



Module 4

Regulations and Standards



Topics:

- Regulated Sources of Radiation,
- Hierarchy of Standards,
- Radiation Protection Goals.



Regulated Sources of Radiation

What Needs to be Regulated?

- Byproduct Material,
- Source Material,
- Special Nuclear Material,
- Naturally occurring Radioactive Material (NORM),
- Ionizing Radiation Producing Devices.

Byproduct Material

- Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident of the process of producing or utilizing special nuclear material.

Source Material

- Uranium or Thorium or any combination of uranium and thorium in any physical or chemical form.

Special Nuclear Material

- Plutonium and Uranium enriched in the isotope 233 or in the isotope 235 but does not include source material.



NORM

- Naturally Occurring Radioactive Material, such as radium, and not classified as source material.

Radiation Producing Machines

- Electronic devices that are capable of emitting ionizing radiation.
- Examples are linear accelerators, cyclotrons, radiofrequency generators that use cyclotrons or magnetrons, and other electron tubes that produces x-rays.

Hierarchy of Standards

List of Radiation Protection Standards:

- Federal Laws and Regulations (Nuclear Regulatory Commission, NRC),
- State Laws and Regulations (Louisiana Department of Environmental Quality, LDEQ),
- LSU Radiation Safety Manual (RSM).

Federal Laws and Regulations

- Nuclear Regulatory Commission (NRC): safe use of radioactive materials for beneficial civilian purpose while protecting people and environment.
- Title 10 CFR: Provides regulation basis for radiation safety and protection.
- NRC regulates commercial nuclear power plants and other uses of nuclear materials, such as in nuclear medicine, through licensing, inspection and enforcement of its requirements.

State Laws and Regulations

- Louisiana Administrative Code Title 33 Environmental Quality Part XV. Radiation Protection.
- Since Louisiana is an Agreement State, Department of Environmental Quality is the regulatory agency for radiation safety and protection.
- Emergency and Radiological Services Division under Office of Environmental Compliance issues specific licenses for the receipt, possession, distribution, use, transportation, transfer, and disposal of radioactive material.

LAC 33, Part XV, Chapter 4

- Occupational dose limits,
- Radiation dose limits for individual members of the public,
- Surveys and monitoring,
- Control of exposures from external sources in restricted areas,
- Respiratory protection.

LAC 33, Part XV, Chapter 4, Cont.

- Storage and control,
- Waste disposal,
- Records,
- Reports,
- Enforcement.

Other Chapters of LAC 33, Part XV of Interest

- Chapter 6. X-Rays in the Healing Arts.
- Chapter 7. Use of Radionuclides in the Healing Arts.
- Chapter 8. Radiation Safety Requirements for Analytical X-Ray Equipment.
- Chapter 9. Radiation Safety Requirements for Particle Accelerators.

LSU Radiation Safety Manual

- The Radiation Safety Manual is the document that describes the rules, procedures, and guidelines for using radioactive material and radiation producing machines at LSU.



Radiation Protection Goals

Radiation Protection Goals

- Exposure to faculty, staff, students, the public, and the environment will be maintained as low as reasonably achievable, and that no radiation exposure will be received without societal benefit.
- This is accomplished through good radiation safety practices and the use of:
 - Time (decrease your time from the source of radiation when possible),
 - Distance (increase your distance from the source of radiation when possible),
 - Shielding (utilize shielding between you and source of radiation when possible).

Radiation Protection Philosophy

- Benefits must outweigh the risk.
- Keep Radiation Doses AS LOW AS REASONABLY ACHIEVABLE (ALARA).

Radiation Protection Objectives

- Prevention of Non-Stochastic Effects:
 - Severity varies with magnitude of dose,
 - Health effects have a threshold dose,
 - Examples: cataracts and impairment of fertility.
- Limit Risk of Stochastic Health Effects:
 - Severity independent of dose (both Somatic and Genetic),
 - Examples: leukemia and malignant tumors.