

UNIVERSITY OF KANSAS - LAWRENCE CAMPUS

LABORATORY SAFETY MANUAL

PART I - General Laboratory Safety Plan

*Section 1) Laboratory Safety Plan Introduction

The purpose of this plan when implemented is to provide a safe laboratory (work or learning) environment for all individuals frequenting laboratories at the University of Kansas - Lawrence Campus.

This manual or plan, hereafter referred to as the University of Kansas Laboratory Safety Manual (LSM), has been designed, as a minimum, to meet the requirements established by federal and/or state regulations as applicable. Additionally, it is conceptually but not legally based upon the guidance that exposure to Hazardous Materials/radiations shall be kept "As Low as Reasonably Achievable (ALARA)". This plan covers general laboratory safety and the use of hazardous chemicals, hazardous organisms/biological agents, and machines or materials that emit ionizing radiation or laser beams (Radiation Generating Devices [RGDs.]).

For ease of use and efficiency, this Laboratory Safety Manual is divided into five parts. Part I consists of the safety requirements that apply in the use of all Hazardous Materials (HM) whether they be hazardous chemicals, biohazards, or radioactive materials. Certain sections of Part I also apply to the use of Radiation Generating Devices. The Chemical Hygiene Plan consists of Part I and Part II. The Biosafety Plan consists of Part I and Part III plus the Bloodborne Pathogen Program and the Guidelines for Recombinant DNA use. The (Ionizing) Radiation Safety Plan consists of Part I and Part IV. This includes Radiation Generating Devices that produce ionizing radiation. The Laser Safety Plan includes selected portions of Part I and all of Part V.

This Manual addresses the standard operating procedures (SOPs) and engineered safety features required for safely using materials or radiation generating devices that are normally used in most laboratories. The manual also addresses the process by which **additional laboratory-specific safety plans (LSSPs)** will be developed when the hazardous materials and/or radiation generating devices pose higher levels of risks than those encountered in the average laboratory and by which the requirement for additional SOPs and/or engineered safety facilities/equipment will be identified and met. This provides a graded approach to safety in order not to burden all users with unnecessary requirements.

To accomplish this graded application of safety requirements, the types of hazards (described in the previous paragraph) and the **levels** of the hazards associated with each type will be identified for each laboratory through registration with the Environment, Health and Safety (EHS) Department. For each type of hazard (chemical, biohazard, radioactive materials, devices producing ionizing radiation, and devices producing laser beams), the magnitude of the hazard will be classified as Level I, II, III or IV. For Level III and IV activities, the Laboratory Supervisor is required to submit a proposed Laboratory-Specific Safety Plan(LSSP) to the EHS Department that addresses the additional SOPs, safety equipment and/or safety features beyond those in this Manual that are needed to establish a safe working environment. For Level III hazards, the proposed LSSP requires EHS approval before implementation. For Level IV hazards, the proposed LSSP requires the approval of both EHS and the appropriate subcommittee of the Laboratory Safety Committee before implementation. The content of the approved LSSP(s) becomes part of the University Safety Plan for that laboratory. It is at this level that training of users becomes specialized and specific rather than general. After an LSSP has been developed and EHS has reviewed, EHS will provide a written Safety Authorization to the laboratory that permits the laboratory to implement its activities as specified in the LSSP and this Manual. Section 3.9 of Part I describes the process through which this graded approach will be implemented and maintained.

In general, other physical hazards are governed by the University Safety and Health Manual which is applicable to all students, employees, and visitors on campus.

Note 1: See 1.1.3 and 1.1.4 below for the identification of those sections of Part I that apply to Radiation Generating Devices.

Note 2: This Plan adopts the principle of "ALARA" from radiation safety regulations as a commitment in the use of all Hazardous Materials/radiations because it is the best expression of the goal of the overall safety program. It is the guideline for 'prudent practice' where specific written regulations do not cover a situation. The definition of ALARA given in the Glossary should be studied, understood, and used as a qualitative guide to be applied at all times. (ALARA is a qualitative goal because a quantitative risk assessment is not possible or feasible in many cases. However, it is a commitment to avoid unnecessary exposure to Hazardous Materials.)

Note 3: It is recommended that first time users of this manual read the Glossary before proceeding to other parts of this manual. Definitions that are manual-specific are provided there. In some cases, exemptions are specified by the definition. The definition of "laboratory" is of special importance. Any person who is not sure whether his/her activities fall under the jurisdiction of this Laboratory Safety Manual; should contact the Environment, Health and Safety (EHS) Dept. for clarification.

1.1) Regulations

The regulatory mandate for a written safety plan arises from numerous regulations and standards that are associated several different federal and state agencies. The regulatory bases for each of the specific areas of this Laboratory Safety Manual are listed in this section.

1.1.1) Chemical Hygiene Plan (Part I + Part II of this Laboratory Safety Manual)

The University of Kansas Chemical Hygiene Plan must meet the requirements established by the Kansas Department of Labor - Division of Industrial Safety and Health (KDOL-ISH). This state agency requires public sector employers in Kansas who have laboratories to comply fully with the Federal Occupational Safety and Health Administration's (OSHA) Standard -- "Occupational Exposure to Hazardous Chemicals in Laboratories" (29 CFR 1910.1450). This regulation is also known as the OSHA Lab Standard. A copy of it may be found in Part I: APPENDIX 8.1.1. The KDOL-ISH directive for compliance with the OSHA Lab Standard (29 CFR 1910.1450) requires that the University develop and carry out the provisions of a written Chemical Hygiene Plan that has capabilities and components specified in section 1.2 below.

1.1.2. Biosafety Plan (Part I + Part III of this Laboratory Safety Manual + the Bloodborne Pathogen Program under Human Resources + the Recombinant DNA Guidelines of the Recombinant DNA Committee)

"Prudent Practice" as part of the regulatory framework requires that the capabilities and components specified in section 1.2 below be addressed in the Biosafety Plan. The National Research Council's "Biosafety in the Laboratory, Prudent Practices for the Handling and Disposal of Infectious Materials" and the CDC-NIH, "Biosafety in Microbiological and Biomedical Laboratories" are considered the prudent practice level of safety. The Bloodborne Pathogen Program is mandated by 29 CFR 1910.1030 and the national guidelines for work with Recombinant DNA are given in 51 FR 1695a.

Note: The Bloodborne Pathogen Program and the Recombinant DNA Guidelines were the only existing formal programs in Biosafety before this comprehensive program was designed. After this comprehensive program has been implemented, the intent is to rewrite those programs in the format of this Plan and incorporate them directly into the Plan. Until that revision takes place, these programs are independently administered.

¹1.1.3 (Ionizing) Radiation Safety Plan (Part I + Part IV of this Laboratory Safety Manual)

Kansas Regulations 28-35-133 through 363 under the Bureau of Air and Radiation Control, Kansas Department of Health and Environment specify that all work with ionizing radiation be covered under a license that requires the establishment of an adequate radiation safety program that is addressed by the capabilities and components specified in section 1.2 below. Not all parts of Part I are applicable to Radiation Generating Equipment. Sections or items of Part I marked with an * are applicable to all Radiation Generating Devices and those marked with a superscript I apply only to Radiation Generating Devices which produce ionizing radiation beams.

¹1.1.4 Laser Safety Plan (Selected sections of Part I + Part V of this Laboratory Safety Manual)

"Prudent Practice" as part of the regulatory framework requires that the capabilities and components specified in section 1.2 below be addressed in the Laser Safety Plan. ANSI Standard Z-136 provides the accepted basis for 'prudent practice' in the use of lasers. The applicable sections of Part I are marked either with an * or a superscript L.

1.1.5 Reserved (Non-Ionizing Radiation Safety Plan exclusive of lasers)

***1.2) Common Regulatory Requirements of the Safety Plans**

The Laboratory Safety Program, when implemented,

*1.2.1) Shall be capable of protecting employees from health hazards associated with hazardous materials/radiations in the laboratory.

*1.2.2) Shall be capable of keeping employee chemical exposures below the OSHA permissible exposure limits specified in 29 CFR 1910 Subpart Z, radiation exposure below the limits specified in KR 28-35-135 through 363, and laser radiation exposure below the limits specified in ANSI-Z-136.

*1.2.2.1) Shall be capable of keeping ionizing radiation exposures "as low as reasonably achievable" (ALARA) and should consider ALARA as a guide in managing all other exposures to hazardous materials /radiations.

Note: Obviously, unnecessary exposure to hazardous materials/radiations is unacceptable.

*1.2.3) Shall be readily available to employees, employee representatives, and federal and state agencies.

*1.2.4) Shall include each of the following components and shall indicate specific measures the employer will take to protect laboratory employees, students, and/or visitors:

*1.2.4.1) The Standard Operating Procedures (See Glossary) relevant to safety and health considerations to be followed when laboratory work involves the use of Hazardous Materials/radiations.

*1.2.4.2) The criteria the employer will use to develop and implement control measures to reduce employee exposure. Includes engineered controls, facility design, administrative controls, use of personal protective equipment, and hygiene practices.

*1.2.4.3) The requirement that fume hoods, glove boxes and other protective equipment be functioning properly and the measures that will be taken to meet this requirement.

Note: This includes shielding and barrier requirements when either ionizing or laser radiations are involved

*1.2.4.4) The provisions for documented employee information and training.

*1.2.4.5) The circumstances under which a laboratory procedure shall require prior approval before implementation and the level at which approval shall be obtained.

*1.2.4.6) The provisions for medical consultations and examinations.

*1.2.4.7) Designation of personnel responsible for the implementation of the Chemical Hygiene Plan, Biosafety Plan, Radiation Safety Plan, and/or the Laser Safety Plan and the assignment of Chemical Hygiene Officer(s), Radiation Safety Officer(s), Biosafety Officer(s), and/or Laser Safety Officer(s) as appropriate.

*1.2.4.8) The special provisions for additional employee protection for work with "EHS Safety Authorization-Requiring Hazardous Materials", such as carcinogens, reproductive toxins, highly toxic substances, highly hazardous biological agents, and for work with most sources of ionizing radiation and certain classes of lasers. Protective provisions may include: designated or specially controlled areas, containment devices, shielding and barriers, waste removal, and decontamination procedures.

***1.3) Program Policy**

No faculty, staff, students, or visitors of the University of Kansas - Lawrence Campus shall engage in any laboratory activity or be present during such an activity that presents the risk of exposure to Hazardous Materials or Radiations without first having received the appropriate information and training as required by this program. This is necessary to protect the safety and health of University laboratory users/occupants/visitors and achieve the goals and requirements of the University's Safety and Health Policy. This includes "KU laboratory activities" performed off campus by KU personnel/students/visitors when such activities are not under the jurisdiction of another institution.

Note: Remember that Hazardous Materials include all biohazards.

***1.4) Program Application**

This program applies to all University of Kansas personnel (faculty and staff), students and visitors who are engaged in the laboratory use of hazardous materials or hazardous radiations or who occupy laboratories in which such use is carried out.

Note #1: This program, in general, does not apply to activities that are not associated with laboratories as defined in the Glossary. That is, with the exceptions given below, Facilities Operations, Student Housing, Administrative Offices, etc., are not subject to this manual. The safety requirements for the use of Hazardous Materials in settings other than "laboratories" are included in "The Employee's Safety and Health Manual." The requirements of that manual apply to all areas of the campus and to all personnel, students, and visitors. However, any individuals who enter a laboratory as defined in the Glossary shall meet the requirements of an Authorized Occupant or Visitor as specified in this Laboratory Safety Manual (definitions in the Glossary). In addition, the possession and use by any KU personnel or, students or visitors of any radiation generating device or radioactive materials each as defined in the Glossary is subject to the provisions of the Laboratory Safety Manual. That is, no one on the Lawrence campus is exempt from this manual when these two types of hazards are involved.

Note #2: If a person feels that mutually exclusive procedures (conflicts) are mandated between and/or within the Laboratory Safety Manual and the Employee's Safety and Health Manual, he/she should contact the EHS staff for clarification or resolution of the perceived conflict. A unique condition or process could cause a particular mandated procedure not to be the safest procedure. The person shall then consult with the EHS staff for the establishment of an appropriate procedure that still meets regulatory requirements.

***1.5) Program Responsibilities**

The University is committed to safety. Responsibility for safety rests at all levels. General responsibilities at the higher administrative levels are described in the "Preface" of the Kansas University (Lawrence Campus) Safety Program. This section defines specific or more detailed responsibilities, as applicable, with respect to Laboratory Safety.

***1.5.1) Chairs, Unit Directors or Supervisors** - (Chairpersons, Directors, or Supervisors of Academic, Research, or Support Units with laboratories as defined in the Glossary)

Chairs, Directors or Supervisors shall:

*1.5.1.1) Provide the unit resources necessary to develop, implement and maintain the unit safety program in compliance with the Kansas University Safety Program including this Laboratory Safety Manual.

*1.5.1.2) Be responsible for the over-all effectiveness of the unit safety program.

*1.5.1.3) Support and foster the development and maintenance of appropriate safety consciousness and attitudes in all individuals within the unit.

*1.5.1.4) Appoint a unit/departmental safety coordinator or accept the responsibilities of the Unit Safety Coordinator. See 1.5.3 and Glossary.

***1.5.2) Authorized Laboratory Supervisor (ALS)** -

The Authorized Laboratory Supervisor shall:

*1.5.2.1) Provide the resources necessary to develop, implement and maintain the laboratory-specific safety program in compliance with the University Safety Program including this Laboratory Safety Manual.

Note: "Laboratory-specific safety program" refers to the safety program as carried out in all the laboratories and facilities for which the authorized laboratory supervisor is responsible.

*1.5.2.2) Be responsible for the over-all effectiveness of the laboratory-specific safety program.

*1.5.2.3) Support and foster the development and maintenance of appropriate safety consciousness and attitudes in all individuals within the laboratory.

*1.5.2.4) Appoint a Unit Safety Coordinator or accept the responsibilities of the Unit Safety Coordinator. See 1.5.3 and Glossary.

*1.5.3) Laboratory, Departmental or Unit Safety Coordinators

Note: In some cases, the Unit Safety Coordinator must have special qualifications and the nominee for Unit Safety Coordinator must be approved by the appropriate Safety Officer of EHS. In all cases, the Unit Safety Coordinator shall be an authorized user with respect to the area of safety in which the service will be given. See Glossary for definition and explanations.

The Unit Safety Coordinator shall:

*1.5.3.1) Assist the Laboratory/Unit/Departmental Supervisor in establishing and maintaining the Laboratory/Unit/Departmental laboratory safety program in compliance with the Kansas University Safety Program and this Laboratory Safety Manual.

*1.5.3.2) Monitor the effectiveness of the laboratory/unit/departmental safety program through reviews, audits, and inspections.

Note: This includes identifying deficiencies and non-compliance, recommending remedial actions, and reporting findings to the Unit/Departmental Supervisor and, as needed, to EHS.

The Unit Safety Coordinator may:

*1.5.3.3) Be assigned additional responsibilities within the laboratory/unit/ departmental safety program by the laboratory/unit/departmental supervisor and as approved by the EHS when needed.

*1.5.4) Authorized Users (AU), Authorized Occupants (AO), and Laboratory Visitors (i.e., all laboratory occupants)

The Authorized Users, Authorized Occupants, and Laboratory Visitors shall:

*1.5.4.1) Comply with the applicable sections of the Kansas University Safety Program which includes this Laboratory Safety Manual and laboratory-specific Standard Operating Procedures (SOPs).

*1.5.4.2) Report unsafe conditions or actions to the Authorized Laboratory Supervisor or, if necessary, to EHS.

*1.5.5) Dept. of Environment, Health & Safety (EHS)

EHS shall:

1.5.5.1) Assist the university administration, Lab Safety Committee and its subcommittees in the development and maintenance of the laboratory safety program subject to the limits imposed by the university administration through allocation of resources and/or assigned responsibilities.

1.5.5.2) Assist in the development and maintenance of the training programs required within the Laboratory Safety Manual.

Note: Depending upon resources, legal requirements, and assigned responsibilities, EHS, in some cases, will provide the training and, in other cases, will assist units in establishing their own training programs.

1.5.5.3) Perform periodic and requested evaluations of the Laboratory Safety Program through appropriate reviews, audits and inspections and make recommendations for remedial actions and program revisions as needed at the appropriate level of administration.

1.5.5.4) Be responsible for documenting all changes and revisions to this Laboratory Safety Manual. Updated portions are to be archived and coded as to effective dates. New revisions are to be made available to the laboratories either electronically or through hard copy.

1.5.5.5) Evaluate all proposed Laboratory-Specific Safety Plans for Level III and IV activities and provide recommendations concerning these to the Laboratory Supervisor and/or the appropriate subcommittees of the Laboratory Safety Committee as needed or required.

1.5.5.6) Provide the written Safety Authorizations implementing approved Laboratory-Specific Safety Plans.

*1.5.6) Laboratory Safety Committee

The Laboratory Safety Committee shall:

*1.5.6.1) With the assistance of EHS, develop and recommend to the Provost a campus-wide laboratory safety program.

Note: Some sections of the Laboratory Safety Manual become part of state license or permit requirements and must be approved by the state before implementation or before a change in this manual is implemented.

*1.5.6.2) Periodically, but no less than annually, review the effectiveness of the Laboratory Safety Manual and Program and file a report with the Provost.

*1.5.6.3) Recommend remedial or corrective actions when deficiencies in the laboratory safety program or incidents of non-compliance with the Laboratory Safety Manual are identified by them or reported to them by EHS. (These recommendations shall be made at the appropriate level and in the appropriate sequence.)

*1.5.6.4) Evaluate and formally respond to laboratory safety questions addressed to the Laboratory Safety Committee by the Provost.

*1.5.6.5) Be pro-active in investigating and evaluating laboratory safety on campus and making recommendations for improvements in the Laboratory Safety Manual.

1.5.6.6) Evaluate all proposed Laboratory-Specific Safety Plans for Level IV activities and provide recommendations concerning these to EHS and/or Laboratory Supervisor as needed or required and approve them when it is satisfied that safety has been appropriately addressed. Upon request by EHS, proposed LSSPs for Level III activities will also be evaluated.