

**RADIATION SAFETY PROGRAM OVERVIEW**

ENVIRONMENTAL HEALTH & SAFETY RADIATION SAFETY PROGRAM

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# INTRODUCTION

The purpose of this manual is to provide an overview of the radiation safety program and describe the best practices for operations involving radioactive materials, radiation-generating devices, and high-energy lasers. In general, specific Nuclear Regulatory Commission (NRC) and Mississippi State Department of Health (MSDH) regulations are not restated. However, it is important to note that all such regulations are applicable and binding for personnel working with or using radioactive materials and/or ionizing radiation-generating devices at the University. **Please see the Radiation Safety Policy for further details regarding regulatory compliance.**

The State of Mississippi is an NRC Agreement State, operating a State program of radiation safety which satisfies the requirements of Federal laws and regulations. The control of radiation in Mississippi is under the regulatory direction of the Division of Radiological Health (DRH) of the MSDH as mandated by State law. According to the Mississippi Radiation Protection Law of 1976, the regulations set forth by the DRH have the force of law.

This manual, part of the University's Broad Scope License, contains an overview of procedures for acquiring authorization to use, purchase, possess, or have radioactive material, radiation generating devices, or high energy lasers (Class 3B and Class 4); procedures for ordering or otherwise acquiring radioactive materials; safety precautions to follow when using radioactive materials, sealed sources, or other ionizing radiation producing devices; emergency procedures for handling accidents involving radioactive materials, sealed sources, or other radiation producing devices; and procedures for requesting the disposal of radioactive materials or radiation generating devices.

# RADIATION SAFETY COMMITTEE

**2.1. Overview and Composition of RSC**

The Radiation Safety Committee (RSC) is a committee of technical and administrative personnel charged with the responsibility of establishing and maintaining a comprehensive radiation protection and safety program at the University. The RSC reports to and makes specific recommendations regarding radiological safety to the Chancellor (Executive Manager as defined by NUREG-1556).

* The RSC is comprised of the Radiation Safety Officer (RSO) and Laser Safety Officer (LSO) as well as at least 3 individuals with demonstrable expertise in the use of radioactive materials, radiation-generating devices, and/or high-energy lasers.
* The Chair of the RSC is elected by the members, with the concurrence of the Chancellor (or designee), to serve for a two-year term.
* The Office of Research Integrity and Compliance coordinates and provides administrative support for the RSC, including recordkeeping for all committee matters.

**2.2. RSC Meetings**

* The RSC meets no less than every six months. The RSC can meet more often at the request of any member of the committee, at the direction of the Chancellor, or at the request of the Office of Research Integrity and Compliance or the Research Environmental Compliance Officer.
* All members of the RSC have the right to vote on any action brought before the committee. A quorum must be present at any meeting requiring any action of the committee. A quorum is defined as more than 50% of the assigned members. Actions are passed by the committee when a simple majority greater than 50% of the members present vote in favor of the action.
* An action can be introduced during regular or special committee meetings and may be voted on during the meeting or deferred to a specific subsequent meeting. Additionally, actions of the committee may be introduced and voted on by e-mail, providing that more than 50% of the members return a ballot prior to the deadline delineated on the ballot.

* 1. **RSC Functions**
  + Advises the RSO, when necessary or requested, on all matters pertaining to the radiological safety of all University programs involving radioactivity, ionizing radiation exposure, radiation-producing devices, and high-energy lasers.
    1. Radioactivity refers to the spontaneous emission of ionizing radiation from any material (solid, liquid, or gas).
    2. Ionizing radiation describes high energy photons (x- ray, some ultraviolet wavelengths and gamma) and other high energy particles (alpha, beta, and other nucleons) which are capable of producing ionization in substances they pass through.
    3. LASER- Acronym for Light Amplification by the Stimulated Emission of Radiation. A laser is a device that stimulates atoms or molecules to emit light at particular wavelengths and amplifies that light, typically producing a narrow beam of non-ionizing radiation.
    4. Class 3B LASER- lasers or laser systems that emit between 5 and 500 milliwatts (mW) and can cause injury if someone views the beam directly. Class 3B lasers can produce eye injury before the aversion response takes over.
    5. Class 4 LASER- laser or laser systems that emit powers greater than 500 milliwatts (mW) and can cause injury if someone views the beam directly or views a reflection of the laser beam. Class 4 lasers present a hazard for eye and skin injury, can produce laser-generated air contaminants, and can cause fires from interactions of the beam with flammable materials.
  + Reviews, approves, or withholds approval of applications, protocols, and proposals for the use of radioactive materials, radiation-generating devices, as well as Class 3B and Class 4 Lasers within the institution from the standpoint of radiological safety.
  + Reviews and prescribes special conditions, requirements, and restrictions as necessary to protect University personnel and the general population from health hazards associated with the use of radioactivity and radiation generating devices at the University.
    1. Conditions, restrictions, and requirements in all cases will be made in accordance with all applicable Federal and State regulations.
    2. As delineated in the Radiation Safety Policy, RSC approval must be obtained in writing before any project involving radioactivity, radiation producing devices, or high energy lasers are initiated.
  + Prescribes such special conditions and requirements as necessary in connection with the ordering, handling, usage, storage, and disposal of radioactive material, radioactive waste, contaminated equipment, radiation generating devices, and high energy lasers, in addition to their associated laboratories and storage areas so as to promote radiological safety.
    1. These conditions and requirements may include, but are not limited to, physical examinations, additional training, designation of a limited area of use, disposal methods, survey requirements, and any other conditions or requirements deemed reasonable and prudent by the committee.

# RADIATION SAFETY OFFICER (RSO)

At the University of Mississippi, the RSO carries out the responsibilities prescribed by the NRC and MSDH for both the “Radiation Safety Officer” and “Laser Safety Officer”. The RSO has the authority and responsibility to:

* + - Disseminate information on radiation health physics
    - Implement or execute policy decisions regarding radiological safety made by state and federal regulations, ANSI standards, and University policies
    - Review all proposals, protocols, and user applications involving the use of radioactive materials, radiation-generating devices, and high-energy lasers
    - Submit all extraordinary protocols, procedures, and all user applications to the RSC for review and approval
    - Perform unannounced inspections and radiation contamination surveys of any University facility
    - Perform safety inspections of lasers and laser systems both before operations begin and periodically afterwards
    - Perform or supervise declassification surveys of all areas and equipment, when requested
    - Review all construction plans of new radioisotope and radiation facilities subject to these regulations from the standpoint of radiological safety. Recommend approval or disapproval of such plans based upon radiological considerations to the Research and Environmental Compliance Officer
    - Obtain and maintain all licenses and registrations necessary for the use of radioactive material at the University
    - Order, receive/ship, monitor and inventory all radioisotopes and sources of radiation purchased or otherwise procured for use at the University, dispose of all radioactive waste in accordance with applicable Federal, State, and local laws and regulations
    - Review of purchases and acquisitions of lasers, and the maintenance of updated laser inventories throughout the University
    - Administer the personnel monitoring program for the University
    - Maintain appropriate records and provide timely and necessary reports of exposure to all persons enrolled in the dosimetry program
    - Exercise emergency powers in accordance with the University of Mississippi Hazardous Material Contingency Plan, order the evacuation of areas, or the immediate cessation of work in areas, where the use of radioactive material or radiation generating devices or high energy lasers pose an immediate threat to life and health, or where it is evident that the health hazards of continued work would result in violation of existing Federal, State, or local regulations
    - Order remedial actions to alleviate violations of regulation, license, or law
    - Provide updates to and work as a liaison between the University and the MSDH Division of Radiological Health
    - Provide overall administrative direction for the radiation safety program of the University

Note: In the event of a conflict or dispute between the RSC and the RSO over a policy or direction not covered by this manual, the matter will be referred to the Executive Management for resolution.

# AUTHORIZATION OF PERSONNEL

As delineated in the Radiation Safety Policy, all personnel (faculty, staff, visitors, and students) working with or handling radioactive materials or operating radiation producing devices or high energy lasers are required to be “Authorized Users”. Authorization may be granted to individuals by the RSC provided that the applicable requirements of this section are met.

The qualifications of each applicant or user of radioactive material or radiation producing devices or high energy lasers will be evaluated by the RSO. Authorization to use radioactive materials or radiation producing devices or high energy lasers may be granted to applicants who, in the opinion of the RSO, demonstrate the necessary ability to work with radioactive material, radiation-generating devices, and high energy lasers in a safe manner. Personnel should apply for authorization using which can be obtained from the University [website](https://app.smartsheet.com/b/form/b5c98f28fc264d71a57c715fd7b28144).

**4.1** **Individual Authorized Users**

To become an authorized user, the following provisions must be met:

* + - The individual completes the Authorized User request application found [here](https://app.smartsheet.com/b/form/b5c98f28fc264d71a57c715fd7b28144)
    - The applicant documents previous training and experience with radioisotopes to indicate proficiency in the areas of safe handling of radioactive materials, in regulatory compliance, and in the area of the proposed research or work involving the use, the handling of radioactive materials, or any radiation generating devices.
    - The applicant submits a history of past occupational exposures. In addition, the applicant must also submit a history of any exceptional medical exposures and meet any other special medical requirements that the RSC may stipulate.
    - The applicant completes the requisite Radiation Safety Training modules on CITI. Separate training modules are available for radiation safety and laser safety. The applicant should complete the pertinent modules.
    - For applicants who will be using radioactive materials or radiating-generating devices, the applicant must meet with the RSO to complete additional training and discuss dosimetry needs.

Following initial authorization, all users must complete retraining on CITI modules every three years in order to maintain authorization.

**4.2 Classroom Authorization**

Authorization for classroom use, rather than individual use, may be obtained from the RSO if the following provisions are met:

1. The classroom supervisor must obtain and maintain Individual Authorization.
2. At no time is radioactive material to be left in a classroom or laboratory unattended by the supervisor. All classroom radioactive materials are to be securely locked up after use to prevent inadvertent or intentional use, misuse, or theft of the radioactive material by unauthorized or unsupervised persons, including students.
3. The radioactive material to be used by the students must meet one of the following requirements:

* The materials are encapsulated sources of low activity.
* The radioactive material will not be directly manipulated by any student enrolled in the class but will be used by an instructor with the proper authorization, for the purpose of demonstration only, observing all appropriate radiological controls procedures and safety precautions.
* The radioactive materials generate radiation of low enough energy that personnel monitoring devices are not required.

1. The instructor of a class requesting the Classroom Authorization provision of these regulations will send a list of the persons who participate in the class to the RSO. The class roll is to contain the UM ID#’s of the persons named on the roll.

Note: The RSO has the authority to terminate authorization of personnel that fail to complete retraining and/or demonstrate a lack of compliance, as delineated in the Radiation Safety Policy.

# PERSONNEL MONITORING

The University and all people covered by this manual shall use, whenever practical, any procedure or control that will allow the occupational and public doses to radiation to be As Low as Reasonably Achievable (ALARA). The following describes dose limits and monitoring expectations.

**5.1 Occupational Dose Limits**

The RSC and RSO shall ensure that the occupational dose to authorized users at the University meets the following dose limits, as given in the “[Regulations for Control of Radiation in Mississippi,](file:///C:\Users\Cammi%20Thornton\Box\ORIC\Website%20and%20Current%20Forms\RSC\Regulations_Laws\Mississippi%20Regulations.pdf)”

* + - * 1. For adults, an annual limit, which is the more limiting of:
* The total effective dose equivalent (TEDE) to being equal to 5 rems (0.05 Sv), or,
* The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rems (0.5 Sv).
* The annual limits to the lens of the eye, to the skin, and to the extremities which are:
  + An eye dose equivalent of 15 rems (0.15 Sv), and
  + A shallow dose equivalent of 50 rems (0.5 Sv) to the skin or to any extremity.
    - * 1. For Minors
* PERSONS UNDER 18 YEARS OF AGE WILL NOT BE ALLOWED TO ENTER, OR TO WORK IN, AN AREA WHERE RADIOACTIVE MATERIALS ARE USED, STORED OR OPERATED.
  + - * 1. For Embryo/Fetus
  + Dose to an Embryo/Fetus, shall not exceed 500 mrem during the course of the pregnancy in accordance with the current version of the [Regulations for Control of Radiation in Mississippi](file:///C:\Users\Cammi%20Thornton\Box\ORIC\Website%20and%20Current%20Forms\RSC\Regulations_Laws\Mississippi%20Regulations.pdf).
  + Declared Pregnant Woman is defined as a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.
  1. **Dosimetry Program**
  2. Enrollment in the Dosimetry Program

Personnel are required to wear an appropriate monitoring device (Dosimeter) when any of the following apply:

* + - 1. Any person entering an occupational radiation environment in which he or she is likely to receive in excess of 10% of the Maximum Permissible Dose allowed by regulation of penetrating ionizing radiation
      2. Any person working with Beta emitters of energy greater than 0.25 MeV, which does not include Low Energy Radioisotopes such as H-3, C-14, S- 35, C1-36, Ca45, and Ni-63.
      3. Any person working with Neutron sources of any type.
      4. Any person working with Gamma Emitters of any type.
      5. Any person working with X-ray producing devices or sources.

In all circumstances, the dosimeter should be appropriate to the type and energy of the radiation to be encountered.

* 1. Dosimeter Use Expectations
* Personnel are to wear only the individual dosimeters assigned to them by the RSO.
* Dosimeters are to be stored away from sources of radiation, excessive heat, and moisture when not being worn by personnel for monitoring purposes. **Dosimeters must not be taken out of the laboratory unless authorized by the RSO.**
* Dosimeters assigned by the RSO for occupational exposure monitoring are to be worn only when the assignee is engaged in the occupation which requires monitoring. Except for medical personnel engaged in the performance of their duties involving radiation exposure, persons assigned dosimetry are not to wear dosimeters assigned by the RSO during diagnostic or therapeutic radiation exposure.
* All dosimeters will be processed by an approved National Voluntary Laboratory Accreditation Program (NVLAP) processor, as specified in Rule 1.4.17(3) of the [[Regulations for Control of Radiation in Mississippi](http://www.ehs.msstate.edu/files/2021-07/MSDH%20Regs%20for%20Control%20of%20Radiation%20in%20MS.pdf)](file:///C:\Users\Cammi%20Thornton\Box\ORIC\Website%20and%20Current%20Forms\RSC\Regulations_Laws\Mississippi%20Regulations.pdf).
  1. Annual Exposure Reports
* In accordance with the “[Regulations for Control of Radiation in Mississippi](file:///C:\Users\Cammi%20Thornton\Box\ORIC\Website%20and%20Current%20Forms\RSC\Regulations_Laws\Mississippi%20Regulations.pdf),” an annual report will be provided to monitored personnel for any portion of a fiscal year if:
  + The individual’s occupational dose exceeds 1mSv (100mrem) TEDE or 1 mSv (100 mrem) to any individual organ or tissue, or,
  + The individual requests their annual dose report.
* The annual exposure report will be distributed on DHS Form 87, "Annual Report of Radiation Exposure" within 30 days of the request, or within 30 days after the dose has been determined, whichever is later.
* Terminated personnel, who were monitored under the University dosimetry program during the calendar year of their termination, will be provided with one final notice of exposure upon request or on the same schedule given for current personnel.

A copy of the exposure data is permanently maintained by the University.

# RECORDS

Environmental Health & Safety will maintain records as required by the MSDH. In addition, Environmental Health & Safety reserves the right to maintain other records to protect the interests of the University, the local community, and the personnel associated with the University. A complete listing of records, required by the Division of Radiological Health, is contained in the "[Radiological Safety--Standard Operating Procedures](file:///C:\Users\Cammi%20Thornton\Box\ORIC\Website%20and%20Current%20Forms\RSC\Procedures\RSC%20SOP_2025.docx)."

# STANDARD OPERATING PROCEDURES

For Standard Operating Procedures (SOPs), please view the [Radiation Safety Program Standard Operating Procedures](file:///C:\Users\Cammi%20Thornton\Box\ORIC\Website%20and%20Current%20Forms\RSC\Procedures\RSC%20SOP_2025.docx).

* SOP 1: Procedures for the authorization of personnel
* SOP 2: Procedures for dosimetry
* SOP 3: Location classification
* SOP 4: Procedures for the procurement of radioactive materials, radiation generating devices, and lasers
* SOP 5: Registration of X-Ray devices
* SOP6: Registration of class 3B and 4 lasers
* SOP 7: Use of caution signs and labels
* SOP 8: General safety rules for radioisotope laboratories
* SOP 9: Radiation emergency procedures
* SOP 10: Procedures for personnel decontamination
* SOP 11: Calibration of instruments
* SOP 12: Sealed source leak testing
* SOP 13: Surveys
* SOP 14: Contamination surveys
* SOP 15: Radioactive liquid waste
* SOP 16: Radioactive solid waste
* SOP 17: Procedures for shipping radioactive materials
* SOP 18: Procedures for declassification of equipment and work areas

# 8 FORMS (to be added)