Design Guidelines for Radiation Use Laboratories

This section provides general design guidelines on research laboratories where radiation sources and equipment will be used. The design should involve key decision makers including, but not limited to EHS, PIs, UH Fire Marshal, Facilities Management, Facilities Planning & Construction, etc. The team composition should be confirmed with the Project Manager. These guidelines are in addition to the *UH Campus Design Guidelines & Standards, Section 12.0 a - Laboratory Buildings.*

Radiation use areas may require different technical considerations depending on the type of radiation (RAM, X-ray, and Laser). Design of radiation use areas will require detailed evaluation by the Radiation/Laser Safety Officer. The intent here is to ensure that health and safety hazards associated with proposed facilities shall be anticipated and carefully evaluated early at the design stage.

Radioactive Material Use Locations

Radioactive material use is regulated by a Radioactive Materials License, issued by the Texas Department of State Health Services in agreement with the Nuclear Regulatory Commission. Design guidelines below, will promote health and safety of personnel, regulatory compliance and ensure minimal impact to the environment.

- Facilities with potential use of radioactive material shall be designed with adequate ventilation systems such that, in the event of an accident, they can be shut down and isolated to contain radioactivity.
- Air flow shall be from clean to contaminated areas
- The laboratory shall have adequate access control to ensure security of regulated radiation sources and device such as x-ray machine and Class 3b and 4 lasers. Multi-use facilities require the use of card keys to address concerns associated with the issuance of many conventional keys. Lockable doors and cabinets should be provided.
- Radiation shielding design for high-energy gamma and x-ray emitters must be approved by the Radiation Safety Officer (RSO)/EHS.
- All radioactive material use locations shall be provided with sink for hand washing. Sinks shall be constructed of impervious material such as stainless steel.
- “High, Very High, or Airborne” radiation areas warrant additional requirements by the Radiation Safety Committee, RSO or designee.
- For radioactive material use areas, floors shall be constructed of a seamless material, preferably made of a single piece without grouting. The surface shall be sealed and not carpeted to allow easy cleaning during spill and contamination.

Ionizing Radiation Generating Machines

Machine produced radiation comes in a variety of forms and present different challenges. Institutional approvals by the RSC, State regulatory registration requirements, and licensing and shielding considerations may apply. The RSO shall be involved at the early stages of design to ensure registration, licensing, and shielding are properly addressed. Shielding requirements include:

- The shielding design must be prepared by a Board Licensed Physicist.
- All shielding design, including final construction drawings shall be reviewed and approved by the RSO and/or RSC as applicable prior to construction and operations.

Proposed changes to radiation use laboratories must be coordinated with the RSO/EHS Department before the start of the project.

Static Magnetic Fields

Facilities designed to house static magnetic fields shall comply with UH EHS Policy on Magnet Safety available at http://www.uh.edu/ehs/manuals.html as well as other UH and regulatory guidelines. In addition to the general hazards associated with magnetic fields, persons with cardiac pacemakers, prosthetic limbs, insulin pumps and aneurysm clips face additional safety and health concerns from magnet use areas with field strength above 5.0 Gauss. The design guidelines in the EHS Policy on Magnet Safety will ensure health and safety of persons susceptible to exposure to magnetic fields in excess of 5.0 Gauss.

Guidelines for Radiation Laboratories Changes and Services

Changes and services in a radiation laboratory should be done properly and in a safe manner in coordination with laboratory personnel. These include laboratory moves, modifications, maintenance, and housekeeping. Special considerations must be given for equipment moves, transfers, or disposal.

All unwanted radioisotopes, radioactive samples, and radioactive wastes should be disposed of properly as described in the waste disposal section of this manual prior to a move. All obsolete x-ray machines, lasers, and radiation labeled equipment should also be disposed in coordination with the Radiation Safety Officer using an amendment. Laboratories no longer using radioactive material must be decontaminated and a final survey and wipe test taken to show compliance. The PI must also submit an amendment application to delete a closed lab from their sublicense or subregistration.

PIs may move their own radioactive material in consultation with the RSO, but sturdy containers must be used. These containers must be able to contain any liquid from breakage and shielding must be considered. Care must be taken to assure that contamination is minimized. The Labor Crew will not move and Property Management

will not accept or dispose of any radiation or radioactive labeled equipment without the prior authorization of the RSO and EHS Department.

The RSO will verify that the labs are completely cleared of radioactive material, radioactive wastes, and radiation labeled equipment prior to close out. Radiation Safety personnel will perform a final survey and wipe test and then remove all signage. **New faculty may not take over and move into the labs until they are released by Radiation Safety.**

PIs authorized to obtain and use radioactive materials and/or radiation producing devices leaving the University must follow the Principal Investigator Checkout Procedure on EHS website www.uh.edu/ehs. In addition, the PI must send a written notice to the RSO with final departure date from UH to EHS-1005 or via email at least 30 days prior to departing. Radiation Safety Personnel will audit the location at the final date of occupancy or within 2 business days to clear and release to the University department.

It is the responsibility of the PI to assure that the area in the lab to be modified or receive maintenance is free of radioactive contamination and/or presents a minimal radiation exposure hazard. Radiation Safety can be contacted for assistance. All work with radioactive materials, x-ray machines, and lasers should cease while the modification or maintenance is being carried out. Direct support and supervision by laboratory personnel should be provided as needed for Facilities Management (Plant Operations personnel) or external contractors. Custodial personnel or routine maintenance workers must also be protected and given specific instructions on how and when such work can be performed.

X-ray machines and lasers cannot be moved, transferred, disposed or scrapped for parts without prior notification and approval of the RSO. The PI must submit an amendment form to delete listed equipment from their subregistration. PIs may not transfer x-ray machines and lasers to another researcher unless that individual is authorized and pre-approval from the RSO granted. X-ray machines and lasers must be rendered inoperable prior to disposal. X-ray tubes must be removed and power cords cut. Verification by Radiation Safety is required. X-ray machines and lasers must be inspected and approved by Radiation Safety prior to startup after each move. Appropriate safety devices must be in place and functional as required.

Radioactive materials labeled equipment such as refrigerators, freezers, centrifuges, incubators, fume hoods, etc. must not be moved into laboratories not authorized for radioactive material use. Surveys and wipe tests must be performed and documented. Contaminated equipment must be decontaminated to acceptable levels or below prior to move or disposal. Radiation Safety may verify the equipment for contamination. Labels and warning signs must be removed if the equipment is to be disposed.

Principal Investigators, along with the responsible department, not Radiation Safety is responsible for transferring or disposing of equipment. Radiation Safety will assist with procedures and associated paperwork and assuring that good health physics practices are followed and disposal is done in compliance with institutional policies and other applicable regulations.