with chemicals. This chapter should be used together with Chapter 3 of Part I.

3.1) General Chemical Hazard Control

The Authorized Laboratory Supervisor or Authorized User shall:

3.1.1) Utilize and comply with the general hazard control methods specified in Part I: Chapter 3 - Section 3.1 for addressing chemical hazards in his/her lab.

3.1.2) Not conduct any chemical activity in the lab for which it has not been properly designed, nor where appropriate engineering controls, personal protective equipment and/or safety equipment are not available.

3.2) Chemicals Hazard Control Responsibilities

3.2.1) The general hazard control responsibilities specified in Part I: Chapter 3 - Section 3.2 are applicable for addressing chemical hygiene/safety.

3.3) Lab Hazard Registration/Safety Authorization Application

The Authorized Laboratory Supervisor (ALS) shall:

3.3.1) For each lab under his/her jurisdiction, perform an assessment to identify chemical hazards present in their lab in accordance with Part I: Chapter 3 - Section 3.3.

3.3.2) Complete the Lab Hazard Registration form and submit to EHS in accordance with the procedures identified in Part I: Chapter 3 - Section 3.3.

3.3.2.1) Attach a copy of the laboratory's chemical inventory list to the LHR form.

(Note: This information will be used by EHS to determine the laboratory's chemical safety hazard level (I, II, III or IV), fulfill emergency response information needs, and to prepare laboratory entrance postings.)

3.3.3) Update the LHR information whenever conditions change significantly and as required under Part I: Chapter 3 - Section 3.3 & Section 3.8.

3.3.4) Appropriately train and inform all Authorized Users and Authorized Occupants with respect to the hazards identified on this form.

3.3.5) A blank copy of the appropriate LHR form is available in Part I: Chapter 8 - Appendix 8.3.1.

3.4) Communication of Chemical Hazards in the Laboratory

3.4.1) Inventory of Hazardous Chemicals (Use with Part I-3.4.1)

The Authorized Laboratory Supervisor shall:

3.4.1.1) Establish and maintain an up-to-date inventory of all chemicals being used in the laboratory.

a) Include the following minimum information in the inventory:

- Identity of Chemical - (Product name or Chemical Name)
- Chemical's Manufacturer
- Location Information - (Building, Department, and Room# or Area)
- Quantity of Chemical Present - (Maximum Daily Amount)

b) Not introduce a new chemical into the laboratory unless it has been added to the inventory and all Authorized Users and Authorized Occupants have been appropriately trained and informed with respect to the new chemical.

3.4.1.2) Keep the inventory list readily available to any person entering the laboratory should they request to see it. (Repeat of Part I-3.4.1.3)

3.4.1.3) Submit a copy of the chemical inventory list to EHS a minimum of annually.

3.4.1.4) See EHS website for an example Chemical Inventory form - <http://ehs.ku.edu/laboratory-safety-forms>

3.4.2) Safety Data Sheets for Hazardous Chemicals

Chemical manufacturers, importers, and distributors are required to send a Safety Data Sheet (SDS) with the initial shipment of a chemical, or when SDS information is updated. The SDS contains detailed information about the chemical such as: product identity, chemical and common name(s), physical and chemical characteristics, physical and health hazards, employee exposure information, general precautions for safe handling and use, generally applicable control measures, emergency and first-aid procedures, and other pertinent information.

Federal and State regulations require the University (i.e. Labs) to maintain any safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible during each work-shift to laboratory employees when they are in their work areas. SDS's must be readily accessible to laboratory users/occupants (no barriers to immediate access by them) during each work-shift when they are in their work-areas. In order to achieve this, the following measures must be implemented:

The Authorized Laboratory Supervisor shall:

3.4.2.1) Make or verify that a Safety Data Sheet for each hazardous chemical present in the work-area is readily available to laboratory users/occupants within their work-area. An SDS must be available for each chemical on the chemical inventory list.

(Note: Either a copy of the Safety Data Sheet must be physically present and readily available within the individual's work-area; or this information may be made available electronically (computer, campus ethernet, or Internet -- see (<http://ehs.ku.edu/msds>) via a computer readily accessible to laboratory users/occupants in their work-area.)

3.4.2.2) Initiate and document efforts undertaken to obtain the appropriate Safety Data Sheet if one is not available in the work area or has not been received. Contact EHS for assistance in obtaining them.

Note: If a new compound is synthesized for which a Safety Data Sheet is not available, the Authorized Laboratory Supervisor shall create a Safety Data Sheet that furnishes comparable information based upon the best information available to the Supervisor about the properties of the compound--using comparisons with similar types of compounds, etc.

3.4.2.3) Include the information on the Safety Data Sheets in training laboratory users/occupants to become Authorized Users and Authorized Occupants.

The Authorized Laboratory Supervisor should (is encouraged to):

3.4.2.5) Keep a hardcopy or digital of any SDS's received by them.

Note: An example of a blank Safety Data Sheet may be found in Part II – Appendices

3.4.3) Chemical Labeling

Chemical manufacturers, importers, and/or distributors are required to label, tag, or mark each container of hazardous chemical(s) leaving their workplace with the following information:

- Identity of the Hazardous Chemical,
- Appropriate Hazard Warning,
- Name and Address of the chemical manufacturer, importer, or other responsible party.

Various Federal and State regulations stipulate that labels on incoming containers of hazardous materials shall not be removed and that each container with chemicals in the work area shall be properly labeled so that laboratory users/occupants can immediately identify what chemical is present. To achieve this, the following measures must be implemented:

The Authorized Laboratory Supervisor shall:

3.4.3.1) Implement and maintain these container labeling requirements in their laboratories.

Authorized Users shall:

3.4.3.2) Not remove or deface the original label from incoming containers unless they immediately replace it with a label that provides the following required information:

- a) Identity of the Chemical,
- b) Appropriate Hazard Warning,
- c) Name and Address of the chemical manufacturer, importer, or other responsible party.

Note: Authorized Occupants shall not handle containers with hazardous chemicals for which they have not received the necessary training to become AUs and, therefore, shall not remove labels under any circumstances.

Note: The AU shall remove or obliterate labels only on empty containers that have no hazards associated with them. The AU shall not dispose of empty containers with hazardous warning labels in normal trash.

3.4.3.3) Place and maintain, at all times, a label, tag or mark on each non-original container of chemical stored, handled, and used in or by the laboratory with the following minimum information:

- a) Identity of the Chemical,
- b) Appropriate Hazard Warning

3.4.3.4) All container labels shall be legible, in English (as a minimum), and prominently displayed on the container.

Note 1: Clarification – It is understood that in some instances it may be virtually impossible to adequately label non-original chemical containers often used in the laboratory (such as test tubes, sample vials, beakers, flasks, etc.) with the information required above because of their relatively small size. Regulations do allow for the use of signs, placards, process sheets, batch tickets, SOPs, or other such written materials in lieu of affixing labels to individual containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required above in 3.4.3.3. The alternative written materials shall be readily accessible to the all lab laboratory users/occupants in their work area throughout each shift.

Note 2: Exception – Although prudent practice would dictate that all containers of chemicals should be labeled at all times, regulations do allow the following exception for chemical container labeling: “The employer (laboratory) is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee (lab person) who performs the transfer.” The unlabeled chemical container must be under the direct control of the individual at all times. If the chemicals will not be immediately used or are going to be left in the portable container unattended, the container must be labeled in accordance with 3.4.3.3 above.

Warning: The discovery of "orphan" (unknown and unclaimed) containers with any hazardous materials, which is inclusive of hazardous chemicals, is clear non-compliance with the safety requirements of this Laboratory Safety Manual!

3.4.4) Chemical Hazard Warning Signs

The Authorized Laboratory Supervisor shall:

3.4.4.1) For other than chemical containers, post, as required and/or necessary, the appropriate hazard warning signs identifying areas where chemical hazards are present inside the laboratory.

(Note: Regulations require that areas where certain compounds or chemical hazards are present be identified by warning signs, tags, etc. Contact EHS for assistance in identifying appropriate signage. For labs requiring Laboratory-Specific Safety Plans, this issue will be addressed as part of that LSSP.)

The Authorized User shall:

3.4.4.2) Post the appropriate hazard warning signs before initiating any operation or activity inside the lab that may present a chemical hazard.

3.4.5) Laboratory Entrance Posting

The Authorized Laboratory Supervisor shall:

3.4.5.1) Assist EHS in establishing the appropriate laboratory entrance posting(s) that identifies the chemical hazards present in the lab. This will be done in accordance with the procedures identified in Part I: Section 3.4.6.

a) This will consist of submittal of LHR form, chemical inventory list and consultation with EHS to determine chemical hazard levels.

3.4.5.2) Maintain readily visible laboratory entrance postings with up-to-date chemical hazard warning information.

3.4.5.3) Post Appropriate Access Restrictions.

Guidance Note: Access restrictions are to be evaluated by the Authorized Laboratory Supervisor for any Chemical Safety Level I or II Laboratories. Access might be restricted only during certain specifically identified procedures within the laboratory. In this case, temporary signs may need to be used which forbid entrance during those times. In other cases, access might be restricted just as it is for Levels III and IV.

3.4.5.4) Post requirements for any required medical status: exclusion of or special protection for persons with special susceptibilities--might include allergy sensitivities, etc.

3.5) Engineering Controls for Chemical Hygiene/Safety

The Authorized Laboratory Supervisor and Authorized Users shall:

3.5.1) Utilize and comply with the engineering control measures specified in Part I: Chapter 3 - Section 3.5 when working with chemicals. This includes:

3.5.1.1) Process Modifications (Part I: Section 3.5.1)

3.5.1.2) Physical Isolation/Containment (Part I: Section 3.5.2)

3.5.1.3) General Exhaust Ventilation (Part I: Section 3.5.3)

3.5.1.4) Laboratory Fume Hoods (Part I: Section 3.5.4)

3.5.1.5) Biological Safety Cabinets (Part I: Section 3.5.5)

3.5.1.6) Gloveboxes/Containment Devices (Part I: Section 3.5.6)

3.6) Personal Protective Equipment for Chemical Hygiene/Safety

The Authorized Laboratory Supervisor and Authorized Users shall:

3.6.1) Adhere to the personal protective equipment control measures specified in Part I: Chapter 3 - Section 3.6 when working with chemicals. This includes:

3.6.1.1) General PPE Measures (Part I: Section 3.6.1)

3.6.1.2) Head Protection Measures (Part I: Section 3.6.2)

3.6.1.3) Eye & Face Protection Measures (Part I: Section 3.6.3)

3.6.1.4) Hand & Body Protection Measures (Part I: Section 3.6.4)

3.6.1.5) Foot Protection Measures (Part I: Section 3.6.5)

3.6.1.6) Hearing Protection Measures (Part I: Section 3.6.6)

3.6.1.7) Respiratory Protection Measures (Part I: Section 3.6.7)

3.7) Safety Equipment for Chemical Hygiene/Safety

The Authorized Laboratory Supervisor and Authorized Users shall:

3.7.1) Adhere to the safety equipment control measures specified in Part I: Chapter 3 - Section 3.7 when working with chemicals. This includes:

3.7.1.1) Safety Shields/Containment (Part I: Section 3.7.1)

3.7.1.2) Safety Showers (Part I: Section 3.7.2)

3.7.1.3) Eye Wash Fountains (Part I: Section 3.7.3)

3.7.1.4) Fire Extinguishers (Part I: Section 3.7.4)

3.7.1.5) First Aid Kits (Part I: Section 3.7.5)

3.7.1.6) Storage Cabinets (Part I: Section 3.7.6)

3.7.1.7) Spill Control Kits (Part I: Section 3.7.7)

3.8) Laboratory Inspections/ Reviews for Chemical Hygiene/Safety

3.8.1) Laboratory Inspections/Reviews shall be conducted as specified in Part I: Chapter 3 - Section 3.8.1.

3.8.2) Deficiencies, Violations and Corrective Actions shall be handled in accordance with Part I: Chapter 3 - Section 3.8.3

3.8.3) Example of EHS lab Safety Evaluation/Audit checklist is on the EHS website:
<http://ehs.ku.edu/laboratory-safety-forms>

3.9) Safety Levels for the Chemical Hygiene/Safety Plan

Note: In this section, LSSP will be used for Laboratory-Specific Safety Plan

3.9.1) Introduction

Federal and State regulations require that the University's chemical hygiene/safety plan shall contain provisions for the proper protection of laboratory users/occupants from exposure to hazardous chemicals. This includes certain elements and specific measures for identifying the circumstances under which a particular laboratory operation, procedure or activity shall require prior approval by the University before implementation. There are also several regulations that either limit or require the University to report the types, amounts, and hazards of chemicals present. Some even require the University to seek special permits for procurement, storage, and use. Therefore, the following procedures have been developed to address compliance with these requirements and to provide safety for laboratory users/occupants.

3.9.2) Chemical Hygiene/Safety Levels

The following Chemical Hygiene/Safety Levels have been established to identify the severity of chemical hazards present in the lab and facilitate registration of hazards, approvals and establishment of Laboratory-Specific Safety Plans when needed.

3.9.2.1) Chemical Hygiene/Safety Level I

- a) No to minimal chemical hazards present, mostly non-hazardous chemicals. No known or only minimal chemical risks to laboratory users/occupants.
- b) No chemicals present that require a written EHS Safety Authorization.
- c) Authorized supervisor must approve all chemical users. This can be accomplished by meeting the chemicals safety-specific information and training requirements in Part II: Chapter 4 - Section 4.2 and 4.3.
- d) Authorized Supervisor must provide LHR and Chemical Inventory to EHS.

3.9.2.2) Chemical Hygiene/Safety Level II

- a) Slight to moderate chemical hazards present. Slight risk to laboratory users/occupants.
- b) No chemicals present that require a written EHS Safety Authorization.
- c) No chemicals present in a quantity that requires regulatory reporting.
- d) Authorized supervisor must approve all chemical users. This can be accomplished by meeting the chemicals safety-specific information and training requirements in Part II: Chapter 4 - Section 4.2 and 4.3.
- e) Authorized Supervisor must provide LHR and Chemical Inventory to EHS.

3.9.2.3) Chemical Hygiene/Safety Level III

- a) Severe chemical hazards present. Substantial risk to lab laboratory users/occupants.
- b) Chemicals present that require an EHS Safety Authorization and a written LSSP as described in Part I: Chapter 3 - Section 3.9.
- c) Chemicals present in a quantity that requires regulatory reporting.
- d) EHS will require all chemical users to have chemical safety-specific information and training in accordance with Part II: Chapter 4 – Sections 4.2 & 4.3 and may require additional training.

3.9.2.4) Chemical Hygiene/Safety Level IV

- a) Extreme chemical hazards present. High risk to laboratory users/occupants.
- b) Chemicals present that require an EHS Safety Authorization and a written LSSP as described in Part I: Chapter 3 - Section 3.9.
- c) Chemicals present in a quantity or type that requires regulatory reporting or a regulatory agency permit.

3.9.3) Chemical Hazards Present That Require an EHS Safety Authorization

Any laboratory meeting the criteria established for Chemical Hygiene/Safety Level III or IV must obtain an EHS Safety Authorization before it can initiate any Level III/IV laboratory activities. Identified below are the chemical hazard conditions or chemicals that require such Safety Authorizations.

3.9.3.1) Chemical Hygiene/Safety Level III

- a) Types and quantities of chemicals present that present a severe hazard and substantial risk to laboratory users/occupants.
- b) Type and quantity of chemicals present that require reporting to a Federal, State, or local regulatory agency.

c) Flammable/Combustible Liquids or Flammable Gases present at or above the quantities below:

Flammable/Combustible Liquids

Storage Type

EHS Review/Approval Required

1) Unapproved Cabinets, Shelf or open storage/use	>30 gallons total (all classes)
a) Glass, plastic, or metal cans	>10 gallons total (all classes)
b) Approved Safety Containers	>30 gallons total (all classes)
c) Any single container (drum, tank, etc.)	> 5 gallons in size (any class)
2) Storage in Approved Safety Cabinets	> 1 cabinet per lab
a) Class I liquids	> 30 gallons per cabinet
b) Class I, II, & III combined	> 60 gallons per cabinet

Flammable Gases

Type

EHS Review/Approval Required

1) Flammable Gas Cylinders	> Lecture size >2 cylinders total
a) Hydrogen	> 1 cylinder
2) Flammable Gas Cylinders - Lecture size	>5 lecture cylinders total

d) Corrosive Liquids, Solids, or Gases present at or above the quantities below:

Corrosive Compounds

EHS Review/Approval Required

Perchloric Acid (70% or greater concentration)	Any Quantity when being heated >100°F
Chlorine (gas)	>= 5 lbs total
Fluorine (gas)	>= 5 lbs total
Corrosive Liquids	>10 gallons total volume present
Corrosive Solids	>100 pounds total mass of all present
Corrosive Gases Any cylinder	> lecture size
Multiple Corrosive Lecture Cylinders	5 or more lecture cylinders

e) Reactive Liquids, Solids, or Gases present at or above the quantities below:

Reactive Compounds

EHS Review/Approval Required

All solid/liquid Reactives	=>1 pound of any single reactive compound
All solid/liquid Reactives	=>10 pounds total combined reactives in lab
Reactive Gases Any cylinder	> lecture size
Multiple Reactive Lecture Cylinders	5 or more lecture cylinders

f) Explosive compounds

Explosives

EHS Review/Approval

Potentially Explosive Compounds	See limits for Reactives
Any DOT identified explosive compound(s)	Any quantity requires a Level III LSSP

h) Particularly Toxic Compounds at or above quantities below: Particularly Toxic Compounds Level III LSSP Required

<u>Particularly Toxic Compounds</u>	<u>EHS Review/Approval</u>
OSHA Listed Carcinogen - Formaldehyde	Any Quantity – Level III LSSP
OSHA Regulated Substances (EHS Group A)	Any Quantity - Level III LSSP
NTP “Known Carcinogens”- Group 1	Any Quantity - Level III LSSP
IARC “Group 1 Carcinogens”	Any Quantity - Level III LSSP
Acute Toxicity (LD50< 50 or LC50<100)	Any Quantity - Level III LSSP

3.9.3.2) Chemical Hygiene/Safety Level IV

a) Types and quantities of chemicals present that present an extreme hazard and high risk to laboratory users/occupants.

b) Type and quantity of chemicals present that require reporting to and a permit from a Federal, State, or Local regulatory agency.

c) Explosive compounds present at or above the quantities below:

<u>Explosive Compounds</u>	<u>EHS/Committee Review/Approval</u>
Any ATF identified explosive compound(s)	any quantity requires Level IV LSSP

d) Particularly toxic chemicals present at or above the quantities below:

<u>Particularly Toxic Compounds</u>	<u>EHS/Committee Review/Approval</u>
OSHA Listed Carcinogens (except Formaldehyde)	Any quantity requires Level IV LSSP

3.9.4) Process for Obtaining an EHS Safety Authorization

Go to section 3.9 of Part I and follow the procedures specified in 3.9.3.

Note: That section describes how an LSSP is to be developed including how the appropriate approvals may be obtained for the proposed LSSP. After the LSSP has been approved, EHS will perform an inspection to verify that all conditions of the LSSP have been met. After that verification, EHS will provide a written Safety Authorization that will permit the Laboratory Supervisor to begin use of the HM.

Example Hazardous Chemical Approval/SOP template is available in Part 1 – Appendix 8.2.2