



**RADIATION
SAFETY
MANUAL**
JACKSON STATE UNIVERSITY

2013 Edition



Environmental Management Plan

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1. INTRODUCTION

1.1 Purpose

The purpose of this manual is to establish radiation safety policies for Jackson State University (JSU). This manual summarizes the procedures necessary to meet the requirements of the radioactive material license issued for non-human use radioisotopes at JSU. More detailed information can be obtained from the Regulations for the Control of radiation in Mississippi, prepared by the Mississippi State Department of Health (MSDH), and distributed by the Division of Radiological Health (DRH). This publication will be referred as the Regulations throughout this manual.

1.2 The License

Radioisotope users employed by JSU operate under MSDH Radioactive Material License No. MS-867-01. This license is issued by the MSDH under an agreement with the U.S. Nuclear Regulatory Commission (NRC) which names the MSDH Division of Radiological Health (DRH) as the agency solely responsible for licensing the use of radioactive material in Mississippi. The MSDH retains complete jurisdiction in such matters. A copy of the license is available for review, along with a copy of the Regulations, in the Chairman of JSU Radiation Safety Committee's office. JSU personnel authorized to use radioisotopes should retain a copy of this license, provided by the JSU Radiation Safety Committee, for review.

2. INSTITUTIONAL RADIOISOTOPE SAFETY COMMITTEE

2.1 Responsibilities

JSU Radiation Safety Committee (RSC) is composed of a group of primary isotope users appointed by the Vice-President of Research. The Committee meets as often as necessary to fulfill its function, but not less than once in 6 months. A quorum must be present when a committee meeting is held. A quorum is defined as any number greater than 50% of the appointed members. The RSC is responsible for:

- A. Ensuring that all individuals who work with or in the vicinity of radioactive materials have sufficient training and experience to enable them to perform their duties safely and in accordance with the Regulations, the conditions of the JSU license and this manual.

- B. Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with the Regulations, the conditions of the JSU license and this manual.

2.2 Duties

The Committee shall:

- A. Be familiar with all pertinent parts of the Regulations, the conditions of the license, and any information submitted in support of the license request or amendments.
- B. Review the training and experience of all individuals who use radioactive material and determine that their qualifications are sufficient to enable them to perform their duties safely and in accordance with the Regulations, the conditions of the license and this manual.
- C. Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material (e.g. security and housekeeping personnel).
- D. Review and approve all requests for use of radioactive material within the institution.
- E. Prescribe special conditions that will be required during a proposed use of radioactive material such as requirements for bioassays and special monitoring procedures.
- F. Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with the Regulations, the conditions of the license, and this manual. The review shall include an examination of all records, reports from the radiation safety officer (RSO), results of DRH inspection, written safety procedures, and the adequacy of the institution's management control system.
- G. Recommend remedial action to correct any deficiencies identified in the radiation safety program. Such remedial action includes rescinding an individual's privileges to utilize sources of radiation, by vote of the committee majority, when such action is necessary to prevent a continued breach of the provisions in this manual, the Regulations, or the conditions of the license

- H. Maintain written records of all committee meetings, actions, recommendations, votes taken, and decisions.
- I. Ensure that the radioactive material license is amended, when necessary, prior to any changes in facilities, equipment, policies, procedures, and personnel, as specified in the license.

2.3 THE CHAIRMAN OF THE RADIATION SAFETY COMMITTEE

The Chairman of the RSC shall:

- A. Serve as the administrative officer in promulgating the policies established by the committee,
- B. Perform the following duties:
 - 1) Keep a record of the action taken in approving the use of sources of radiation, communications, and reports involved in the work of the RSC.
 - 2) Act with the RSO when the RSO is absent from the facility.
 - 3) Act with the RSO for the Committee between meetings and report such actions taken to the Committee for Review at the next RSC meeting.
- C. Have the authority to:

After submitting amendment request to and upon the approval by Mississippi State Department of Health, he/she can issue approvals to utilize sources of radiation, based on properly submitted applications for use, between meetings of the RSC, and provided such approvals are reviewed by the RSC during the next committee meeting. At that time individuals shall be granted full approval, be granted limited approval with restrictions on use, or be denied continued use of radiation sources.

2.4. THE RADIATION SAFETY OFFICER

Authority for the enforcement of the RSC's rules and procedures, as well as the Regulations is vested by the Vice-President for Research in JSU Radiation Safety Officer.

- A. The JSU RSO shall have the authority to:

- 1) Make necessary immediate safety decisions, in accordance with the rules and procedures established by the RSC, as well as the Regulations.
 - 2) Ensure compliance with all aspects of this manual and the Regulations by all departmental personnel and individuals assigned to supervise radiation safety at the departmental level.
 - a. In the event of a conflict between JSU RSO and department official, the matter will be resolved by the Chairman of the RSC who may elect to call a meeting of the entire RSC, and the decision will be recorded.
 - b. In the event of a conflict between JSU RSO and the RSC in policy mattered not covered in this manual or the Regulations, the matter will be referred to the Vice-President of Research for resolution, and the decision will be recorded.
- B. The JSU RSO shall have the following responsibilities:
- 1) Advise the RSC in establishing radiation safety policy as it applies specifically to JSU.
 - 2) Over-all administrative direction of JSU Radiation Safety Office and the JSU Radiation Safety Program.
 - 3) Act as a liaison between the Division of Radiological Health and JSU.
 - 4) Produce and circulate radiation safety procedures in the form of this radiation safety manual which includes the control of research use of radiation sources.
 - 5) Ensure compliance with the conditions of the JSU radioactive material license, this manual, and the Regulation.
 - 6) Maintain an inventory of all radioactive materials at JSU every 6 months.
 - 7) Maintain a record of radioactive waste disposal, advise personnel on disposal methods, supervise disposal activities and approve all shipments of radioactive waste off site.
 - 8) Ensure that proper personnel radiation dosimetry methods are employed, maintain occupational exposure records on all personnel when required due to work with sources of radiation (including

documenting previous occupational exposures, notifications of unusual exposures, annual exposure notices, and termination exposure notices).

- 9) Act as the JSU site representative with regard to dosimetry vendors- approve any dosimetry changes by the departments and relay these changes to vendors.
- 10) Survey, at least quarterly, all laboratories where radioactive materials are employed.
- 11) Ensure that all labs. Sinks, refrigerators, and other equipment are posted as required by the Regulations and this manual.
- 12) Ensure that personnel acquire and use the proper survey meters and see that such instruments are calibrated annually.
- 13) Survey and document such surveys of packages containing radioactive materials as they are received.
- 14) Advise and/or assist in the case of spills or accidents involving radioactive material.
- 15) Produce and circulate a Radiation Disaster Manual for JSU. Establish a radiation disaster team which is to execute a disaster drill according.
- 16) Report radiation exposures in excess of the Regulations to the Division of Radiological Health as required.
- 17) Catalog the locations of all radiations devices and documents the schedule of evaluation by the Division of Radiological Health and/or JSU personnel.
- 18) In accordance with the training policies and procedures listed in this manual, ensure that personnel are properly trained in radiation safety before using radioactive.
- 19) Ensure that equipment and areas restricted for use with radiation sources are surveyed and tested prior to release for unrestricted use as prescribed by this manual.
- 20) Coordinate with Public relations to ensure that any information released to the public or regulatory agencies, regarding the use of radiation

sources at JSU, is both accurate and in accordance with JSU information guidelines.

3. APPLYING FOR AUTHORIZATION TO USE RADIOACTIVE MATERIALS

Under a license the authority to control radioisotope use within this institution is vested in the institutional Radiation Safety Committee (RSC). Persons requiring information concerning the use of radioactive materials should call the JSU RSO.

All personnel or new personnel applying for approval to use radiation sources must obtain from the JSU RSO an application form (See Attachment 1). When completed, this form and other pertinent documents should be returned to RSO for submission to the RSC. Regular approval for the use of radioactive material (non-human use) will be based upon:

- A. Fulfillment of training and experience requirements established under Mississippi State Department of Health and Nuclear Regulatory Commission (NRC) guideline. The minimum guidelines for non-human use shall include, but shall not be limited to, adequate training and/or experience in the safe handling of radioisotopes, radiation dose units and biological hazards of radiation, and characteristics of ionizing radiation (College degree in physical, biological, chemical sciences, or engineering plus 40 hours of training and experience).
- B. The applicant's agreement in writing to follow all JSU, state, and federal requirements governing the use of radioactive materials and to accept all responsibility for personal injury resulting from failure to comply with such requirements.
- C. The applicant's submission of an occupational exposure history to the JSU Radiation Safety Office.

3.1 Regular Authorization (RA)

- A. RA is requested by the applicant through completion of the application form (as the Attachment 1)
- B. RA is only granted to persons who are considered permanent employees of the University and is therefore restricted to full-time faculty and staff.

- C. Maintaining RA requires that the individual attend the Radiological Safety Training (and/or Retraining) Program mandated by Jackson State University Radiation Safety Program and that the applicant pass the examination with Radiation Safety grade of 75% or better.
- D. Training is administered to new employees and refresher training is administered to all pertinent staff thereafter.
- E. RA is of indefinite duration, and does not need to be renewed unless revoked under extraordinary circumstances of documented poor or errant safety performance; unless voluntarily surrendered by the user; or unless employment of the user is terminated for whatever reason.
- F. RA approval requires that the applicant document adequate previous training and experience with radioisotopes to indicate proficiencies 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, handling, or operation of radioactive materials or radiation generating devices.
- G. RA approval requires that the applicant submits a history of past occupational and medical exposures, and meet any other special medical requirements that the RSC may stipulate.

3.2 Classroom Authorization (CA)

- A. CA may be obtained from RSC if the following provisions are met:
 - 1) The classroom supervisor must obtain and maintain a RA.
 - 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 the theft of the radioactive material by unauthorized or unsupervised persons, including students.
 - 3) The radioactive material to be used by the students must meet the following requirements:
 - a. The materials are encapsulated sources of low activity.
 - b. 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 control procedures and safety precautions.

- c. The radioactive materials generate radiation of low enough energy that personnel monitoring devices are not required.
- B. The instructor of a class requesting the CA provision of these regulations will send a list of the persons who participate in the class to the RSC. The class roll is to contain the SOCIAL SECURITY Numbers of the persons named on the roll.

4. PROCUREMENT OF RADIOACTIVE MATERIALS

Radioactive materials exceeding exempt quantities may be procured only by authorized users. Users may order only those radioisotopes and quantities for which they are currently approved. The NRC requires that all commercial and non-commercial shippers possess documentation indicating that recipients are authorized to possess the type and quantity of radioactive material requested. All companies providing radioactive materials to JSU are expected to possess a copy of the facility's license. Copies of this license will be sent to all new suppliers upon request. Radioactive materials are classified as hazardous materials and are subject to the federal and state requirements regarding the tracing of hazardous materials. In order to maintain the correct inventory, the following procedures must be observed when completing a standard purchase requisition to order radioactive material:

- A. Radioactive material purchase order requisition (Attachment 2) must identify the isotope (e.g., ^3H , ^{14}C , etc.) and the activity expressed in millicuries (mCi) or microcuries (μCi). This information must be placed in the beginning of the description space provided on the form.
- B. Only the name and purchasing identification number of an individual approved by the JSU RSC may be listed on the requisitions. Other names will suffice.
- C. Completed requisition forms for radioactive materials must be submitted to the JSU RSC for approval prior to action by purchasing. Forms submitted directly to Purchasing without the approval of the RSC will be returned to the department and cause delaying action.
- D. The JSU RSC will review requests for purchasing radioisotopes, ensure that only individuals approved by the Committee request the material, and verify that isotopes ordered are those approved by the RSC. The RSC office

will deliver all correct requests to Purchasing as soon as the review process is completed.

5. RECORD KEEPING

- A. Many of the records required by radioactive material licenses and device requisitions are centralized in the JSU RSC Office. However, authorized users of radioactive material and radiation producing devices are required to maintain copies of certain records in the event the centralized files are destroyed. This also provides authorized users with individual safety documentation required by the many certification organizations that review JSU operations.
- B. Records are maintained as follows:
 - 1) The RSC chairman will maintain records of all RSC meeting minutes or correspondence relating to committee action on a particular item.
 - 2) The JSU Radiation Safety Office will maintain records of:
 - a. All radioactive material licenses, registrations, amendments, and associated correspondence involving JSU.
 - b. All approved users or applicants pending approval by the RSC.
 - c. All locations approved for radioactive material use, isotopes used, survey frequency, and responsible parties.
 - d. All occupational exposures, including exposure histories, unusual exposures, over exposures, and reports of annual occupational exposure for all individuals required to wear dosimetry devices.
 - e. All individuals trained to work around sources of radiation.
 - f. All receipts of radioactive material or radiation devices.
 - g. All package surveys performed on packages that pass through the JSU Central Receiving Department.
 - h. All radioactive material used by or under the supervision of approved individuals.

- i. All radioactive waste generated and disposed of by JSU including the location of waste collection containers, the identity and activity of radioactive waste for decay in storage, and the results of any survey or sample results generated while properly disposing of radioactive waste.
 - j. All required area surveys performed periodically by approved individuals, as well as quarterly area surveys or follow-up area surveys performed by the JSU Radiation Safety Office.
 - k. All area and equipment decommissioning surveys performed prior to releasing the area or equipment for unrestricted use.
 - l. All leak tests of non-exempt sealed sources of radiation.
 - m. All survey meter calibration certificates, including the meter location, identification, and assigned user.
 - n. Any employee bioassays or contamination surveys.
 - o. All incidents involving sources of radiation, including spills, lost sources, transfer or shipping irregularities, lost dosimetry devices, equipment malfunctions, and worker contamination.
 - p. Semiannual inventories of all radioactive material possessed by JSU whether held in storage, in use or held as waste.
 - q. All notices of possible violations issued to individuals approved to use radioactive materials.
- 3) Individuals approved to use radiation sources for research purposes will maintain:
- a. Records of receipt for all radioactive material packages delivered directly to the individual without passing through JSU Central Receiving Department.
 - b. Records of all radioactive material used under their supervision.
 - c. Records of all radioactive waste (e.g. drum logs) generated for disposal.

- d. Records of all required surveys of areas where radioactive materials are used or stored.
 - e. Records of all survey meter calibration certificates.
 - f. The JSU Radiation Safety Manual.
- 4) The chairman for each department using sources of radiation shall maintain copies of :
- a. All dosimetry records (film and ring badges) for personnel working around sources of radiation.
 - b. Blank film badge service alteration forms used to add or delete individuals from the department's film badge service.
 - c. The JSU Radiation Safety Manual.

6. AREA SURVEYS

- A. Areas in which radioisotopes are used require periodic surveys with appropriate monitoring instruments or wipe tests. Surveys frequency depends on toxicity, activity, and use with the frequency of survey ranging from daily to monthly.
- B. The JSU Radiation safety Office will review isotope use in existing and proposed radioisotope research laboratories and determine the appropriate survey frequency based on hazard present.

Research laboratory hazard classifications are based on the radiotoxicity of the isotope in use, the maximum amounts of activity stored or used in the area, and type of use in terms of the relative hazard of the handling and experimental procedures. Under no circumstances will a research laboratory be surveyed less than once a month.

- C. Area survey procedures for research in vitro use of radioactive:
 - 1) Research laboratories possessing and using radioactive material must be surveyed daily after use.
 - 2) A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mrem/hr:

- a. A series of wipe tests to measure contamination levels. The method for performing wipe tests must be sufficiently sensitive to detect 200 dpm per 100 cm² for the contaminant involved.
- b. A permanent record must be kept of all survey results, including negative results, using the JSU survey results form (Attachment 3).
For research laboratories:
 - 1. A copy of each survey form must be submitted to the JSU Radiation Safety Office.
 - 2. A copy must be maintained on file in the department by the surveyor.
 - 3. Areas must be cleaned when the contamination level exceeds 200 dpm/10cm², if the counting instrument efficiency is known for the contaminant involved, or twice normal background, if the instrument efficiency for the contaminant involved is unknown.

3) Quarterly Surveys

- a. Quarterly area surveys shall be performed by the JSU Radiation Safety Officer in each area using or storing radioactive materials. Each survey shall consist of:
 - 1. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mrem/hr.
 - 2. A series of wipe tests to measure contamination levels. The method for performing wipe tests must be sufficiently sensitive to detect 200 dpm per 100 cm² for the contaminant involved.
- b. Results of these quarterly surveys will be documented and maintained in the JSU Radiation Safety Office. Positive contamination findings will be reported to radioactive users for action.
- c. Quarterly surveys by the JSU Radiation Safety Officer are to be unannounced in order to accurately assess the safety

precautions being taken in each area using or storing radioactive material.

1. The Radiation safety Officer or his representative shall have access, at any time, to any area where radioactive materials are used or stored.
2. If the department or the radioactive material user wishes to provide an escort during these quarterly surveys, the provision of such an escort or representative must not in any way delay the completion of the quarterly survey.
3. If such a delay appears probable, the JSU Radiation Safety Officer or his representative has the authority to begin the survey in the area(s) in question immediately.

7. PACKAGE SURVEY PROCEDURES

- A. Effort will be made by JSU Radiation Safety Office to survey and record survey results on all clearly labeled radioactive material package(s) passing through the JSU Central Receiving Department. This will be done to:
 - 1) Verify proper packaging and monitoring by the shipper.
 - 2) Document worker safety for those individuals assigned to handle packages labeled as containing radioactive materials.
 - 3) Ensure adequate facility inventory of radioactive material received by JSU researchers.
- B. For radioactive material package(s) delivered directly to departments other than JSU Central Receiving Department.
 - 1) The individual user is responsible for visually inspecting each package for damage and safety opening undamaged package(s) of radioactive materials using the following procedures:
 - a. The outer package inspection shall be performed as soon as practicable after (less than 3 hours) the package is received at the licensee's facility, if received during the licensee's normal working hours, or 18 hours, if received after normal working hours.

- b. If the outer package appears to be damaged:
 - 1. Do not attempt to move the package(s) and restrict worker access to any area where the package(s) was previously placed or stored.
 - 2. Contact the JSU Radiation Safety Officer immediately

- C. Once the radioactive material package is delivered to JSU Central Receiving Department, the package shall be visually inspected immediately. If the package appears to be damaged, the JSU Central Receiving supervisor shall take the following steps:
 - 1) Do not attempt to move the package(s) and restrict worker access to any area where the package(s) was previously placed or stored.
 - 2) Do not allow the delivery vehicle to leave the area until released by the JSU Radiation Safety Officer.
 - 3) Contact the JSU Radiation Safety Officer immediately.

- D. The JSU Radiation Safety Office will contact JSU Central Receiving Department at least once daily for package(s) containing radioactive materials. Upon receipt of a package containing radioactive material, a representative of the JSU Radiation Safety Office will:
 - 1) Virtually inspect the package for any sign of damage (e.g. wetness, crushed). If damage is noted, the survey procedure will be halted and the following steps taken:
 - a. Restrict further access to the package.
 - b. Using gloves swipe the exterior of the package and measure the swipe activity with a thin window GM tube survey meter for radiation levels above twice background levels.
 - c. If negative, proceed with package survey.
 - d. If positive:
 - 1. Place the package in a plastic bag and relocate to a functional, prepared hood for further examination and eventual return to the shipper.
 - 2. Survey all areas and workers (including clothing) that came into contact with the package. Decontaminate,

if necessary, to acceptable levels of (e.g., <2,000 dpm/cm² of beta emitters).

3. Contact the Division of Pathological Health, the shipper and the carrier as soon as possible and provide contamination details.

2) If the package appears to be undamaged upon visual inspection:

- a. Measure the radiation exposure rate at 3 feet from package surface and record. If greater than 10 mR/hr, stop the procedure and notify the JSU Radiation Safety Officer, if not already present.
- b. Measure the surface exposure rate and record. If greater than 200 mR/hr, stop the procedure and notify the JSU Radiation Safety Officer, if not already present.
- c. Swipe the outer surface of the container and measure the swipe activity with a thin window GM tube survey meter. If greater than twice background levels contact the JSU Radiation Safety Officer, if not already present.
- d. Put on gloves.
- e. Open the outer package and remove packing slip. Verify the contents (using the packing slip) and check the integrity of the inner container quickly, if necessary.
- f. Swipe the external surface of the inner container (not the vial) and measure the activity of the swipe with a thin window GM tube survey meter. If greater than twice background levels contact the JSU Radiation Safety Officer, if not already present.

3) All results of surveys performed by the JSU Radiation Safety Office will be recorded on the JSU package Survey Form (Attachment 4).

8. IONIZING RADIATION EXPOSURE PROTECTION AND MONITORING

PERSONS UNDER THE AGE OF 18 WILL NOT BE ALLOWED TO ENTER, OR TO WORK IN, AN AREA WHERE RADIOACTIVE MATERIALS OR RADIATION PRODUCING DEVICES ARE USED, STORED OR OPERATED.

8.1 Maximum Permissible Dose Limits

- A. All laboratory operations must be planned to prevent exposure of personnel to ionizing radiation above the limits stated in this safety manual. In addition to these basic regulations, it is also JSU's policy that exposure to ionizing radiation associated with laboratory operations be maintained "as low as reasonably achievable (ALARA). The permissible dose requirements of the Mississippi Regulations and the recommendations of the National Council on Radiation Protection and Measurements will be followed with regard to worker exposures and exposures to members of the public. These maximum allowable exposure values are given in Table 1 below.

- B. In addition to the limits regarding external exposure of workers and members of the public. JSU will also abide in accordance with the Mississippi State Department of Health regarding releases of radioactive material in effluents to restricted and unrestricted areas.

8.2 Radiation Exposure Monitoring

- A. Departments are required to:
 - Furnish film badges for all individuals working with radioactive materials.
 - Designate a specific individual in each department to be responsible for:
 1. Maintaining copies of department film/ring badge reports.
 2. Collecting badges monthly for return to the JSU Radiation Safety Office and processing by the vendor.
 3. Distributing badges provided by the JSU Radiation Safety Office from the vendor.
 4. Forwarding any requests for employee radiation exposure histories (from employers or employees) to the JSU Radiation Safety Office for action.

- The JSU Radiation Safety Office must be provided the name and phone number of this designated badge manager.

Table 1. Maximum Permissible Dose

<i>Maximum Permissible Dose for Occupational Exposure</i>	
Annual limit must not exceed:	
Sum of Whole Body Deep Dose in any one (1) year and All Internal Organ Exposures (Total Effective Dose Equivalent—TEDE)	5 rems
Sum of Whole Body Deep Dose and Highest Organ rems in any one (1) year Committee Dose Equivalent Excluding Lens of Eye (Total Organ Dose Equivalent—TODE)	50
Lens of the Eye rems in any one (1) year	15
Permissible Dose for Fertile Women: --With respect to the fetus rems in gestation period	* 0.5
Permissible Dose for Minors: --In restricted areas above limits	10% of
<i>Maximum Permissible Dose for Members of Public</i>	
Individual rems in any one (1) year	0.100

*Control badges and personnel badges should be stored in a low background area.

- B. Individuals using ^3H and/or ^{14}C exclusively will also be furnished film badges to monitor any exposure that may be received from isotopes used or stored in adjacent area. This will document the individuals' whole body external exposure while at JSU and having access to areas where a variety of radioisotopes are used.
- C. All firm badges must be worn on the front portion of the upper body (area of the blood forming organs and eyes) and must be worn outside any protective shields (lead aprons) provided.

D. Pregnant individuals having access to area where radioactive materials are used (and stored in the case of radioactive materials) shall be provided two film badges by their departments.

- One badge must be worn as specified above.
- The second badge must be worn on the front of the lower abdomen underneath any protective shield (lead aprons) to serve as a fetal monitor.

E. Use of ring badges.

- Ring badges must be worn by personnel who are handling or manipulating unsealed or unshielded sources with tongs or forceps or who are holding partially shielded containers of radioactive material with their hands. However, these dosimeters are not needed for personnel handling sources with dose rates less than 5 rems per hour at 1 cm; above this level ring dosimeters (badges) are required.
- At the discretion of the JSU Radiation Safety Officer, departments may be required to furnish TLD ring badges to monitor exposure to the hands of individuals using high energy beta emitting isotopes. This decision will be based on the isotope, activity, and procedures used by the individual.

F. Individuals assigned film or ring badges are required to:

- Wear film badge inserts (film packets) inside the proper badge holder at all times and wear the badge in the proper location.
- Wear only the badge assigned to and bearing their name.
- Return each badge at the end of the month to the department badge manager for processing. It is the badge wearer's responsibility to arrange returns despite vacations, personal leave or other reasons. The department badge manager is expected to contact delinquent individuals but is not expected to track down and retrieve an individual's badge.
- Report any lost badges immediately to the department badge manager or the JSU Radiation Safety Office.

1. For an isolated occurrence of a lost badge, the JSU Radiation Safety Officer will estimate the probable dose to the individual based on recent duties and past badge exposures.
2. For repeated occurrence of lost badges the JSU Radiation Safety Officer will assign the full quarterly exposure limit (1.25 rems) to the individual.

8.3 Adding and Deleting Film and Ring Badges

- A. All changes in film a ring badges service will be handled through the JSU Radiation Safety Office. The JSU Radiation Safety Officer is authorized to be the only representative of JSU when requesting changes in film or ring badge services.
- B. In order to add an individual to a department's film or ring badge service, the department badge manager must:
- 1) Obtain a blank copy of the JSU Previous Occupational History Form (Attachment 5).
 - 2) Provide the individual needing the badge with the blank JSU Previous Occupational History Form, point out the instructions for completing the exposure history and point out the instructions for employee training.
 - 3) Emphasize that before a badge can be ordered both the completed Occupational Exposure History and the Statement of Employee Training (Attachment 6) must be returned to the department badge manager.
 - 4) Employees needing badges have three working days to complete and return to the department badge manager both the exposure history and the statement of training forms. After that time supervisors are required to reassign the employees to an area free of any radiation exposures.
 - 5) After collecting both the exposure history and the statement of training from each individual needing a badge, obtain a copy of the JSU Film Badge Addition/Deletion Form (Attachment 6). Complete the Form according to the instructions for adding a person to the film badge service and return all three forms to the JSU Radiation Safety Office. The JSU Radiation Safety Officer will contact the badge supplier and place the badge order.
- C. In order to delete an individual from a department's film or ring badge service:
- 1) Obtain a copy of the JSU Film Badge Addition/Deletion Form.

- 2) Follow the instruction on the form for deleting a badge.
- 3) Submit the completed form to the JSU Radiation Safety Office. The JSU Radiation Safety Officer will contact the badge supplier and delete the desired badges.

8.4 Records regarding personnel exposures to radiation

A. The JSU Radiation Safety Officer will:

- 1) Use the Occupational Exposure History Form information to contact past employers, request exposure records, and maintain this information on file.
- 2) Maintain copies of each department's monthly film badge report, as well as a historical listing of personnel exposures at JSU.
- 3) Maintain a record of each terminated badge in order to generate any personnel exposure histories requested.
- 4) Retain a copy of annual occupational exposure notices issued to employees.
- 5) Review all film badge reports monthly to check for completeness, timely return of badges, unusual badge reading and over exposures. A summary of this review will be provided to each department manager for necessary corrective action.

B. Department badge managers will:

- 1) Maintain on hand in the department files blank copies of both the JSU Previous Occupational History Form and the Film Badge Addition/Deletion Form.
- 2) Maintain on hand in the department files copies of the department's monthly film badge reports.

C. Notices to employees.

- 1) At the request of a worker formally engaged in licensed or registered activities, JSU shall provide the worker a report of his exposure to sources of radiation at JSU. Such reports are to be furnished within 30 days of the

request. Requests for this information may be placed through the JSU Radiation Safety Office.

- 2) The JSU Radiation Safety Office will provide annual occupational exposure notices to all badged individuals currently employed by JSU.
- 3) The JSU Radiation Safety Office will provide a complete occupational history to each badged individual terminated by JSU.
- 4) When an individual receives an exposure to radiation in excess of the permissible amount, the report of that exposure will be sent to the Division of Radiological Health and to the individual exposed.

9. PRENATAL RADIATION EXPOSURE POLICY

Dose to an Embryo/Fetus, taken from the Regulations for the Control of Radiation in Mississippi

- A. The Licensee or registrant shall ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman¹ does not exceed 0.5 rem (5 millisieverts).
- B. The Licensee or registrant shall make efforts to avoid substantial variation² above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in accordance with Mississippi Regulations.
- C. The dose to an embryo /fetus shall be taken as the sum of
 - 1) The deep dose equivalent to the declared pregnant woman; and
 - 2) The dose to the embryo/fetus from radio nuclides in the embryo/fetus and radio nuclides in the declared pregnant woman.
- D. If by the time the woman declares pregnancy to the licensee or registrant, the dose to the embryo/fetus has exceeded 0.45 rems (4.5 millisieverts), the licensee or registrant shall be deemed to be in compliance with Mississippi Regulations if the additional dose to the embryo/fetus does not exceed 0.05 rem (0.5 millisieverts) during the remainder of the pregnancy.

¹Declared pregnant woman –means a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

²The National Council on Radiation Protection and Measurements recommended NCRP Report No. 116 “Recommendations on Limits for Exposure to Ionizing Radiation” (1993) that no more than 0.05 rem (0.5 millisieverts) to the embryo/fetus be received in any one month.

- E. Initial radiation safety training for all women of childbearing age shall be offered when they notify their supervisor or the JSU Radiation Safety Officer as soon as possible or even suspect that they may be pregnant, if their duties involve working in areas where radiation sources are used or stored.
- F. It is the responsibility of any supervisor, when notified that an employee may be pregnant and working around sources of radiation to refer that employee to the JSU Radiation Safety Officer for counseling regarding risks and employee rights.
- G. Employee counseling.
 - 1) The employee will be provided a handout supplying specific information regarding natural background radiation, radiation exposure limits, and relative risks from radiation exposures (Attachment 11).
 - 2) The employee will be informed that the maximum permissible dose (MPD) equivalent to the fetus from occupational exposure of the expectant mother shall not exceed 0.5 rem (5 millisieverts). This is the maximum dose for the nine-month gestation period.
 - 3) The employee shall understand her rights.
 - a. An employee may request to remain in her present position whether or not the radiation exposure history shows doses below the maximum permissible dose.
 - b. A pregnant employee cannot be forced to resign or to take an unpaid leave.
 - c. Neither can the employee provide JSU with a waiver of liability as a condition for remaining on the job.
 - 4) Employee counseling shall be documented by the JSU Radiation Safety Officer and signed by the employee (Attachment 8).

H. JSU is committed to the principle of keeping exposure as low as is reasonably achievable. An effort will be made to keep prenatal exposure well below the MPD.

If the employee chooses to continue working in an area where radiation sources are used or stored:

- 1) The department must provide the employee with an additional film badge to be worn at waist level beneath any protective shielding during gestation.
- 2) The department must provide the employee with a self-reading personal dosimeter for daily exposure determination, if the potential for overexposure exists.

10.0 GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIALS

- A. Wear laboratory coats or other protective clothing when using radioactive materials.
 - 1) Laboratory coats must be completely buttoned.
 - 2) Laboratory coats are not to be worn with the sleeves rolled up.
- B. Wear disposable gloves at all times while handling radioactive materials.
- C. When using isotopes detectable by a survey meter, monitor hands, clothing, and the work area for contamination at the conclusion of work and before leaving the area.
- D. Do not eat, drink, smoke, or apply cosmetics in any area where radioactive material is stored or used. Evidence of such activity (food containers, food wrappers, tobacco remains, eating utensils, food remains in trash cans, cosmetics) in an area where radioactive material is used or stored will be considered a breach of this prohibition.
- E. Wear personnel monitoring devices (film badges, TLD ring badges, or other dosimeters) at all times while in areas posted for radioactive material use or storage.

- F. Wear TLD ring badges during preparation and use of radioactive materials.
- G. Dispose radioactive waste only in specially designated receptacles, as directed. Do not dispose of "Caution Radioactive Material" labels in designated receptacles. These receptacles are marked to contain radioactive material.
- H. Never pipette by mouth.
- I. Survey laboratory areas for contamination after each procedure or at the end of the day. Decontaminate if necessary.
- J. Confine radioactive solutions in covered containers plainly identified and labeled with the compound name, radionuclide, date, activity, and, if applicable, the radiation level.
- K. Always transfer among gamma and/or beta emitting radioactive material in shielded containers.
- L. All work surfaces in areas where radioactive materials are used must be covered by impermeable bench coats secured with "Caution Radioactive Materials" tape. These coats must be changed when contaminated or when wear affects the protection provided by the coats.
- M. All items or utensils in contact with radioactive materials must be labeled "*Caution Radioactive Materials.*"
- N. If a damaged package containing radioactive material is received, stop procedures and notify the JSU Radiation Safety Officer immediately.
- O. If the surface exposure rate of a package containing radioactive material exceeds 200 mrem/hr. stop the opening procedures and notify JSU Radiation Safety Officer immediately. GM tube survey meter survey does not detect certain low energy, radioisotopes such as Carbon-14 or Tritium. Damaged packages containing such materials must be monitored for contamination by swipe tests.

11.0 INSTRUMENT QUALITY CONTROL

- A. Survey meters must be calibrated at least annually and following repair with a radionuclide source.

- 1) The source shall be an approximate point source.
- 2) The source activity shall be traceable within 5% accuracy to the U.S. National Bureau of Standards (NBS) calibrations.
- 3) Calibration shall be performed at two points on each scale. The two points should be approximately 1/3 and 2/3 of full scale.
- 4) The exposure rate measured by the meter shall differ from the true exposure rate by less than 10% of full scale or the meter manual will be used to make the necessary adjustments to bring the meter into calibration. Readings within + or – 20% will be considered acceptable, if a calibration chart or graph is prepared and attached to the meter.
- 5) Calibration may be performed by the manufacturer, an authorized consultant, or an outside firm. Alternatively, it may be picked up by the JSU Radiation Safety Office and sent out for calibration.
- 6) Each calibrated survey meter will possess a calibration certificate on file in the JSU Radiation Safety Officer. A copy of the calibration certificate will be supplied to the instrument user.

12.0 PROCEDURES FOR RADIOACTIVE WASTE DISPOSAL BY THE USER

12.1 Radioactive Waste Disposal

Record keeping is critical for waste disposal. Therefore, all wastes must be well documented before disposal.

All radioactive waste generated at JSU will be disposed by decay in storage and broker disposal using a licensed and approved radioactive waste broker.

Radioactive waste must NOT be directly disposed of by any authorized user or unauthorized person into the sanitary sewage system, into laboratory drainage system, into the atmosphere or into regular trash containers.

Radioactive waste at JSU can be classified simply into solid or liquid wastes that need to be disposed differently. Liquid radioactive wastes are those containing radioactive material made of clear solutions, not suspensions or emulsions. If precipitates are visible, filtration is needed. The solid that is filtered off will be combined with solid wastes. Solid wastes are materials such as paper towel,

organic or inorganic solids, animal carcasses, tissues, vials, and glass, etc. that are contaminated by radioactive material. Storage of such wastes will be in specially assigned containers approved by the RSO with clear labels as radioactive waste containers. Disposal of such waste will follow precisely the regulations stated in accordance with the Mississippi State Department of Health. Special procedures that will be taken for waste disposal are outlined below.

12.2 Liquid Wastes

Liquid wastes of ^3H , ^{14}C , ^{32}P , ^{35}S , and ^{75}Se will be collected by the RSO or an assigned person by the RSO. The waste should be contained in containers suitable for liquid wastes and labeled with the type of isotope, date of purchase, estimated amount of radioactive material (in mCi), person(s) who generated or responsible for the waste. If the wastes contain known chemical/biological hazard materials, it must be treated with standard procedure as one would treat the chemical/biological hazards before submitting to the RSO.

12.3 Solid Wastes

A. Wastes without contamination of hazardous chemical/biological materials

Solid wastes containing radioactive material with a physical half-life less than 65 days may be kept for decay-in-storage before disposal in ordinary trash provided: **(1)** Radioactive waste to be disposed of in this manner shall be held for decay a minimum of ten half-lives. **(2)** Before disposal as normal waste, radioactive waste shall be surveyed to determine that its radioactivity cannot be distinguished from background with a low-level laboratory survey instrument. All radiation labels will be removed or obliterated. ^{35}S -, ^{75}Se -, and ^{14}C -containing solid wastes will be sent to radioactive waste disposal. Since only one user is likely to use ^{35}S and ^{75}Se , we don't expect to generate a large quantity of such solid waste. The user will store the wastes in a safe place in the laboratory with clear labels: type of isotope, date of purchase of isotope, estimated amount mCi of isotope, person(s) who generated the waste and person(s) who packed the waste, and emergency contact numbers including RSO's number and the user's number.

B. Waste containing Hazardous Chemicals such as carcinogens and toxicants.

Due to the chemical hazards, these wastes will be separately stored and disposed of by preparing in waste containers and shipping to waste broker for ultimate disposal.

C. Waste containing animal carcasses.

At this time we only allow JSU users to use ^3H and ^{14}C isotopes involving animals. These wastes will be disposed as medical wastes. Should the use of other isotopes become necessary, a special approval by the Mississippi Department of Health, Division of Radiological Health will be needed. Disposal of such wastes will be separately discussed. According to the Mississippi State Department of Health "Regulations for the Control of Radiation in Mississippi", 0.05 mCi or less of ^3H and ^{14}C per gram of animal tissue, averaged over the weight of the entire animal may be considered as "not radioactive" and be disposed. All radiation labels will be removed or obliterated.

- 1) All radioactive waste must have proper documentation, which includes chemical and radiological identification of the components of the waste stream to within 1% of the weight or volume, whichever is applicable.
- 2) Stock solutions of radioactive material and high activity waste will not be included in low level waste for disposal.

D. Waste Packaging.

The following instructions are subject to regulatory revision. The Radiation Safety Office reserves the right to amend these regulations governing the packaging and preparation of waste streams as necessary to remain in compliance with Federal or State regulations governing wastes and disposal. Such changes will be submitted to the Radiation Safety Committee (RSC) at its regular meeting for incorporation into the local University regulations. Only one radioisotope may be contained in a one package offered for disposal, without prior approval by the RSC. Due to the difficulty with the disposal of radioisotopes which do not appear in Attachment 9, all users planning to utilize those radioisotopes are required to consult with the RSC prior to waste production to ensure that adequate and cost-effective methods of disposal are available.

- 1) Identification: All wastes are to be identified conspicuously on the outside of the outermost package with the following information:
 - a. The supervisor's name and department,
 - b. The packer's name and department, if different from above.

- c. The radioisotope contained in the package,
- d. The quantity of activity contained in the package offered for disposal,
- e. The date the package was sealed.

Radioactive wastes contaminated with biohazard are to be rendered harmless prior to requests for disposal, and are not to be offered for disposal to the RSC in biohazard labeled bags or containers.

- E. Additional Hazards: wastes which contain physical or chemical hazards must be identified in advance. Chemical wastes must be identified in advance for preparation.
- F. All radioactive wastes prepared for disposal by the user will be accompanied by the form "Request for Disposal of Radioactive Materials."
 - 1) Radioactive chemical waste is waste from radioactive materials to wholly chemical processes, or biochemical processes involving non-etiological cell cultures which have been destroyed in the course of research.
 - 2) Radioactive biological waste is waste generated from the introduction of radioactive materials either to living multicellular organisms, or organisms, organisms which have disease producing capabilities
 - 3) For the purposes of these regulations, liquid scintillation fluids containing solvents which destroy the disease-producing capability of living organisms will be treated as radioactive chemical wastes.
 - 4) Radioactive liquid wastes offered for disposal will be homogeneous in nature, and will not contain visible tissue, animal, or plant parts. Such visible parts will have to be strained or filtered out of the liquid and offered separately as dry solid radioactive waste.
 - 5) Any waste stream or package, of any weight or volume, which does not conform to the description of the waste provided on the waste disposal form, as applicable, will be returned to the user or generator for correction, verification, or repackaging.
 - 6) Any questions concerning the completion of waste disposal form will be referred to the Radiation Safety Office.

12.4 RADIOACTIVE WASTE DISPOSAL BY THE RADIATION SAFETY OFFICE

Waste disposal by the Radiation Safety Office will be in accordance with the provisions and instructions contained in this manual. The final disposal of accumulated wastes will be in accordance with all applicable Federal, State, and local laws, ordinances, and regulations.

13.0 CLASSIFICATION AND DECLASSIFICATION

Location classification will be made by the Radiation Safety Office in accordance with the following instructions:

- A. All laboratories and areas where radioactive material and/or radiation generating devices used or stored must be approved by the Radiation Safety Office prior to use.
- B. No room, location, or equipment used for radioactive work or storage may be returned to general use until satisfactory declassification has been certified by the Radiation Safety Office. Declassification of rooms, location or equipment, will be conducted in accordance with the guidelines specified in this manual. Certification of declassification will be appropriate when all survey points indicate activity less than the limit for uncontrolled access.

14.0 LEAK TESTS OF SEALED SOURCES

In accordance with the special conditions of the Jackson State University's License, all sealed sources except those exempted by the MSDH Regulations cited in the License, will be tested for leakage and contamination at intervals not to exceed six months. In addition, all sealed will be inventoried on the same schedule as leak Tests. Leak tests will be performed by the Radiation Safety Officer or a representative, in accordance with applicable guidelines of this manual.

15.0 USE OF CAUTION SIGNS AND LABELS

- A. Posting of laboratories, areas and containers containing radioactive materials, or of laboratories or areas containing radiation producing devices must be in accordance with “Radiation for the Control of Radiation in Mississippi.”
- B. MSDH Form RH-5, “Notice to Employees,” will be conspicuously displayed near each entrance and exit in each area where radiation generation devices or radioactive materials are used.

16.0 RADIATION EMERGENCY PROCEDURES

Emergencies resulting from accidents in radioisotope use locations may range from minor spills of radioactivity, involving relatively little personal hazard, to major radiation incidents and spills involving extreme hazards and possible bodily injury or life threatening situations. Because of many complicating factors, which may arise in any given accident involving radioactive material, and because of the variety of additional hazards normally found in facilities located at the University, regulations for handling emergencies involving radiation cannot be made for all possible situations.

In any emergency involving radioisotopes, always remember to protect personnel from radiation hazards and confine or contain the contamination to the area of the accident and restrict the movement of potentially or actually contaminated individuals.

IN ANY ACCIDENT OR INCIDENT INVOLVING PERSONAL INJURY, THE FIRST CONSIDERATION SHOULD BE FOR THE INJURED PARTY, AND NOT THE SPREAD OF CONTAMINATION. Contamination can be cleaned up after the fact.

16.1 Minor Spills

The term “**minor spill**” will be defined for the purposes of these regulations to mean a total spill of less than 100 μCi (3.7 MBq) of loose radioactive material, wet or dry, outside the confines of a controlled area, and which does not constitute a direct radiation hazard or a significant airborne hazard. A controlled area is an area within an approved use location which is specifically identified by the supervisor as the radioactive work area and is correctly labeled with appropriate signs, tapes, and/or insignia as described in “Regulations for the Control of Radiation in Mississippi.”

- A. The immediate actions for handling a **minor spill** are as follows:
- 1) **Notify All Persons** in the area that a minor spill has occurred.
 - 2) **Prevent the Spread of Contamination** by using the minimum number of personnel necessary to adequately confine the spill.
 - a. Liquid Spills:
 1. Put on protective gloves
 2. Cover the spill area with absorbent material.
 - b. Solid Spills:
 1. Put on protective gloves
 2. Dampen the area of the spilled material with an appropriate dampening agent, taking care not to spread contamination or create an airborne hazard.
 3. Cover the spill area with absorbent material.
 - 3) **Clean up** the spill.
 - a. Using protective gloves, and remote handling tongs if necessary, to place the absorbent material into a plastic bag.
 - b. Remember to place other contaminated material, such as gloves into the plastic bag.
 - c. Dispose of the plastic bag in the radioactive waste container.
 - 4) **Survey**, with a low range thin-window G-M Survey meter or a wipe test to check for contamination in the cleaned area, on hands and clothing.
 - 5) **Report**, spill to the Radiation Safety Officer and the area supervisor as soon as possible.

16.2 Major Spills

The term “**major spill**” will be defined to mean a spill of 100 μCi (3.7 MBq) or more of loose radioactive material, a spill of loose radioactive material which constitutes a significant direct radiation hazard, a spill of loose radioactive material which can result in an airborne radioactivity hazard, or

a spill of any amount of radioactive material outside the physical boundaries of an approved use location.

A. The immediate actions required in the event of a **major spill** are as followed:

- 1) **Clear the area:** Notify all persons not involved in the spill to evacuate the room or area.
- 2) **Prevent the Spread:** Cover the spill with absorbent material. Do not attempt to clean up the spill. Confine the movement of all personnel potentially contaminated. If the spill can create an airborne hazard, switch off any fans, to minimize air dispersal.
- 3) **Shield the Source:** If possible the spill should be shielded, but only if it can be one without further spread of contamination or without significantly increasing your radiation exposure.
- 4) **Close the room and Secure the Area:** Leave the room and lock the door to prevent entry until emergency personnel arrive. If the spill occurs outside an approved location, withdraw a safe distance from the spill and maintain watch over the spill area, warning all passerby to stand clear of the spill.
- 5) **Call for Help:** Notify the Radiation Safety Office as soon as possible or call the Campus Police, also notify the location supervisor, if known.
- 6) **Personnel Decontamination:** If the spill is on the skin, flush thoroughly with water and then wash with mild soap and lukewarm water into a leak proof catch basin, and not down sewage drains. If clothing is contaminated, remove and store affected clothing for further evaluation.

16.3 Airborne Radioactivity Accidents

Accidents involving radioactive mists, dusts, fumes, organic vapors, and gases require special equipment and training. In the event of a spill of radioactive material which can reasonably be believed to have created an airborne hazard, the following immediate actions are required.

- 1) **Clear the area:** Notify all persons not involved in the spill to evacuate the room or area.

- 2) **Prevent the Spread:** If appropriate respirators are immediately available for the material encountered, put on the respirator, switch off any fans or circulating equipment and close any windows or doors. **Do not waste time in indecision. Vacate the room as soon as possible.** If respirators are not available, evacuate the room immediately.
- 3) **Close the Room and Secure the Area.** Leave the room and move all personnel potentially exposed to the airborne contaminants to a safe single location. Lock any doors to prevent entry until emergency personnel arrive.
- 4) **Call for Help.** Notify the Radiation Safety Office as soon as possible, or call the JSU Campus Police. Also notify the location supervisor, if known.
- 5) **Additional Precaution:** Secure all ventilation going into and out of the airborne contamination location from power panels outside the airborne hazard perimeter if possible. Ensure all entrances and exits are closed, locked, and posted with signs prohibiting access. If necessary, post guards at doors to prevent entrance by unauthorized persons.
- 6) **Do Not Reenter:** Do not enter the airborne hazard until approval of the Radiation Safety Office is secured.

16.4 Radiation Hazard Accidents with Injuries

- A. **Minor wounds with little or no bleeding** wash immediately under running water. **If the wound is a puncture,** let the wound bleed for a few minutes to wash out any contaminants.
- B. **If the wound is bleeding heavily,** apply direct pressure using a gloved hand, if possible, and a dry sterile dressing over the wound.
- C. **Get competent medical attention immediately.** Immediate help may be available from the local hospitals.
- D. **Report all accidents with injuries** involving radiation hazards to the Radiation Safety Office as soon as possible, including, but not limited to, puncture wound, cuts, abrasions, suspected overexposure, ingestion, and/or inhalation accidents.

- E. **Permit no person with a radiation injury** to return to work without expressed written approval from the Radiation Safety Office and the attending physician.

16.5 Overexposure or Ingestion Injuries

- A. Any person who suspects overexposure, which is defined as whole body exposure in excess of 5 rem per year, is required to report this fact to the Radiation Safety Office.
- B. Any person, who ingests, absorbs, inhales, or has skin or eye contact with radioactive materials, in the workplace, must immediately report the incident to the Radiation Safety Office in person or by messenger. Persons undergoing medical diagnosis or therapy involving ingestion of radioactive materials will not be required to report such ingestion to the Radiation Safety Office.

16.6 Radiation Hazards in Fires

- A. Attend to the injured persons and remove them from harm.
- B. Alert all personnel: Notify all people in the immediate area to evacuate and activate the nearest fire alarm.
- C. Close all doors and windows to confine the fire.
- D. Call JSU Campus Police and Radiation Safety Office.
- E. Evacuate to a safe area or exit the building. Do not use the elevator.
- F. Have a knowledgeable person of the incident and laboratory report to the emergency personnel.

17.0 PERSONNEL DECONTAMINATION

The following general rules and precautions will be observed in any decontamination of personnel procedure.

- A. Decontamination of personnel will be done only under the supervision of the Radiation Safety Officer or a delegate.

- B. Instruments used must be checked for proper operation and must be within calibration dates.
- C. Personnel assisting in decontamination will use necessary precautions and protective clothing to prevent the spread of contamination to the personnel or the surrounding area.
- D. Decontamination will be performed in a manner which will not spread contamination to other parts of the body.
- E. When washing a contaminated area of the body, care must be taken to prevent abrasions, cuts, or other invasions of the skin to prevent internal contamination.
- F. When drying an area of the skin, which has been decontaminated by washing, do not rub the skin. A gentle patting of the skin with drying material is recommended.
- G. Never use water that is warmer or colder than body temperature for washing. Warm water opens up pores. Cold water closes pores. Body temperature water is recommended for decontamination.
- H. Several gentle washes using mild soaps and the techniques outlined above are much better than one severe scrubbing.
- I. In the event that decontamination does not occur using the techniques above, further decontamination efforts will be determined by competent medical authority.

18.0 FUME HOODS

Fume hoods are designed to protect the operator by providing directional air flow. Fume hoods are not adequate for operations that might result in atmospheric radioactive contamination. For such operations enclosures such as glove boxes must use a lab coat, disposable gloves, and other appropriate safety attire must be worn at all times when working at a hood, or wherever a chance of contamination arises.

If radioactive material must be kept in a hood for short periods, it must be safely packaged and well-shielded. For storage for more than a month the material should be forwarded to the central storage room (i.e. Room 447 of John A. Peoples Science

Building) for storage. A warning tag or a sticker identifying the radioisotope, level of activity, date, etc. must be affixed in a prominent location outside the hood.

Large quantities of flammable, explosive, or pyrophoric materials must never be stored in hoods, but rather in approved storage lockers. These materials, in any quantity, must never be stored in hoods containing radioactive materials.

Acids, solvents, and heat sources can damage the inside surfaces of hoods, making any needed decontamination difficult. Always use protective coverings such as sheet plastic, absorbent paper, or heat-resistant materials as working surfaces. The sliding front window of fume hoods protect against splashing chemicals and unexpected reactions and controls air velocity at the front of the hood. The recommended minimum air velocity of 100 fpm is achieved by matching the arrow on the side of the vertical sash with the arrow on the frame.

Periodically, hood ventilating systems must be shut down for maintenance or repair. Before any hood ventilating system is shut down, the occupants of the room must be notified. The hood sash must be in its most closed position during shutdown, and a sign stating *CAUTION-HOOD OUT OF SERVICE –DO NOT USE* must be placed on the front of the hood. This sign must remain in place until service is restored, at which time the occupants of the room must be notified. Construction and maintenance requires that the principal investigator or supervisor renders the hood as free as possible of radioactive and chemical contamination before hood repairs or modifications are begun.

19.0 STORAGE OF RADIOACTIVE MATERIALS

Radioactive materials that are not being used must be stored in a secure area such as:

- building or room locked during off-hours,
- lockable, fire-retardant safety boxes or cabinets, designed to be earthquake resistant.

Radioactive research equipment that is too large to be stored at the laboratory should be arranged to be stored at a central storage area (Room 447 of John A. Peoples Science Building), provided that the package has been monitored and tagged by Safety Officer.

Unsuitable storage areas include bench tops, desk drawers, fume hoods, and wooden cabinets or lockers.

20.0 RADIATION SAFETY TRAINING

A. All employees

All new employees who may enter a controlled area must receive an orientation in radiation safety within one month of their initial hire. This orientation is part of the mandatory new-employee health and safety orientation. In addition, current employees who enter controlled areas, even though they are not radiation workers, must have radiation safety training (see Attachment 6) commensurate with their job responsibilities. Supervisors must make arrangements with the JSU Radiation Safety Office to schedule the required training. Training must also be provided when there are significant changes to radiation protection policies and procedures that affect general employees.

B. Radiation Workers

Radiation workers must be given safety training sufficient to familiarize the worker with the fundamentals of radiation protection and the ALARA process. Training should include both classroom and applied training, and be commensurate with job assignments. Retraining must be provided at least every year or when radiation protection policies or procedures are changed.

The training may be concurrent with assignment as a radiation worker; otherwise, the training must precede assignment as a radiation worker. The knowledge of radiation safety fundamentals possessed by radiation workers must be certified by examination before an unsupervised assignment. Training should emphasize procedures specific to a facility may be waived provided that this training has been received at another institution. Retraining is required at least every year and when policies or procedures are changed.

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APPENDIX I

All forms can be submitted electronically by request

ATTACHMENT 1

APPLICATION FOR AUTHORIZATION AND USAGE OF RADIOACTIVE MATERIALS

Date of Application:_____

Please complete the requested information:

1. Name of Application:_____

Soc. Sec.# :_____

Name of Principal Investigator:_____

Title:_____

Department:_____ Office Location:_____

Telephone:_____ Fax Number:_____

Type of Authorization Requested:

___ Regular ___ Temporary (or until experienced documented)*

*If temporary authorization requested:

Supervisor:_____

Department:_____

2. Radioisotope(s) requested in this application:

Nuclide	Physical and Chemical Form	Maximum Possession Amount (mCi)

ATTACHMENT 1 cont.

3. Radioisotopes for which previous approval was granted:

Location of previous approval: _____

Nuclide	Physical and Chemical Form	Maximum Amount (mCi)

4. Describe your formal experience handling radioactive materials, including locations, radioisotopes and amounts handled. (Add more pages if necessary)

List the radiation safety and safety training courses you have attended:

Name of Course	Location (Institution)	Mo./Yr.

5. List the location (s) where the radioactive material will be used (building and room number).

ATTACHMENT 1 cont.

Describe the storage facilities and security for radioactive materials that will be used. (Add more pages if necessary.)

6. Describe the personnel (dosimeters) monitoring, laboratory monitoring (survey and any other) and protective equipment that will be used for each nuclide.

Dosimeters: _____

Monitoring Equipment:

Make: _____ Model: _____ Detector: _____

Make: _____ Model: _____ Detector: _____

Protective Equipment:

Lab Coats _____

Eye Protection _____

Gloves _____

Fume Hood _____

Shield _____

Type of

Shield: _____

Thickness: _____

Other(Describe): _____

7. Describe the experimental procedures that will be utilized with the requested isotope.

Emphasize aspects that pertain to safety issues. A brief description of materials and methods is usually adequate. (Add more pages if necessary.)

ATTACHMENT 1 cont.

- What amount of radioactivity will be used in a typical experiment?

- What is the frequency of experiments?

8. Describe the types of waste that will be generated in this research, including physical and chemical forms. List any other hazardous constituents, such as hazardous chemical, biological hazards, etc. Identify the amounts, volumes and rates of disposal of the waste. (Add more pages if necessary.)

9. Please describe any special hazards associated with the use(s) of radioactive materials requested in this application.

Applicant's Signature: _____

Date: _____

Department Chairperson's Signature: _____

Date: _____

10. **Completed by the JSU Radiation Safety Committee ONLY**

Approval:_____ Disapproval:_____

Reason(s):_____

Committee Chairman's Signature:_____

Date:_____

ATTACHMENT 2

REQUEST FOR PROCUREMENT OF RADIOISOTOPES

NAME OF PRINCIPAL USER: _____	SOC. SEC.#: _____
DEPARTMENT: _____	PHONE: _____

Other individuals who will use the material:

Name (Print)	Soc. Sec.#	Department

Area of Use (Building and Room #)	Name of Chemical (s)	Physical Type (solid, liquid, gas)	Amount to be Purchased (e.g., mCi)

STATE OF REQUEST AND AGREEMENT

The individual named as principal user signifies by his/her signature below that he/she had read, that he/she understands, and that he/she without reservation of any kind, to abide by the University Regulations governing the possession, use and disposal of radioactive materials as given in the University Radiation Safety Manual. The undersigned hereby waives any right or recourse against Jackson State University for any damage whatsoever resulting from any failure to fully conform with said regulations.

Signature: _____ Date: _____

ATTACHMENT 3

LABORATORY SURVEY FORM

Jackson State University Radiation Safety Manual states that laboratories using radioactive materials shall be surveyed daily after use and quarterly by RSO, using a low range survey meter and/or a series of swipes to detect contamination (depending on the type of isotopes used). Only swipes are required in laboratories using C-14 and H-3 exclusively, but these swipes must be counted using a liquid scintillation counter. Good surveys/swipe locations include preparation counters, hoods and sinks where lab equipment is cleaned. To reduce the number of survey and/or swipe locations, users are advised to limit radioactive material use to few areas clearly defined by absorbent drop cloths held in place with radioactive material marker tape. Results exceeding the action level are to be reported to the Radiation Safety Officer immediately, and the area must be resurveyed following decontamination.

Date: _____
Authorized User: _____ **Department:** _____
Surveyor: _____ **Frequency:** _____
Counting Equipment: _____
Contamination Action Level: 220 DPM/100 CM² or >2X Background

Gamma or Liquid Scintillation Counter	and/or	Survey Meter
Manufacturer: _____	/	_____
Model: _____	/	_____
Serial: _____	/	_____
Background: _____	/	_____
Efficiency: _____	/	_____
Calibration Date: _____	/	_____
Calibration Due Date: _____	/	_____

***Swipe / Survey Results:**

Lab Room#	Location of Swipe	Swipe Results (units)	Survey Results (units)	Resurvey Results

***A crude sketch of the laboratory is needed the first time this form is submitted. Indicate counters, hoods, sinks and survey locations.**

ATTACHMENT 4

JSU PACKAGE SURVEY FORM

DATE SURVEYED: _____	SURVEYOR: _____
PURCHASE ORDER: _____	LOT NUMBER: _____

Condition of Package:

Check all that apply

OK PUNCTURED WET CRUSHED OTHER

Contents of Package agrees with shipping papers:

YES _____ NO _____ EXPLAIN _____

Survey Meter:

Manufacturer: _____ / _____
Model: _____ / _____
Serial: _____ / _____
Background Reading: _____ mR/Hr / _____ CPM
Efficiency: _____ / _____

External Survey: Surface _____ mR/Hr 3 feet _____ mR/Hr

Swipes: Outer _____ CPM Internal _____ CPM

ATTACHMENT 5

PREVIOUS OCCUPATIONAL EXPOSURE HISTORY FORM

You have been identified as a JSU employee who requires a film badge prior to being assigned duties involving sources of radiation. As a requirement of this facility’s radioactive material licenses (issued by the Mississippi State Department of Health), the JSU Radiation Safety Office must notify the JSU film badge supplier of any past occupational exposure that you may have received while wearing a film badge issued by a previous employer.

You must complete this form by supplying the name, address, and dates of previous employment where you were issued a film badge. You must also provide your Social Security Number and Birthday for this office to track your occupational exposure to radiation while employed at Jackson State University.

CHECK ONE:

I was NOT issued a film badge at any of my previous place of employment.

I was issued a film badge by these previous employers (address included) on the following dates, and I authorize the release of my exposure history to the JSU Radiation Safety Office:

EMPLOYER	ADDRESS	DATES

THIS OCCUPATIONAL EXPOSURE HISTORY FORM MUST BE SUBMITTED WITH THE STATEMENT OF EMPLOYEE TRAINING FORM.

ATTACHMENT 6

JSU STATEMENT EMPLOYEE TRAINING

As instructed by the JSU Radiation Safety Office, I have viewed the radiation safety video tape(s) demonstrated good radiation safety practices to be followed by all JSU personnel assigned to duty in an area where radiation sources are used or stored. I also understand that questions regarding the safe use of radiation sources at JSU may be directed to the JSU Radiation Safety Office.

DATE: _____

J#: _____

DEPARTMENT: _____

FILM TITLE: *RADIATION SAFETY SERIES*

CHECK ALL THAT APPLY

- VIDEO # 1 INTRODUCTION**
- VIDEO # 2 LABORATORY TECHNIQUES**
- VIDEO # 3 EMERGENCY PROCEDURES**

NAME: _____
(PRINT)

SIGNATURE: _____

ATTACHMENT 7

JSU FILM BADGE ADDITION / DELETION FORM

Print/Type (blue/black ink)

A / D (1)	NAME (LAST, FIRST) (2)	M / F	DATE OF BIRTH (MM/DD/Y YYY)	POSITION (2)	S.S# (3)	HISTORY (4)	BADGE #	USE (5)

Instructions:

All personnel must complete formal basic radiation protection training and on-the-job training provided by the Principal Investigator, PRIOR to using ionizing radiation. Please complete an Authorization Form with the JSU Radiation Safety Office.

1. Action: (A)-add; (D)-delete
2. Position: (F) faculty; (P) post-doc; (V) visiting scientist; (S) staff; (G) grad. student; (U) undergrad. Student
3. Provide Social Security Number
4. Attach a completed AUTHORIZATION TO RELEASE RADIATION EXPOSURE INFORMATION form for each person added or NONE (NH) to indicate that they have no occupational radiation history.
5. Use: (N) Not using radiation but working in a radiation lab; (C) Radiochemicals; (S) Small Sealed Sources; (XRD) X-Ray Diffraction; (XRF) X-Ray Fluorescence; (XRM) X-Ray Medical; (XRN) X-Ray Nonmedical; (XRC) Cabinet X-Ray; (I) Self Shielded Irradiator; (O) Other

ATTACHMENT 8

JSU COUNSELING OF PREGNANT WORKERS AND SOURCES

As instructed by the JSU Radiation Safety Office, I have viewed the radiation safety video tape provided by the JSU Radiation Safety Office. I understand that the video tape and the information supplied by the JSU Radiation Safety Office are designed to assist me in understanding the risks associated with working around sources of radiation when pregnant. I also understand that any questions or concerns may be directed to the JSU Radiation Safety Officer or the Mississippi State Department of Health/Division of Radiological Health (601.987.6893).

My signature below offers assurances that I will read the information regarding my rights as a JSU employee and contact the JSU Radiation Safety Officer, if necessary.

TITLE OF VIDEO TAPE: _____

RADIATION SAFETY SERIES

J #: _____

NAME (PRINT): _____

DEPARTMENT: _____

SIGNATURE: _____

DATE: _____

ATTACHMENT 9

LIST OF APPROVED RADIOISOTOPES

<u>Element and Mass Number</u>	<u>Chemical Symbol and Mass Number</u>
Carbon 14	¹⁴ C
Hydrogen 3 (Tritium)	³ H
Phosphorus 32	³² P
Sulfur 35	³⁵ S
Selenium 75	⁷⁵ Se

ATTACHMENT 10

RADIOACTIVE Hazardous Waste Collection Form

MM-DD-20XX

This form must be filled out prior to a waste pick-up. Waste will not be removed from the lab unless the form is completed.
 For questions or to arrange pick-up call Office of Haz. Materials Management at JAP #433 phone # 601-979-4315

Responsible Person: _____ Bldg and Lab #: _____

QTY	SIZE (e.g., 2L)	Chemical Name (no abbreviations or formulae)	Phase S/L/G	Hazards (circle as appropriate)	Office Use Only
				ignitable corrosive reactive toxic radioactive spill debris unused chemical	LP Bulk
				ignitable corrosive reactive toxic radioactive spill debris unused chemical	LP Bulk
				ignitable corrosive reactive toxic radioactive spill debris unused chemical	LP Bulk
				ignitable corrosive reactive toxic radioactive spill debris unused chemical	LP Bulk
				ignitable corrosive reactive toxic radioactive spill debris unused chemical	LP Bulk
				ignitable corrosive reactive toxic radioactive spill debris unused chemical	LP Bulk

Before you call for a pick-up, please make sure that:

- ___ All containers are labeled
- ___ Labels are completely filled out, including chemical name
- ___ Hazards checked
- ___ Container dated when full
- ___ Bottles are stored in secondary containment.
- ___ Containers are segregated according to compatibility

Comments _____

*PLEASE BE ADVISED, THERE WILL BE AT LEAST A THREE (3) BUSINESS DAY DELAY BEFORE THE WASTE WILL BE COLLECTED.

ATTACHMENT 11

JSU PRENATAL RADIATION EXPOSURE POLICY FOR EMPLOYEES

Initial radiation safety training for all women of childbearing age shall be offered when they notify their supervisor or the JSU Radiation Safety Officer as soon as possible or even suspect that they may be pregnant, if their duties involve working in areas where radiation sources are used or stored.

Women of childbearing age shall be given instructions prior to assignment to a position involving possible to ionizing radiation.

The employee should understand that the maximum permissible dose equivalent to the fetus from occupational exposure of the expectant mother should NOT exceed 0.5 rem (500 mrem). This is the maximum dose for the nine-month gestation period. This institution is committed to the principal of keeping exposure as low as is reasonably achievable. An effort should be made to keep prenatal exposure well below the Maximum Permissible Dose (MPD).

It is the responsibility of any supervisor, when notified that an employee may be pregnant and working around sources of radiation to refer that employee to the JSU Radiation Safety Officer for counseling regarding risks and employee rights.

A pregnant employee may request to remain in her present position whether or not the radiation exposure history shows dose below the maximum permissible dose. If the employee chooses to remain in a position where a radiation exposure potential exists, the department will provide an additional film badge (monitor) at waist level during gestation. If over-exposure potential is great, a person dosimeter will be provided for daily determination of exposure levels.

A pregnant employee cannot be forced to resign or to take an unpaid leave. Neither can the employee provide the employer with a waiver of liability as a condition of remaining on the job.