UNIVERSITY OF KANSAS - LAWRENCE CAMPUS
Part I - General Laboratory Safety Plan

Section 3) Hazard Communication and Control Measures

Hazard control is defined as measures, practices, or procedures utilized to remove, prevent, or reduce employee exposure to real or potential safety, health and/or environmental hazards. Hazard control can become a complicated subject due to the diversity of potential hazards that may be present in the laboratory environment.

This Chapter identifies the minimum control measures that shall be implemented and followed in the laboratory environment at the University of Kansas - Lawrence Campus in order to protect university personnel/students/visitors from potential hazards associated with Hazardous Materials (HM) and Radiation Generating Devices. Reminder: "laboratory environment" includes off campus locations involving KU personnel/students/visitors when such location is not under the jurisdiction of another institution.

*3.1) General Hazard Control

There are three general types of hazard control:

*3.1.1) Engineering Controls (See Glossary for definition.)

The Authorized Laboratory Supervisor (ALS) or Authorized User (AU), as appropriate, shall:

3.1.1.1) Initially, eliminate the hazards associated with the use of Hazardous Materials (HM)/radiations or reduce them through the use of engineering controls to an acceptable level keeping the concept of "As Low As Reasonably Achievable" (ALARA) in mind. These are accomplished by:

a) Evaluating for and using the <u>least</u> hazardous equipment, Hazardous Materials, or process needed to perform the required task.

b) Physically isolating the operator or process when appropriate.

c) Providing the appropriate local and general exhaust ventilation.

d) Providing appropriate shielding.

e) Contact EHS Dept for assistance (4-4089).

*3.1.2) Administrative Controls

Administrative controls are procedural measures implemented to reduce or eliminate hazards when engineering controls are insufficient or not feasible.

The Authorized Laboratory Supervisor shall:

3.1.2.1) Establish and enforce standard laboratory practices, procedures, work methodologies, etc., with the general philosophical goal of keeping exposures to Hazardous Materials and/or radiations "As Low As Reasonably Achievable" (See Chapter 2 of this Part for universal Standard Operating Procedures.).

3.1.2.2) Assess and identify all hazards associated with the Hazardous Materials and/or hazardous radiations used in the laboratory and communicate the nature of those laboratory hazards, as appropriate, to visitors, authorized occupants and authorized users. (See Sections 3.3 & 3.4 of this Part.)

3.1.2.3) Provide laboratory users with adequate information and documented training to safely work with Hazardous Materials (HM)/Radiation Generating Devices. (See Chapter 4, Information & Training.)

3.1.2.4) Perform laboratory inspections and provide maintenance on a routine basis (See Section 3.8 of this Part.).

3.1.2.5) Perform prior review and approval of particularly hazardous operations, procedures, or activities and obtain additional approval and/or establish approved Laboratory-Specific Safety Plans when required. (See section 3.9 of this Part.)

*3.1.3) Personal Protective/Safety Equipment.

When engineering and administrative controls are not sufficient, or have not yet been implemented, Authorized Users may have to rely upon personal protective/safety equipment to protect them from hazards present. These may include:

3.1.3.1) Personal Protective Equipment

*a) Eye/Face/Hearing Protection (section 3.6.3 & 3.6.6 of this Part)

b) Hand/Body Protection (section 3.6.4 of this Part)

c) Foot Protection (section 3.6.5 of this Part)

d) Respiratory Protection (section 3.6.7 of this Part)

3.1.3.2) Safety Equipment

*a) Safety Shields/Containment (section 3.7.1 of this Part)
Note: Includes radiation shielding when necessary.

b) Safety Showers/Eyewash Fountains (sections 3.7.2 & 3.7.3 of this Part)

c) Fire Extinguisher (section 3.7.4 of this Part)

d) First Aid Kits (section 3.7.5 of this Part)

e) Storage Cabinets (section 3.7.6 of this Part)

f) Spill Kits (section 3.7.7 of this Part)

*3.2) Hazard Control Responsibilities

Authorized Users shall:

*3.2.1) Comply with the hazard control measures identified in this chapter.

Authorized Laboratory Supervisors shall:

*3.2.2) Implement the hazard control measures identified in this chapter and require all personnel/students/visitors in their laboratories to follow them.

*3.2.3) Develop and implement more stringent hazard control measures in laboratories when/where necessary.

*3.2.4) Never transfer Hazardous Materials or RGDs that require Laboratory-Specific Safety Plans (LSSP) to another individual unless authorized to do so by EHS. (Such Hazardous Materials or RGDs must be under the responsibility of an authorized laboratory supervisor with an appropriate LSSP at all times. Such RGDs shall not be re-located without prior approval from EHS.)

Unit Safety Coordinators (USC) shall:

*3.2.5) Implement the hazard control measures identified in this chapter and in associated Laboratory-Specific Safety Plans or laboratory-specific Standard Operating Procedures and monitor compliance in their assigned areas of responsibility.

*3.2.6) Provide assistance to laboratory supervisors in implementing these hazard control measures; and in developing and implementing more stringent hazard control measures when/where necessary.

*3.2.7) Perform safety audits and inspections as specified in 3.8 of this chapter.

EHS shall:

3.2.8) Provide assistance to laboratories in the development and selection of appropriate hazard control measures.

3.2.9) Perform special safety audits and inspections as specified in 3.8.

3.2.10) Provide the Laboratory Safety Committee an annual evaluation (report) of the effectiveness of the laboratory safety program and recommendations for changes, if any, that need to be made to strengthen the program.

The Laboratory Safety Committee, through its subcommittees, shall:

3.2.11) Evaluate the effectiveness of the laboratory safety program at least on an annual basis and submit its reports with associated recommendations to the EHS Council.

3.2.12) Act on any report submitted to it by EHS.

3.2.13) Investigate any substantive problems reported to it. (The normal sequence for addressing problems is as follows: the Authorized Laboratory Supervisor, the Departmental Safety Officer, the chair or director of the unit in which the Authorized Laboratory Supervisor is located, EHS and then the Laboratory Safety Committee)

*3.3) Hazard Assessment and Hazard Identification

This administrative control measure requires the assessment, identification and communication of hazards so that personnel/students/visitors (Visitors, Authorized Occupants or Authorized Users) can be properly informed of hazards present in the laboratory.

The Authorized Laboratory Supervisors (ALS)/Dept. Safety Coordinators (USC) shall:

*3.3.1) Assess their laboratory in order to identify hazards that may be present at least on an annual basis.

*3.3.2) Use the "Laboratory Hazard Registration Form" provided in Part I - Chapter 8.3.1 to conduct and document this required assessment. Additional assessments are usually required when the work requires a Laboratory-Specific Safety Plan. See Part II - Section 3.9, Part III - Section 3.7, Part IV - Section 5, Part IV - Section 7 and Part V- Section 3.9 for situations in which Laboratory-Specific Safety Plans (LSSPs) are required. The procedures for establishing required LSSPs is given in this Part, Section 3.9.

*3.3.3) Keep a photocopy of the completed hazard registration form in the laboratory's copy of the Laboratory Safety Manual at Section 7.1.3 of Chapter 7, Part I or with the laboratory-specific Standard Operating Procedures.

*3.3.4) Provide a copy of the hazard registration form to EHS for entry into the university-wide database and for developing the appropriate Laboratory Entrance Posting.

*3.3.5) Update the hazard registration form immediately if/when laboratory hazards change and, forward the new/updated information to EHS promptly, and submit and obtain approval of proposed amendments to existing Laboratory-Specific Safety Plans before initiating use involving significant changes in materials/equipment requiring Laboratory-Specific Safety Plans.

*3.3.6) Communicate to Authorized Occupants and Authorized Users the content and laboratory location of the hazard registration form and Laboratory-Specific Safety Plans, if the latter are needed. The hazard registration form and the Laboratory-Specific Safety Plans become a part of their information and training.

Note: Some of this information may need to be shared with Visitors as well. See section 4.4 of this Part. All individuals entering an authorized laboratory belong to one of the three classifications.

*3.3.7) Immediately inform Authorized Occupants and Authorized Users of any changes/updates in the hazard registration form (or Laboratory-Specific Safety Plans and laboratory-specific Standard Operating Procedures).

*3.3.8) Maintain and keep records of training, inventories, laboratory-specific Standard Operating Procedures, Laboratory-Specific Safety Plans, and safety evaluations (surveys, contamination monitoring results, exposure levels, audit and inspection reports) See 3.4 below.

*3.3.9) Verify that the items of 3.3.8) above are organized and readily available to individuals with a "right to know."

Note: To the extent that it is practical, it is recommended that such documents be inserted as additional sections in this Laboratory Safety Manual. If choices need to be made, the inclusion of the laboratory-specific Standard Operating Procedures and Laboratory-Specific Safety Plans in this manual is preferred.

*3.4) Hazard Communication Information

The administrative control measures identified in this section require that information concerning the Hazardous Materials/Radiation Generating Devices present and used in laboratories at the University of Kansas - Lawrence Campus be available and properly communicated to all individuals frequenting the laboratories. Such individuals must be informed of the potential risks associated with Hazardous Materials/Radiation Generating Devices in their work area and must be aware of how to protect their own safety and health.

3.4.1) Inventory of Hazardous Materials
All laboratories must keep an accurate inventory of the chemicals and other potentially hazardous materials on hand. An inventory is a record, usually a database, of the chemicals in the laboratory and essential information on their proper management. A well-managed inventory includes chemicals obtained from commercial sources and those synthesized in the laboratory, as well as the storage location for each container of each chemical. Inventories help in ordering, storing, handling, and disposing of chemicals, as well as emergency planning.

The Authorized Laboratory Supervisor/Unit Safety Coordinator shall:

3.4.1.1) Develop and maintain a current inventory of all Hazardous Materials present in the laboratory as specified in Part II - Section 3.4.1 for hazardous chemicals, Part III - Section 3.3 for Biohazards and Part IV for radioactive materials.

3.4.1.2) Keep the Hazardous Materials inventory list as current as required in the referenced sections of 3.4.1.1.

3.4.1.3) Make the laboratory Hazardous Materials inventory list(s) readily accessible to all occupants (Visitors, Authorized Occupants & Authorized Users) of the laboratory.

3.4.1.4) Submit inventories to EHS as required in the referenced sections of 3.4.1.1.

*3.4.2) Registration and Location of Radiation Generating Devices

The Authorized Laboratory Supervisor (ALS)/Dept. Safety Coordinator (USC) shall:

3.4.2.1) Provide to EHS in the proposed Laboratory-Specific Safety Plan all of the information necessary to register Radiation Generating Devices with the state as required. See Part IV and Part V.

3.4.2.2) Never re-locate, dismantle, discard or transfer responsibility for Radiation Generating Devices until authorized to do so by EHS.

*3.4.3) Safety Information

The Authorized Laboratory Supervisor/Unit Safety Coordinator shall:

3.4.3.1) Obtain or develop safety information for all Hazardous Materials present in the laboratory and maintain this information as specified in Part II - Section 3.4.2 for hazardous chemicals, Part III - Section 3.3.2 for hazardous biological agents, Part IV for radioactive materials and Radiation Generating Devices, and Part V for lasers.

Note: For hazardous chemicals, the information is contained in the Safety Data Sheets. Safety Data sheets for radioactive materials and biohazards and exposure data for Radiation Generating Devices have to be developed. Call EHS Dept. (4-4089) for help as needed.

3.4.3.2) Keep the required safety information as current as required in the referenced sections of 3.4.3.1.

3.4.3.3) Make the safety information readily accessible to all occupants (Visitors, Authorized Occupants & Authorized Users) of the laboratory.

3.4.4) Labeling (General)

Authorized Users shall:

3.4.4.1) Maintain original labels on original containers of Hazardous Materials as received from vendors if possible until emptied and decontaminated.

3.4.4.2) Replace labels with equivalent information when original labels no longer are legible for reasons not under the control of the user.

3.4.4.3) Deface or remove and destroy labels from thoroughly decontaminated containers before such containers are discarded in trash.

3.4.4.4) In general, label all secondary containers with Hazardous Materials

Note: Items in a clearly labeled, marked, defined and reserved work area--preferably in a secondary tray--need not all be labeled if Standard Operating Procedures clearly specify that items from such an area may never be removed except by the Authorized User with the reservation for that area. Contaminated items shall be labeled by the Authorized Users before removal from the area. All containers placed into storage shall be labeled or clearly marked. (Marking in lieu of labeling is acceptable only for containers to be used for short periods of time after which they are decontaminated and returned to clean stock. Such markings must be maintained in a legible form until decontamination is accomplished by the responsible Authorized User.) In some cases, labeling of a tray containing test tubes or vials may be a surrogate for individual labeling if all Authorized Users understand that removal from such a tray or area is not permitted without labeling unless the removal is for the purpose of a process, such as centrifugation or measurement in an instrument, that remains under the control of the Authorized Users for the duration of the process or measurement. (Authorized Occupants are never to remove items from an area marked and set aside for materials for which they are not an Authorized User.)

Note: Creation of an "orphan" container of Hazardous Materials or Hazardous Material-contaminated object without identification of type and quantity of Hazardous Material is considered serious non-compliance with this Laboratory Safety Manual. An "orphan" container or object is one for which the link between the person responsible for the container/object and the container/object itself has been lost and/or information concerning the content of the container/object has been lost.

3.4.4.5) Dispose of any Hazardous Material-contaminated container/object as hazardous waste according to the procedures applicable to the type of Hazardous Materials. See Chapters 6 of this Part, Part II, and Part III and the Radiation Safety Service-approved directions (radioactive waste) as applicable. If in doubt, contact EHS.

3.4.4.6) Follow the specific container labeling Standard Operating Procedures of Part II: 3.4.3, Part III: 3.3.3, and Part IV: 13.3.2 as applicable.

*3.4.5) Hazard Warning/Safety Equipment Signage

Appropriate warning signs are to be displayed inside the laboratory in areas that present a hazard to individuals. Warning Signage shall conform to requirements of applicable OSHA regulations, Kansas Regulations 28-35-133 through 363, or ANSI Z-136, as appropriate. For general information about appropriate hazard warning signage see Part I - Appendix 8.3. For hazardous chemicals warning signage see Part II - Section 3.4.4. For hazardous biological agents see Part III - Section 3.3.4. For radioactive materials see Part IV - Section 13.3.2. For lasers see Part V.

The Authorized Laboratory Supervisors shall:

3.4.5.1) Identify and appropriately post, label or tag any/all hazards in the laboratory.

Note: Any sign or label which comes attached to a commercial RGD shall not be removed, shall be maintained in a legible condition and shall be readily visible.

3.4.5.2) Post the appropriate signs in the laboratory to identify the location of various types of safety equipment, such as:

a) Safety Showers & Eyewashes

b) Fire Extinguisher & Fire Blankets

c) First Aid Kits

d) Spill Control Kits

e) Personal Protective Equipment

3.4.5.3) Contact EHS for assistance in identifying and obtaining the appropriate hazard warning/safety equipment signage.

The Authorized Users (AU) shall:

3.4.5.4) Post the appropriate hazard warning signs or tags before initiating any operation or activity that may present a hazard.

*3.4.6) Laboratory Entrance Posting

The entrance to each laboratory must be posted with EHS approved hazard and emergency information so that all individuals (lab or non-lab) can be properly warned before entering and know who to contact in the event of an emergency or question about the laboratory.

Based upon the levels and types of hazards present in a laboratory, all laboratories on the Lawrence campus also will be assigned a "Hazard Class" that shall be posted on the entrances to the laboratory. (See sections 1 and 3.9 of this Part.) Procedures and requirements are based upon that hazard class. After the hazard controls needed for the laboratory have been established based upon the completed hazard registration form and the requirements of this chapter and its referenced sections, each laboratory will be placed into one of four classes--Level I, Level II, Level III or Level IV. In some cases, laboratories that have a combination of hazards, each of which would be at some lower level, may be placed at a higher overall level. All Level III Laboratories require EHS-approved Laboratory-Specific Plans (LSSPs) and all Level IV Laboratories require EHS/Laboratory Safety Committee-approved LSSPs. Because of regulations, some Level I and Level II labs may also require approved Laboratory-Specific Safety Plans--for example, if radioactive materials are used. See section 3.9 and its references. (Hazard Classes are addressed for each category in Parts II, III, IV and V.)

Note: The proper Laboratory Entrance Posting (LEP) will be developed and provided by EHS after receipt of the hazard registration form. The Laboratory Entrance Posting information will be based upon that provided by the lab supervisor on the Hazard Registration form.

The Authorized Laboratory Supervisor (ALS) shall:

3.4.6.1) Post the entrance to the laboratory with the proper hazard warnings, emergency contact information and overall hazard class.

3.4.6.2) Include in the emergency information the name(s) and phone number(s) of the lab supervisor or other responsible party(ies) to be contacted in the event of an emergency or question about the lab.

Note: There shall be at least two individuals listed on the Laboratory Entrance Posting who can provide information necessary when an emergency occurs. Two lab supervisors who are well acquainted with each other's work may decide to be the "second" person listed on the other's Laboratory Entrance Posting.

3.4.6.3) Establish and maintain Hazard Warning information that identifies the presence of the following:

a) Physical Hazards

b) Chemical Hazards

c) Biohazards

d) Radiation Hazards

-- For Ionizing Radiation see posting requirements in Part IV-Section 13.3.2 and Guidance Document (GD-3.2).

-- For Lasers, see Part V.

-- Contact EHS-Radiation Safety Service (4-4089) for assistance.

Note: An example of a Laboratory Entrance Posting may be found in Chapter 8.3.3.

3.4.6.4) Keep a photocopy of the current Laboratory Entrance Posting in the Laboratory's Laboratory Safety Program manual at section 7.1.4 of Chapter 7, Part I.

*3.5) Engineering Controls

As stated earlier in section 3.1.1, initially, the hazards associated with the use of Hazardous Materials/Radiation Generating Devices shall be reduced or eliminated as much as possible through the implementation of engineering controls.

*3.5.1) Process Modifications/Substitutions

The Authorized Laboratory Supervisors and Authorized Users shall:

3.5.1.1) Examine each laboratory activity for the possibility of substituting less hazardous equipment, Hazardous Materials or processes for the existing ones.

3.5.1.2) Where feasible, make process modifications/substitutions to reduce or eliminate the hazards of existing processes.

*3.5.2) Physical Isolation/Containment

The Authorized Laboratory Supervisor and Authorized Users shall:

3.5.2.2) Make every effort to physically isolate the person from the hazard through appropriate barriers, shields or containment as appropriate.

3.5.3) Exhaust Ventilation

Any laboratory activity that has the potential to generate airborne emissions (fumes, vapors, gases, mists, dusts, smoke, particulates, etc.) must be conducted under the appropriate exhaust ventilation. There are two types of exhaust ventilation: General and Local.

General exhaust ventilation is that usually associated with the normal building temperature control and fresh air supply (HVAC) system. Air is exhausted from rooms and returned to the building air handler for mixing with a certain small percentage of fresh incoming air. With these systems, any airborne contaminants in the laboratory can be picked up and spread throughout an entire facility. General exhaust ventilation is not to be relied upon for contaminant removal.

Local exhaust ventilation is used at the point of contaminant generation to immediately capture and remove the airborne contaminants to the exterior of the facility. Examples of local exhaust ventilation are: Capture Hoods, Canopy Hoods, and Enclosure Hoods. The most common type of local exhaust found in the laboratory environment is the laboratory fume hood which is an enclosure hood.

3.5.4) Laboratory Fume Hoods

The laboratory fume hood is an engineering control that provides physical isolation and containment of the laboratory process or activity and local exhaust ventilation. It is designed to prevent the escape of chemical emissions from chemicals and their reactions into the general laboratory environment. It is not intended to be used as a means to provide general laboratory exhaust ventilation.

3.5.4.1) Criteria for Use

The Authorized User (AU) shall use a properly functioning hood for any chemical procedure that has the potential of creating:

a) Airborne concentrations of one or more chemicals approaching the corresponding Permissible Exposure Limit (PEL) or of radioactive materials that might approach a Derived Air Concentration (DAC).

b) Flammable vapors approaching 10% of the lower explosion limit.

c) EHS Safety Authorization-Requiring Hazardous Chemicals or materials of unknown toxicity. See Glossary for EHS Safety Authorization-Requiring Hazardous Chemicals and sections 3.9 of Part I and II.

d) Fumes, vapors, gases, dusts, mists, or odors that are potentially a nuisance or irritation to other individuals. (Dusts of high toxicity shall only be used in a glove box or equivalent. See Part I: Section 3.5.6.)

3.5.4.2) Procedures Not Requiring a Fume Hood

The Authorized Users may generally conduct the following procedures safely outside the fume hood:

a) Operations with aqueous solutions of salts, dilute acids, bases, other reagents.

b) Operations with liquids or solids that have very low volatility.

Note: Lower Explosion Limit must be below 10%.

c) Operations with closed systems that do not allow significant emissions to escape into the laboratory environment.

d) Operations with extremely small quantities of hazardous chemicals that do not release enough emissions to be a health hazard.

3.5.4.3) Fume Hood Work Practices

Authorized Users shall adhere to the following minimum work practices for the maintenance of proper exhaust ventilation when using laboratory fume hoods. More stringent practices may be necessary in some circumstances.

Authorized Users shall:

a) Confirm adequate hood ventilation performance prior to beginning work inside of hood. (Check for airflow into and through the hood.)

b) Use only materials for which the fume hood has been designed and for which its current exhaust flow rate is capable of providing protection.

c) Keep all apparatuses at least 6 inches back from the hood face (front). Apparatus should be raised 2-3 inches off of the surface with blocks to allow proper airflow under the object.

d) Not put their head in the hood when contaminants are present.

e) Not use the hood as a routine waste disposal mechanism for evaporation of volatile materials.

f) Not store chemicals or apparatus in the hood unless they are part of an ongoing process that must be set up in the hood because of hazardous emissions. Hazardous Materials should be stored in appropriate (ventilated, if necessary) safety storage cabinets.

g) Minimize the quantity of Hazardous Materials and apparatuses present in the hood and not allow them to block baffles or prevent exhaust flow.

h) Keep the hood sash closed at all times, except when manipulating or making adjustments to activities inside.

i) Keep the hood sash as low as practical when working inside. The sash is designed to be used as a limited safety shield. Recommended sash working height is >12 inches and <18 inches.

j) Leave the hood "on" if there are hazardous substances in the hood that present concern about airborne emission. Shut the system off if there is no need to have contents under ventilation.

k) Minimize foot traffic past the face of the hood when in use to prevent cross-draft turbulence that can affect hood face velocity and prevent proper contaminant capture.

l) Use an appropriate barricade or safety shield if there is the chance of an explosion, eruption, or exposure to hazardous radiations.

m) Not place electrical receptacles or other spark sources inside the hood when flammable liquids or gases are present. No permanent electrical receptacles are permitted inside a laboratory fume hood.

n) Keep laboratory doors and windows closed.

o) Not position air movement devices so they interfere with the hood's performance and shall not block air supply vents in the room.

p) Not remove the hood sash, panels or baffles except when necessary for apparatus set-up. Replace all parts and confirm adequate hood performance before beginning operations.

3.5.4.4) Radioisotope Hoods

Authorized Radiation Users, in addition to the work practices for laboratory hoods identified above, shall:

a) Conduct the use of radioisotopes in a hood in accordance with Part IV of this manual.

b) (Should) not use a radioisotope hood as a general-purpose laboratory hood.

c) (Should) not use radioisotopes in a general-purpose laboratory hood without Radiation Safety approval.

3.5.4.5) Perchloric Acid Fume Hoods

Where perchloric acid is heated above ambient temperatures, vapors may condense within the fume hood exhaust system and form explosive perchlorates. In such instances, specially designed perchloric acid fume hood exhaust systems must be in place and utilized. These systems will have dedicated exhausts, a water wash-down system, and may only be used for perchloric acid digestions.

Authorized Users shall:

a) Not use or heat perchloric acid in a fume hood designed for other purposes.

b) Conduct perchloric acid digestions in a proper perchloric acid fume hood system.

c) Identify perchloric acid fume hoods with large warning signs.

d) Not use a perchloric acid fume hood as a general laboratory fume hood.

e) Wash down perchloric acid fume hood systems after each use.

f) (Should) remove the hood baffle regularly (after wash-down) for inspection and cleaning. Flush away any deposits.

g) Use the lowest quantity of perchloric acid possible for the required process.

h) (Should) not use spark-producing apparatus inside a perchloric acid hood.

i) (Should) apply only inorganic coatings and lubricants to apparatuses used within the hood.

j) (Should) label all active and inactive perchloric fans and ductwork with an appropriate caution sticker.

k) Contact EHS for assistance in testing for residual perchlorates prior to system disassembly or for any other assistance.

3.5.4.6) Laboratory Fume Hood Performance Criteria

The Authorized Laboratory Supervisor shall:

a) Maintain all laboratory fume hoods so that a minimum average face velocity of 100 linear feet per minute (100 lfpm) is achieved at the normal (safe) sash working height (usually in the range of 12"-18" open). Newer model fume hoods may be set at 80 fpm or less as directed by EHS.

b) Require that all new hoods have a continuous airflow monitoring device capable of confirming adequate hood airflow. This must be either a pressure gauge, airflow velocity monitor, and/or calibrated alarm device.

c) (Should) provide all existing hoods with a continuous airflow monitoring device capable of confirming adequate hood airflow added as soon as possible. Existing hoods without such a device should at least have a strip of ribbon or tissue taped to the bottom of the sash so that fan operation and airflow into the hood can at least be qualitatively verified during use.

3.5.4.7) Laboratory Fume Hood Inspection/Certification

The Unit Safety Coordinator/Authorized Laboratory Supervisor shall:

a) Verify that all laboratory fume hoods have been properly inspected after installation or modification, and annually thereafter.

b) Contact EHS for assistance in conducting annual Fume Hood Inspections and Certifications. These must consist of a Visual Inspection, Smoke Trace Test, Average Face Velocity Tests, and Written Certification.

3.5.5) Biological Safety Cabinets

These are specially designed, ventilated, safety enclosures used when working with biological organisms that present a hazard. This device is not a laboratory fume hood.

Authorized Users shall:

3.5.5.1) Use Biological Safety cabinets in accordance with the procedures specified in III-3.4.2.

3.5.5.2) (Should) not use hazardous chemicals in these devices.

3.5.5.3) Inspect the biological safety cabinet prior to each use in order to confirm adequate cabinet ventilation performance.

The Authorized Laboratory Supervisor (ALS) shall:

3.5.5.4) Require the inspection and certification of Biological Safety Cabinets on an annual basis in accordance with the manufacturer's requirements.

3.5.6) Gloveboxes/Containment Devices

Authorized Users shall:

3.5.6.1) Operate all gloveboxes/containment devices in a manner so that hazardous substances do not enter the laboratory environment and pose a hazard to personnel/students/visitors.

3.5.6.2) Check that the exhaust air from gloveboxes/containment devices is passed through the appropriate scrubbers, filters, or other treatment devices prior to release into the regular exhaust system. (This includes maintenance of these.)

3.5.6.3) Inspect the gloveboxes/containment devices prior to and during each use to confirm adequate ventilation performance.

The Authorized Laboratory Supervisor shall:

3.5.6.4) Verify that all gloveboxes/containment devices are inspected and certified on an annual basis in accordance with the manufacturer's requirements.

3.6) Personal Protective Equipment (PPE)

*3.6.1) General

Personal Protective Equipment (PPE) is personal apparel that provides some degree of protection from safety hazards. This equipment may include, but is not limited to the following:

Head Protection - Hard Hat, Hair/Head Cover/Hood
* Eye and Face Protection - Safety Glasses, Goggles, Face Shields
Hand and Body Protection - Gloves, Lab Coats, Aprons, Body Coveralls
Foot Protection - Safety Shoes, Boots, Pullovers, Toe/Tarsal Guards
Hearing Protection - Earplugs, Earmuffs
Respiratory Protection - Air Purifying or Air Supplying Respirators

The Authorized Laboratory Supervisor shall:

3.6.1.1) Provide the necessary Personal Protective Equipment within his/her lab(s) and require that it be properly used/worn through appropriate training; establish laboratory-specific Standard Operating Procedures that are enforced.

3.6.1.2) Provide Personal Protective Equipment, if required, at no expense to laboratory personnel who are defined as "employees of the University" and non-laboratory personnel who may be "visitors" of the laboratory.

3.6.1.3) Provide Personal Protective Equipment, if required, other than lab coats, safety glasses, and/or safety goggles, at no expense to individuals who are defined as KU students.

Note: Students may be required to purchase their own lab coats, safety glasses, and/or safety goggles.

Authorized Student Users shall:

3.6.1.4) Purchase and wear Personal Protective Equipment that conforms with the design requirements specified throughout this section 3.6.

Authorized Users shall:

3.6.1.5) Select and wear Personal Protective Equipment in accordance with the hazards present and as specified in the laboratory-specific Standard Operating Procedures and/or applicable Laboratory-Specific Safety Plans.

3.6.1.6) Check, before using, that the protective apparel is compatible with the required degree of protection for the Hazardous Materials/radiations being used.

3.6.1.7) Wear the required minimum safety apparel specified in section 2.5.3.8.

3.6.2) Head Protection

Head protection is required where there is reasonable probability that injury could result without it.

Authorized Users shall:

3.6.2.1) Wear protective helmets (Hard Hats) when working in areas where there is the potential for head injury from falling objects.

3.6.2.2) (Should) wear Hair Covers/Hoods, when applicable, to protect hair from contamination by Hazardous Materials, prevent it from getting in the way, or becoming entangled in moving equipment.

3.6.2.3) Verify that any Personal Protective Equipment designated for head protection meets the design requirements of ANSI Z89.1-1986.

*3.6.3) Eye and Face Protection

State of Kansas law (K.S.A.72-5207[B]) requires that every student, teacher, and visitor in all schools, colleges, and universities shall wear appropriate eye/face protective devices when conducting any activity that presents a hazard to the eyes or face. (See section 2.5.3.8.d).

Authorized Users shall:

3.6.3.1) Wear approved safety glasses whenever there is the potential for flying fragments, objects, chips, particles, dusts, etc.

3.6.3.2) Wear approved safety goggles whenever there is the potential for chemical splashes, irritating mists, liquids, etc.

3.6.3.3) Wear approved face shields whenever there is the potential for hot sparks, molten metals, high temperatures, or chemical splash to face. Face shields should not be used as a substitute for eye protection but should be used in conjunction with either safety glasses or goggles.

*3.6.3.4) Use eye protective devices that provide the appropriate protection from optical radiation (be filtered) as necessary.

*3.6.3.5) Verify, before use, that all eye/face protective devices conform to the requirements of ANSI Z87.1 and/or ANSI Z136 as appropriate.

3.6.4) Hand and Body Protection

Skin contact is a potential source of exposure to Hazardous Materials. Therefore, necessary precautions must be taken to protect the skin when working with Hazardous Materials that can cause significant exposure through skin contact or absorption. Appropriate hand and body protection should be selected to meet the needs of the specific laboratory work environment.

Authorized Users shall:

3.6.4.1) Wear gloves whenever there is the potential for hand contact with Hazardous Materials, thermal hazards, or physical hazards.

a) (Should) wear gloves when the assigned activity requires contact with potentially contaminated surfaces or items in rooms posted with Level I or II hazards and shall wear gloves for such activities in rooms posted with Level III or IV hazards. (See section 2.5.3.8.c)

b) Select gloves based upon the evaluation of the performance characteristics of the hand protection relative to the tasks to be performed, conditions present, duration of use, and the hazards/potential hazards identified.

c) Wash reusable gloves appropriately before removal and inspect them periodically for wear and effectiveness.

d) Remove disposable gloves immediately after use and dispose of them appropriately.

e) Remove gloves before leaving the Hazardous Materials use area in order to prevent contamination. Contaminated gloves shall not be worn outside of the laboratory environment.

f) Remove potentially contaminated gloves in such a fashion that no bare skin touches the outside surface of the gloves.

3.6.4.2) Wear clothes that cover as much of the body as possible. Wear lab coats whenever there is the potential for body/clothes contact with Hazardous Materials. Shorts worn without a protective full-length laboratory coat are prohibited. (See section 2.5.3.8.b)

a) (Should) launder lab coats frequently. (However, any Personal Protective Equipment contaminated with Hazardous Materials shall not be sent to commercial cleaners until decontaminated to a level that presents no hazard.)

b) Remove lab coats immediately if contaminated with Hazardous Materials at such level that penetration through the lab coat is likely or when contaminated with radioactive materials that could expose the body areas beneath the coat to unacceptable doses of radiation.

c) Remove lab coats before leaving the hazardous material use area to prevent the spread of contamination. Contaminated lab coats are not to be worn outside of the laboratory environment. (Ref Section 2.5.3.8)

3.6.4.3) Wear other, greater chemically protective clothing (sleeves, aprons, body coveralls, etc.) if the hazards of the chemicals in use warrant it. Consult the Safety Data Sheet or EHS for further assistance.

3.6.5) Foot Protection - Safety Shoes, Boots, Pullovers, Toe/Tarsal Guards

The requirement and need for safety shoes and/or other foot protection in the laboratory environment is a judgmental process and can only be made after careful hazard assessment of the laboratory operations being conducted.

Authorized Users and Authorized Occupants shall:

3.6.5.1) Wear the appropriate footwear at all times in laboratories where exposure of the feet to Hazardous Materials is probable. Note: Authorized Occupants and/or Visitors are included in this requirement if such individuals walk where the exposure is probable. (Ref. section 2.5.3.8).

a) Wear shoes that cover the entire foot. Wear non-perforated shoes as a minimum when the potential for contamination exists. Bare feet, sandals and open-toed shoes are not permitted in labs where Hazardous Materials are present. Open-toed shoes and sandals shall not be worn when a reasonable potential for contamination is present.

b) In areas of a laboratory where contamination is not likely, such open-toed shoes and sandals are not prohibited but it is better not to use them in laboratories at all for the highest protection. Safety coverings over shoes or sandal might be adequate under some circumstances when the potential for contamination exists.

c) Wear chemically protective booties, pullovers, etc., when necessary and should select them in accordance with the hazard presented.

3.6.5.2) Wear the appropriate protective footwear (safety shoes) when working in areas where there is a danger of foot injuries due to falling or rolling objects, objects piercing the sole, or where the feet are exposed to electrical hazards.

a) Verify, before using, that safety shoes conform with the requirements of ANSI Z41.

3.6.6) Hearing Protection

Noise levels in most laboratories are usually not excessive, but there are laboratory facilities or activities in which noise can reach levels for which hearing protection should be provided or in which the laboratory users/occupants should participate in a hearing conservation program. Excess noise levels should be reported to EHS for proper noise hazard assessment.

Authorized Laboratory Supervisors should:

3.6.6.1) Make hearing protection available to laboratory users/occupants who may be or are exposed to noise levels above 85 decibels, no matter what the length of exposure time, to prevent temporary hearing loss.

Authorized Users and Authorized Occupants shall:

3.6.6.2) Participate in the University's Hearing Conservation Program when they are exposed to noise levels at or greater than 85 decibels over an eight-hour time-weighted average.

Note: The Authorized Laboratory Supervisor shall provide the appropriate hearing protection to be worn at all times if the noise exposure is above this level.

3.6.7) Respiratory Protection

In laboratory environments where airborne contaminants are present, it may be necessary to use respirators to keep personnel/students/visitors' exposures below permissible exposure limits.

Engineering and administrative controls are to be initially implemented to eliminate as far as feasible any potential airborne contaminants (dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors). If, after these actions, respiratory hazards will still be present or produced, then the Authorized Laboratory Supervisor shall select and provide the appropriate, approved respiratory protection equipment.

Respirators fall into three general classifications:

Air-Purifying Air-Supplying Combination Air-Purify/Air-Supplying

The selection of a respirator for any given situation requires consideration of the following factors:

Nature of the hazard
Extent of the hazard
Work Requirements and Conditions
Characteristics and Limitations of Available Respirators.

Only those respirators carrying an MSHA/NIOSH certification as "approved respirators" are acceptable for protection of laboratory users/occupants from exposures at or above a PEL.

Single-strap, paper-filter, comfort masks are not MSHA/NIOSH approved and do not provide protection against hazardous levels (>= PEL) of dusts, mists, fumes, vapors, or other contaminants. They provide minimal, if any, protection against nuisance dust and non-toxic particles only.

Laboratory users/occupants are not to be issued, required to wear, or use an approved respirator without the following conditions being met:

The Authorized Laboratory Supervisor shall:

3.6.7.1) Have a written respiratory protection plan approved by EHS as part of the laboratory-specific Standard Operating Procedures when respiratory protection is required.

3.6.7.2) Perform a hazard assessment and contact EHS to assist in selecting the proper, "approved" respiratory protection.

Each Authorized User or Authorized Occupant requiring respiratory protection shall:

3.6.7.3) Undergo examination by a licensed physician to determine that they are physically and physiologically capable of wearing and working with a respirator prior to being assigned to an operation requiring such approved respiratory protection

a) Undergo, as a minimum, a routine physical and a pulmonary function test.

3.6.7.4) Be fit tested by EHS to assure that the respirator assigned to them provides a tight seal.

a) Not have facial hair that interferes with an approved respirator's seal.

b) Not wear normal corrective lenses (glasses) with full-face respirators because the earpieces interfere with the face piece seal. Special corrective lenses, especially for full-face respirators, should be purchased.

Authorized Users, Authorized Occupants, and Authorized Laboratory Supervisor requiring respiratory protection shall:

3.6.7.5) Be trained in the proper selection, use, limitations, and maintenance of respirators. Note: This includes testing for a seal, checking for saturation or out-of-date filters, checking for type of protection.

a) Contact EHS to arrange for this training.

3.6.7.6) Perform routine inspection, maintenance, cleaning, and storage of their respirator if it is of the reusable type.

a) Notify the Authorized Laboratory Supervisor of identified problems and not use defective respirators until repaired and retested or replaced by the Authorized Laboratory Supervisor.

3.6.7.7) Contact EHS for assistance with any of the above.

*3.7) Safety Equipment

These are specialty devices or equipment that are used to enhance the protection of personal safety. Some are used in a proactive manner and others in reactive manner because of an emergency.

The laboratory supervisor shall provide required safety equipment, check that such equipment is properly functioning or adequate, and enforce the use of such equipment by the Authorized User in his/her laboratory.

Note: This requirement does not address who must provide the funds for purchases and maintenance and does not address who performs the installation and maintenance.

*3.7.1) Safety Shields/Containment

The Authorized Laboratory Supervisor (ALS) should verify that:

3.7.1.1) Fume hoods are equipped with drawn sashes, gloveboxes, face shields or other protective barriers whenever laboratory activities using chemicals with a high potential for sudden splattering (i.e., those involving concentrated acids, bases, oxidizing or reducing agents) are undertaken.

3.7.1.2) Specialty safety shields, barriers, or containment are used whenever laboratory activities using chemicals with a potential for severe reaction or explosion are undertaken.

*3.7.1.3) Radiation shielding or beam blocking devices are adequate and properly functioning.

3.7.2) Safety Showers

The Authorized Laboratory Supervisor shall verify that:

3.7.2.1) An easily accessible, drench/deluge-type safety shower is available within 100 feet, or 10 seconds travel time, of each laboratory storing or using hazardous chemicals.

3.7.2.2) Laboratories routinely storing or using significant quantities of hazardous chemicals have a drench/deluge-type safety shower inside the laboratory.

Note: The meaning of "significant quantities" will be established in consultation with EHS at the time the Hazard Registration form is evaluated, or a proposed Laboratory-Specific Safety Plan is processed.

3.7.2.3) All safety showers conform with the requirements of ANSI Z358.1.

3.7.3) Eyewash Fountains

The Authorized Laboratory Supervisor shall:

3.7.3.1) Provide and maintain an eyewash fountain inside each laboratory where hazardous chemicals are stored or used.

3.7.3.2) Require that eyewash fountains comply with the requirements of ANSI Z358.1.

*3.7.4) Fire Extinguisher

The Authorized Laboratory Supervisor shall:

3.7.4.1) Require that each laboratory has at least one (1) portable fire extinguisher that has been selected in accordance with the fire hazard(s) present in the laboratory. Selection criteria follow:

a) Class A extinguishers are intended to be used on fires involving ordinary combustibles such as paper, wood, plastics, textiles, etc.

b) Class B extinguishers are intended to be used on fires involving flammable liquids such as paints, solvents, petroleum fuels, etc.

c) Class C extinguishers are intended to be used on electrical fires from wiring, electrical powered equipment, or on Class A or B fires in near proximity to electrical equipment.

d) Class D extinguishers are used on combustible metals such as aluminum, magnesium, potassium, sodium, titanium, etc.

e) It is recommended that this one minimum extinguisher be a portable dry-powder type with a rating of at least 2A:10B:C. The lab may also need other types (CO2, Class D, etc.) of extinguisher depending on the hazards present.

3.7.4.2) Contact Facilities Services to obtain fire extinguisher.

Laboratory personnel/students shall:

3.7.4.3) Not be asked to put out fires and shall not use portable fire extinguisher unless they have been properly trained.

*3.7.5) First Aid Kits

The Authorized Laboratory Supervisor should:

3.7.5.1) Obtain and maintain a properly stocked first aid kit in each laboratory.

Laboratory users/occupants:

3.7.5.2) Are not asked to render first aid and shall not render first aid unless they have been properly trained.

3.7.6) Storage Cabinets

Facilities for storage of Hazardous Materials in the laboratory must be selected with as much care as any other safety equipment. Many materials may be stored on ordinary shelves or cabinets, with only common sense safety provisions being necessary. (See I- 2.4.) However, some of these Hazardous Materials must be stored in special cabinets specifically designed to handle their dangerous properties. In other cases, there are restrictions on their use that require extra security precautions to prevent unauthorized access. Hazardous materials requiring special storage cabinets include: flammable materials, corrosive materials, EHS Safety Authorization-Requiring Hazardous Materials (toxics, carcinogens, mutagens, etc.), reactives, explosives, drugs/controlled substances, biohazards, and radioactive materials.

3.7.6.1) Flammable Material Storage Cabinets

Flammable/Combustible materials are among the most commonly employed chemicals in the laboratory and represent one of the most significant hazards because of their ignitability characteristics. The purpose of a flammable material storage cabinet is to postpone the involvement in a fire of the materials stored within the cabinet long enough to allow persons in the immediate area to evacuate the area, or in some cases extinguish the fire. Flammable material storage cabinets protect the flammable materials from people and potential accidents, not the other way around.

The Authorized Laboratory Supervisor (ALS) shall require that:

a) All cabinets used to store flammable materials meet the design and construction requirements of NFPA 30.

b) All cabinets used to store flammable materials are certified as capable of meeting the 10-minute fire test specified in NFPA 251.

c) Flammable materials storage cabinet doors remain closed at all times, except when removing or returning containers.

d) Individual flammable materials storage cabinets are limited to a total maximum volume not to exceed as per the manufacturer’s directions for the cabinet.

e) The doors of flammable materials storage cabinets are conspicuously labeled with the following: "Flammable--Keep Fire Away"

f) Flammable materials storage cabinets are not vented without approval by EHS.

3.7.6.2) Corrosive Materials Storage Cabinets

Certain corrosive materials may also require special storage cabinets because of their potential to generate hazardous vapors or fumes. Generally it is acids that pose a problem, but some bases may also generate problem vapors or fumes. Some cabinets present under a fume hood are specially constructed and vented and can be used for storing corrosive materials.

The Authorized Laboratory Supervisor shall require that:

a) Cabinets used to store corrosives have finishes capable of providing protection from corrosive fumes or vapors.

b) Acids and bases are not stored in the same cabinet, unless the cabinet has been constructed with separate, isolated compartments so that vapors or fumes from the two cannot mix.

The Authorized Laboratory Supervisor should require that:

c) Corrosive materials storage cabinets under fume hoods are ventilated by a connection to the fume hood plenum. Stand-alone cabinets should be ventilated by an appropriate exhaust ventilation duct.

3.7.6.3) Radioactive Materials Storage Cabinets

Since all radioactive materials are chemicals, the requirements for storage of chemicals as specified above may need to be considered. There is one additional legal requirement that is best addressed at the storage level and, if the materials emits radiations that penetrate the storage container, shielding may need to be included in the storage cabinet or refrigerator. The legal requirement is that radioactive materials must be secured against unauthorized use. High fines have been assessed for failure to do so. IF the storage facilities cannot be locked against unauthorized access, a room with radioactive materials must be locked whenever no authorized user is present to prevent unauthorized access.

The Authorized Laboratory Supervisor shall:

a) Provide and use storage facilities that are appropriately shielded for the areas surrounding the storage facilities. Contact the Radiation Safety Office for help in evaluating shielding requirements. This is usually part of obtaining a permit (Laboratory-Specific Safety Plan). See IV-5.

The Authorized Laboratory Supervisor should:

b) Provide securable storage facilities.

c) Provide storage facilities designed for ease of decontamination.

3.7.6.4) Security Storage Cabinets

There are certain materials that need to be stored in secure cabinets in order to prevent unauthorized access, misuse, or potential theft.

The Authorized Laboratory Supervisor shall require that:

a) Items such as reactives, explosives, EHS Safety Authorization-Requiring Hazardous Materials and biohazards are stored in substantially constructed cabinets that are suitable for the materials. For EHS Safety Authorization-Requiring Hazardous Materials, cabinets designed for providing security against unauthorized access are required.

b) The storage of controlled substances or drugs is in accordance with applicable federal and state regulations.

3.7.7) Spill Control Kits

It is inevitable that laboratories using Hazardous Materials will experience at one time or another a spill or release. Therefore it is prudent that each laboratory be prepared and have the appropriate spill control/cleanup supplies on hand in the lab to address potential Hazardous Materials releases.

The Authorized Laboratory Supervisor should:

3.7.7.1) Consult EHS for information concerning the appropriate types and quantities of spill control materials that should be present.

*3.8) Laboratory Inspections/Reviews

In order to provide laboratory facilities that are free from recognized safety hazards and are properly maintained/operated, they must be inspected on a routine basis. This may consist of quick, informal, self-reviews by laboratory users/occupants daily, documented safety inspections by lab supervisors or units on a periodic basis; random inspections by the University Lab Safety Committee or EHS Dept.; or formal compliance inspections by regulatory agencies.

*3.8.1) Required Laboratory Inspections

3.8.1.1) Inspections by Laboratory Users/Occupants

The Authorized Users shall:

a) Conduct daily inspections of their work areas to identify potential safety hazards.

This may be a quick, informal review of activities to be conducted and should be evaluated for compliance with the Laboratory Safety Manual Standard Operating Procedures identified in Chapter 2 and any lab-specific Standard Operating Procedures.

b) Conduct documented surveys/inspections as required by laboratory-specific Standard Operating Procedures or Laboratory-Specific Safety Plans.

3.8.1.2) Inspections by Lab Supervisors

The Authorized Laboratory Supervisor, at least once each academic term (Fall, Spring and Summer) and whenever significant changes in conditions occur or are identified, shall:

a) Assess and document laboratory hazards using the Laboratory Hazard Registration Inventory form.

b) Assess laboratory safety practices using the Laboratory Safety Assessment form provided by EHS. See Part I - Appendix 8.3.4.

c) Verify that appropriate inspections of all reusable Personal Protective Equipment are performed and that equipment is functioning. This may be documented on the Laboratory Safety Inspection Checklist.

d) Verify that all safety equipment identified in section 3.7 above has been appropriately inspected for proper functioning and that such equipment remains available. This may be documented on the Laboratory Safety Inspection Checklist.

e) Verify that local exhaust ventilation devices (fume hoods, biosafety cabinets, gloveboxes, containment devices) have received annual inspections/certifications as required in 3.5.4.7(b), 3.5.5.3, and 3.5.6.4.

3.8.1.3) Inspections by Unit/Departmental Safety Coordinator (USC)

The Unit Safety Coordinator shall:

a) As a minimum, annually inspect/review each lab within his/her jurisdiction for compliance with this laboratory safety manual, lab-specific Standard Operating Procedures and/or applicable Laboratory-Specific Safety Plans.

b) Inspect/review a laboratory when there is reason to believe that the laboratory is not in compliance with the requirements of this Laboratory Safety Manual, lab-specific Standard Operating Procedures and/or Laboratory-Specific Safety Plans.

The Unit Safety Coordinator should:

c) Perform brief inspections on a periodic basis at a frequency determined by the nature of the hazards present in the laboratory and the history of safety performance within the laboratory.

d) Document the inspection using either the Laboratory Safety Inspection or other special check lists.

3.8.1.4) Inspections by EHS Dept. or Laboratory Safety Committee (LSC)

EHS/Laboratory Safety Committee may:

a) Perform random laboratory inspections/reviews to monitor compliance with this laboratory safety manual, or in response to requests for assistance. Such inspections/reviews shall not be performed without first notifying the appropriate Laboratory Supervisor or the Unit Safety Coordinator.

b) Perform unannounced laboratory inspections in response to complaints or emergencies. Every attempt will be made to notify the Laboratory Supervisor or Unit Safety Coordinator upon arrival prior to initiating such an investigation.

Note: Announced and unannounced inspections by the Radiation Safety Service of laboratories with radioactive materials are mandated and "shall" occur.

EHS shall:

c) Recommend appropriate remedial action to the Authorized Laboratory Supervisor when non-compliance with this Laboratory Safety Manual, laboratory-specific Standard Operating Procedures or Laboratory-Specific Safety Plans occur. See 3.8.3 below.

d) Report to the Laboratory Safety Committee any substantive deficiencies in compliance with the requirements of this Laboratory Safety Manual by any individual or unit when appropriate remedial or corrective action cannot be negotiated with the Authorized Laboratory Supervisor. The report shall contain EHS recommendations for corrective action. See 3.8.3 for detailed procedures involving non-compliance.

e) Withdraw "Authorized Laboratory" status when it is the professional judgment of EHS that conditions warrant such action because of an immediate and imminent threat to health or safety. (EHS shall be prepared to justify such action to the Laboratory Safety Committee.)

3.8.1.5) Inspections by Regulatory Agencies

The University of Kansas does not control the inspections performed by regulatory agencies. The University of Kansas must cooperate with such inspections and make records, laboratories, and personnel/students/visitors available to the authorized agencies during an inspection.

The EHS Dept., Laboratory Safety Committee, Authorized Laboratory Supervisor, Authorized Users, and Authorized Occupants shall:

a) Provide records as requested by such agencies.

b) Make laboratories and facilities available for inspection as needed.

c) Be available for interviews as needed.

*3.8.2) Hazard-Specific Inspections

3.8.2.1) Chemical — No hazard specific inspection required at this time.

3.8.2.2) Biosafety — No hazard specific inspection required at this time.

3.8.2.3) Ionizing Radiation See Part IV

3.8.2.4) Laser See Part V.

3.8.3) Deficiencies, Violations, Corrective Actions and Disciplinary Procedures

3.8.3.1) Corrective Actions for an Isolated Occurrence of Non-compliance

Authorized Users shall:

a) Immediately discontinue a practice identified as in non-compliance with this Laboratory Safety Manual and implement one that is in compliance.

b) Not carry out laboratory procedures with equipment or facilities that are not in compliance with the requirements of the Laboratory Safety Manual unless a temporary written waiver of the requirement has been granted by EHS together with a time limit for re-establishing compliance with the Laboratory Safety Manual.

Note 1: Such waivers will be granted only for "minor non-compliance" conditions when immediate corrections are not feasible and may include special administrative procedures for retaining equivalent safety.

Note 2: Reporting requirements are specified in section I-2.5.4.

Authorized Laboratory Supervisors shall:

c) Enforce the requirements of the Laboratory Safety Manual in their laboratory and implement corrective actions immediately if feasible when non-compliance has been identified.

d) Contact EHS at 4-4089 if it is not feasible to take corrective actions immediately and request an evaluation by them for the actions that should be taken -- e.g., cessation of procedures that are in non-compliance or continued work under a waiver granted by EHS. See b) above.

e) Stop all affected procedures immediately when serious non-compliance and/or imminent danger exists whether identified by themselves or EHS.

f) Follow directives given by EHS for correcting noncompliant conditions and actions. These include the following Laboratory Safety Manual mandated procedures:

1) Not resume work after a "stop work" order until the appropriate corrections have been made, **including** a written evaluation of the causes that produced the "imminent danger" and a protocol designed to prevent recurrence of the condition have been submitted to and approved by the Laboratory Safety Committee and EHS.

Note: If, based upon the judgment of EHS, the informal process specified in the note under j) below is justified, work may be resumed upon authorization by EHS with concurrence of the Laboratory Safety Committee before the written approval has been issued by the Committee.

2) File a written report with EHS within one week of an identified "serious violation" that addresses the causes and the steps that will be taken to prevent recurrence of such violation.

g) (May) appeal to the appropriate subcommittee of the Laboratory Safety Committee for relief from requirements placed upon them by EHS subsequent to identification of non-compliance if it is believed the requirements are not reasonable, not appropriate, and not based upon the requirements of this Laboratory Safety Manual and applicable federal, state and local regulations.

Note: Compliance with EHS directives is required until a written evaluation and resolution of the contested requirements has been received from the Committee by the Authorized Laboratory Supervisor. Compliance with Committee directives is mandatory unless overruled by the Provost in a written directive to the Committee.

The EHS staff shall:

h) Recommend corrective actions (based only upon safety and regulatory requirements) to Authorized Users and the Authorized Laboratory Supervisor whenever non-compliance items have been identified by them.

Note: Non-compliance items may have been identified during inspections, as a result of a report, or during the performance of routine services.

i) Issue a "Stop Work" order if "imminent danger" may result from the non-compliance. Such an order may be verbal or written.

j) Submit a written report of the incident involving "imminent danger" including proposed corrective actions to the Supervisor with copies to the Chair of the Department involved and the Laboratory Safety Committee. The report shall include the report specified in f.1) above.

Note: Phone conferences, electronic notifications, or on-site conferences may be used to implement corrective actions on a more timely basis if it is judged expedient to do so. If any of these procedures are adopted, documentation of such conferences and notifications including the recommendations adopted shall be maintained by EHS. The reports specified in this section and f.1) above shall be filed within one week of the incident. The report shall include the documentation specified in this note.

k) Submit a report of EHS-approved resolution for "serious non-compliance" to the Authorized Laboratory Supervisor and the Chair of the involved Department.

l) Document incidents of "minor non-compliance," including the date, in the standard forms used by EHS in inspections.

The appropriate subcommittee of the Laboratory Safety Committee shall:

m) Evaluate, make appropriate recommendations, and establish appropriate requirements as needed when any report or request is submitted to it by a user, laboratory supervisor or EHS concerning issues of non-compliance.

n) (May) request a meeting of the full committee if it is deemed expedient to obtain its recommendations.

3.8.3.2) Corrective Actions for Repeated and/or High Frequencies of Non-compliance

EHS shall:

a) Direct the Authorized Laboratory Supervisor to file a written protocol that must include changes in the Laboratory-specific Standard Operating Procedures that are designed to reduce and control the frequency of Non-compliance.

b) Submit a written approval (including additional requirements if deemed necessary by EHS) of the submitted protocol to the Authorized Laboratory Supervisor, the Chair of the Department and the Chair of the appropriate Laboratory Safety subcommittee. See also section 3.8.1.4.e.

c) Request a meeting that includes, as a minimum, the appropriate Laboratory Safety subcommittee, the appropriate EHS Safety Officer, and the involved Authorized Laboratory Supervisor when the Non-compliance are not addressed in a timely manner by the Authorized Laboratory Supervisor.

The Chair of the appropriate Laboratory Safety Committee shall:

d) Arrange for a meeting of the subcommittee when requested to do so by EHS.

e) Include additional individuals in the meeting as needed.

This may be based upon the recommendation of the EHS or the judgment of the Chair of the subcommittee. This could include involved Authorized Users, Authorized Occupants and/or the Chair of the involved Department.

The appropriate subcommittee of the Laboratory Safety Committee shall:

f) Make binding recommendations for the procedures to be followed and/or restrictions to be imposed for the purpose of reducing and controlling the frequency of noncompliant incidents and for restoring a safe environment in the laboratory based upon the deliberations at that meeting between committee members, the EHS Safety Officer and the other individuals present at the meeting.

g) These recommendations shall include the specific provisions for how the laboratory will be monitored for compliance, the length of time for special monitoring, and how the Non-compliance index will be used to flag additional actions.

Authorized Users and Authorized Laboratory Supervisors shall:

h) Follow the directives of EHS and/or appropriate Laboratory Safety subcommittee.

Note: If an appeal has been filed for action at a higher level, compliance with directives is required until the appeal has been acted upon and directives based upon the appeal have been submitted in writing to both EHS and the Authorized Laboratory Supervisor.

3.8.3.3) Classification of Levels of Non-compliance

The following are the definitions for the various levels of Non-compliance.

a) Imminent Danger Non-compliance

Any situation in the laboratory that could reasonably be expected to cause death, serious injury or illness, or significant risk to the environment.

b) Serious Non-compliance

Any situation in the laboratory in which the non-compliance creates a condition where the capability to protect an individual(s) from safety and health hazards is compromised, or in which the capability of keeping exposures below applicable exposure limits has been compromised.

c) Minor Non-compliance

Any Non-compliance situation not included under imminent danger or serious Non-compliance.

3.8.3.4) Disciplinary Actions

Introductory note: Sections 3.8.3.1 and 3.8.3.2 are not disciplinary actions. They are designed to provide a safe environment on campus and, to the extent possible, will be carried out in the spirit of mutual cooperation. This section addresses procedures to be followed when mutual cooperation has not been achieved and deliberate non-compliance or apparent negligence has been identified.

Authorized Laboratory Supervisors shall:

a) Initiate disciplinary procedures in accordance with the applicable handbook or code (student, staff, faculty) and in keeping with established university grievance procedures against any individual in a laboratory who deliberately refuses to conform with the requirements of the Laboratory Safety Manual or who is negligent in observing safety requirements.

EHS shall:

b) Report in writing to the appropriate subcommittee and the chair of the department or unit any incident involving deliberate non-compliance with the Kansas University Safety Program and related federal, state and/or local regulations and/or negligence in observing safety requirements. This report shall include documentation of the evidence supporting the assessment of deliberate non-compliance or negligence.

c) In any situation of imminent danger or serious non-compliance that may result in safety and health hazards if the laboratory continues to be used, close the laboratory to the individual(s) who has (have) not complied until such time of resolution of the disciplinary action or correction of the identified non-compliance, whichever occurs first.

Note: The manner in which differences of opinion between the Authorized Laboratory Supervisors and EHS concerning the meaning and/or applicability of specific portions of the Kansas University Safety Program are to be resolved has already been addressed in 3.8.3.1 and 2 of this manual. If an individual refuses to follow the requirements of those sections, deliberate non-compliance is involved.

The appropriate subcommittee of the Laboratory Safety Committee shall:

c) Initiate hearings involving the alleged "deliberate non-compliance" or "negligence" in keeping with applicable university handbooks, codes and/or grievance procedures.

*3.9) Prior Hazard Registration and Procedure for Obtaining EHS Safety Authorizations for Level III and IV Laboratories

Explanatory Note: All laboratories will be identified for the types of hazards that are present – chemical hazards, biohazards, ionizing radiation hazards, and/or laser hazards. For each of these the magnitude of the hazard will be assigned as Level I, II, III or IV (increasing hazard with increasing number). Laboratories at Levels III and IV will be subject to additional laboratory-specific safety requirements specified in an EHS-approved **Laboratory-Specific Safety Plan (LSSP)** at Level III and an EHS and Laboratory Safety Committee-approved LSSP at Level IV. (See Section I of this Part for the rationale for this procedure.) This section provides the procedures by which types and levels of hazards in each laboratory will be assigned and the procedures that will initiate the process by which additional EHS and, if needed, Laboratory Safety Committee-approved LSSPs for Level III and IV laboratories may be established.

*3.9.1) Responsibilities of Authorized Users

Authorized Users shall:

3.9.1.1) Obtain prior approval from their laboratory supervisor before procuring or using any Hazardous Materials/Radiation Generating Devices in accordance with all parts of this Manual and this section (I-3.9).

*3.9.2 Responsibilities of Authorized Laboratory Supervisors

Authorized Laboratory Supervisor shall:

3.9.2.1) Submit a completed copy of the **Laboratory Hazard Registration** form, an updated chemical inventory, and a Lab Safety SOP upon implementation of this University Safety Plan. Thereafter submit an updated registration request prior to any change in the mission of the laboratory that would change either the type of hazards present or the Level of the hazards present.

Criteria that place a laboratory at Level III or IV are identified by a review of the hazard registration form, chemical inventory,, any pertinent safety documents, as well as a physical review of the lab space and equipment. This is repeated for chemicals in Part II-Section 3.9, for biohazards in Part III-Section 3.7, for radioactive materials and/or radiation generating devices in Part IV-Section 7, and for lasers in Part V-Section 3.9. (Note: This registration provides the required initial notification to EHS of the hazards present in the laboratory and initiates the process by which the necessary Laboratory-Specific Safety Plans LSSPs will be established for Level III and IV laboratories.

3.9.2.2) Upon notification by EHS of its receipt of the Laboratory Hazard Registration form initiate Level I and II activities identified in the hazard identification except for the use of materials or equipment that emit ionizing radiation. (The latter require LSSPs even at Levels I and II. Under our radioactive materials license, the LSSPs are called "permits." See Part IV if such use is planned.)

An updated Laboratory Hazard Registration form shall be submitted when a new type of hazard is introduced into the laboratory even if it is at Level I or II. For example, a laboratory that initially has been using chemicals but no biohazards shall not introduce biohazards into the laboratory unless registration with EHS has been accomplished.

Note: Upon receiving the Laboratory Hazard Registration form, the EHS Department will propose an overall hazard level for the laboratory when many different types of hazards are present in the laboratory. This will be done in consultation with the Authorized Laboratory Supervisor. If the EHS Department and the Authorized Laboratory Supervisor cannot agree on the hazard level, the Laboratory Safety Committee will review the hazard levels in that laboratory and its recommendations are final.

3.9.2.3) Submit all safety information requested by EHS staff (who will request the information using appropriate forms) for all activities that are planned at Levels III and IV. The process by which the necessary Laboratory-Specific Safety Plans (LSSPs) are to be developed is described below in section 3.9.3 below.

3.9.2.4) Obtain hazardous materials (HM) or radiation generating devices (RGDs) requiring Level III or IV LSSPs only after receiving notification from EHS that the LSSPs have been appropriately approved. Note: Remember that this applies at Level I and II as well for the use of radioactive materials or machines that generate ionizing radiation.

3.9.2.5) Begin use of Level III or IV HM/RGDs **only** after receiving the written **Safety Authorization** from EHS. Note: The Safety Authorization will be granted only after EHS has inspected the facility and has verified that all safety requirements specified by the approved LSSPs have been met. This includes verification that the Laboratory Supervisor has been appropriately trained. See 3.9.3.8 below.

3.9.2.6) Permit laboratory personnel, students, or visitors to use such materials/equipment only after they have received documented safety training required by this Plan which includes training in the procedures and conditions specified in all applicable LSSPs.

3.9.3) Procedures for Obtaining an EHS Safety Authorization for Activities at Level III and IV. Prospective Supervisors are encouraged to discuss plans with EHS very early in the planning stages–even prior to completing the hazard registration form that initiates the process.

3.9.3.1) The Laboratory Supervisor shall complete and submit an updated Hazard Registration form to EHS, whenever plans for a change in the type and/or Level of activities at Level III or IV are being made.

3.9.3.2) Upon receipt of the Hazard Registration form the EHS shall provide the forms to the Laboratory Supervisor that will provide instructions concerning the types of safety information (engineered controls, facilities, SOPs) to be addressed in the proposed Laboratory- Specific Safety Plans (LSSP(s)).

3.9.3.3) The Laboratory Supervisor shall complete and submit one copy of proposed Level III LSSP(s) to EHS and six copies of proposed Level IV LSSPs.

3.9.3.4) The EHS Department /Laboratory Safety Committee shall review the proposed LSSP(s) for adequacy in safety at the level of activities requested. This evaluation will be based upon the proposed safety facilities/equipment and appropriate Standard Operating Procedures (SOPs) taking into account any applicable federal, state and local regulations and the requirements of this Manual.

3.9.3.5) If deficiencies in the proposed LSSP(s) are identified by the EHS Dept. /Laboratory Safety Committee, EHS and the Laboratory Supervisor shall plan appropriate changes that will then be resubmitted by the Laboratory Supervisor for approval by the EHS Department /Laboratory Safety Committee.

Note: Some requirements may not be negotiable. In that case, they become EHS/Laboratory Safety Committee specified conditions in the LSSP.

Note: Wherever “the EHS Department/Laboratory Safety Committee” appears in these steps, it is to be understood that only the EHS needs to review Level III LSSPs. Both EHS and the appropriate subcommittee of the University Laboratory Safety Committee are involved when the LSSP is for a Level IV laboratory. A Laboratory Supervisor has the option of requesting a review by the appropriate Laboratory Safety subcommittee if disagreements with EHS concerning requirements cannot be resolved for proposed Level III LSSPs.

3.9.3.6) Upon approval of the proposed LSSP(s), EHS shall notify the Laboratory Supervisor of that approval.

3.9.3.7) Upon receiving approval of the LSSP(s), the Laboratory Supervisor shall prepare the laboratory to meet all conditions specified in the approved LSSP and then request an inspection by EHS.

Note #1: Hazardous Materials shall not be procured until the EHS approves the facility. In the case of Radiation Generating Devices, the procurement and installation of the devices shall be accomplished in collaboration with the appropriate EHS personnel and shall not be energized until EHS issues the Safety Authorization described in 3.9.3.8 below.

Note #2: No individual may use such HM/RGDs until he/she has satisfactorily documented all required training. This includes the Laboratory Supervisor and all other potential users. The Laboratory Supervisor is urged to address these issues in consultation with EHS as soon as plans for a Level III or IV laboratory are anticipated.

3.9.3.8) When all the conditions of the approved LSSP(s) have been met as verified by EHS, it shall issue a written Safety Authorization to the Laboratory Supervisor that references all documents associated with the approved LSSP(s).

Note: For LSSPs involving radioactive materials/ionizing radiation generating devices substitute "permit" for Safety Authorization.

3.9.3.9) Upon receiving the Safety Authorization from EHS, the Laboratory Supervisor may initiate use of the materials/equipment under the conditions of the applicable LSSPs and this Manual.

Note #1: All LSSPs will automatically contain a commitment to contact the EHS and notify them of the procurement of Level III or IV materials.

Note #2: All LSSPs must establish designated areas in the lab for use of Level III and IV materials (e.g., a hood, lab bench, or glove box) and identify their presence by appropriate signs and postings.