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**ALABAMA A&M UNIVERSITY**



RADIATION SAFETY MANUAL

 **OFFICE OF ENVIRONMENTAL HEALTH & SAFETY**

**DEPT OF PHYSICAL FACILITIES AND ADMINISTRATIVE SERVICES**

**INTRODUCTION:**

The purpose of this manual is to present regulations and recommended procedures for the work with radiation sources at Alabama A & M University (AAMU), in order to protect the individual(s), prevent the spread of contamination and to assist in fulfilling the responsibilities of AAMU to the students, it staff, and its neighbors. The Radiation Safety Committee under the direction of the Office of Environmental Health and Safety issues the Manual.

Radiation can be an invaluable tool in teaching and research and properly used, can provide great benefits to mankind with little or no attendant risk. However, improper use can bring risks of high radiation exposure resulting in chronic illness, injury, or even death. The known hazards in the order of their importance, is the deposition of radioactive materials in the body, external exposure to neutrons, to gamma and x-rays, and to beta radiation.

Use of radiation sources implies acceptance by the user of some increased exposure above the natural background radiation to which man has always been exposed. Common sense dictates that such increase in personnel exposures and contamination levels should be kept to the minimum consistent with reasonable effort and expense. Many years of experience at this campus has demonstrated that minimums considerably lower than the so-called “Maximum Permissible levels” can be maintained provided the user has:

 **1. Adequate knowledge;**

 **2. Adequate equipment;**

 **3. The skill and disposition to use them.**

Proper disposition means a balanced perspective towards radiation entailing a healthy respect, free of both the blind fears of the novice and the familiar contempt one sometimes encounters in the “old hand”. A guideline for assessing appropriate employee disposition for using radiation is available upon request. Contact the Office of Environmental Health and Safety to obtain a copy.

This Manual is designed to help AAMU staff in performing teaching and research with radiation sources in a safe, legal and efficient manner without imposing unnecessary restrictions on anyone’s work. Detailed rules and recommendations concerning all eventually cannot be presented in concise form because of the wide variety of radiation sources and facilities and situations. Some of these rules may be subject to modification in circumstances involving new or unanticipated conditions. Some of the rules come from Federal and State Regulations which, having the force of law, permit no modifications unless specifically permitted by law. Those who feel that these rules require unreasonable effort or expense on their part are urged to present their cases to the Radiation Safety Committee and/or the Office of Environmental Health and Safety for review. However, deviations from the rules and procedures in this Manual will be permitted only upon written authorization from the Radiation Safety Committee and/or the Radiation Safety Officer except to prevent personal injury or serious property loss.

The rules in this Manual are insufficient for work with radioisotopes that decay by alpha emission or by spontaneous fission. Special rules will be made specifying limits on quantities, equipment and procedure f for each proposal to use such radioisotopes. Consult with the Office of Environmental Health and Safety for details.

Materials containing natural radioactivity in concentration not exceeding that of natural potassium (10E-9 curries/gram) are exempt from these regulations.

In general, it is the responsibility of the individual radiation user to understand and conduct his operation in an acceptable manner to minimize hazards to him/herself and others.

It is the responsibility of the laboratory supervisor to insure that ALL personnel, particularly new personnel, in his/her area are properly instructed with respect to the nature of the radiation hazards and the necessary radiation safety procedures in his/her laboratory and that they possess the necessary skills and disposition to cope with radiation safety problems safely.

The Office of Environmental Health and Safety is responsible for assisting all users and supervisors by providing consultation and certain services in matters of radiation safety.

The Radiation Safety Committee, a standing committee of the Office of the Provost, is responsible for establishing policies for the Radiation Safety Program, for reviewing the work of the radiation safety staff, and advising both them and the radiation users on particular problems. (Greater details of the above mentioned responsibilities are listed in detail in Section I of this Manual).

All individuals using radiation sources or responsible for the supervision of persons using radiation sources, must familiarize themselves with ALL portions of this Manual that apply to their operations.

**SECTION I: RESPONSIBILITIES OF GROUPS AND INDIVIDUALS**

**A**. **THE RADIATION SAFETY COMMITTEE:**

 The Radiation Safety Committee is advisory to the Provost of AAMU, through the Director of the Office of Environmental Health and Safety, on matters related to the Campus Radiation Safety Program. The Committee is comprised of faculty members representing various areas of research and teaching, and members who represent the campus administration including the Campus Radiation Safety Officer and Director of the Office of Environmental Health and Safety.

 The Provost delegates to the Radiation Safety Committee the authority to oversee the use of Radiation sources throughout the AAMU campus. Thus, the Radiation Safety Committee has the authority to permit, deny or revoke authorization for individuals to obtain and use radiation sources at AAMU.

 The responsibilities of the Radiation Safety Committee include the following:

1. Review proposals for unusually hazardous use of radiation sources and establish

 criteria for equipment and procedures to ensure employee, student and public safety.

 2. Review cases that involve repeated infractions of the rules and regulations for protection against radiation.

 3. Review accidents that may involve over-exposure or serious economic loss, and other cases for which reports to outside regulatory authorities are required.

 4. Review public relations problems that involve radiation sources.

 5. Review appeals from radiation users to modify rules or the decisions of the OEHS.

 6. Meet formally as often as necessary to review campus radiation safety with the OEHS.

 7. Recommend the establishment or modification of campus radiation safety policies.

**B. RESPONSIBILITIES OF THE RADIATION SAFETY OFFICER:**

The radiation Safety committee charges the Radiation Safety Officer with the following responsibilities to:

1. Provide advice and assistance to **ALL** concurred on **ALL** aspects of radiation safety.
2. Approve proposals for procurement, use, and transfer of radiation sources except proposals involving unfamiliar or extreme hazards which the Radiation Safety Officer judges to require review by the Radiation Safety Committee.
3. Receive and monitor ALL shipments of radioactive materials, delivering acceptable incoming shipments to the consignee and insuring that outgoing shipments conform to shipping regulations.
4. Maintain permanent records of receipt, use, transfer, and disposal of radioactive materials.
5. Supervise and assist in disposal of radioactive waste.
6. Assign personnel monitoring devices (film badges, dosimeters, etc.) when necessary, give instructions in their use, and maintain personnel monitoring records.
7. Check radiation monitoring and survey instruments for proper operation and calibrate as often as necessary.
8. Assist in the design and selection of equipment, shielding and facilities and in the formation of operating procedures for new or modifications of existing installations or buildings.
9. Calculate the levels of radiation intensity, time limits of personnel exposure and minimum working distance around accelerators, reactors, x-ray machines and other intense radiation sources.
10. Perform and keep records of leak tests on sealed sources.
11. Make and keep records of systematic surveys in area where the presence of radiation or contamination of surfaces, air, or water is suspected and notify the area supervisor of the results. In some cases this may require detailed monitoring of an operation from beginning to end by the Radiation Safety Officer.
12. Report Hazardous radiological conditions promptly to the individual(s) responsible, and when necessary, to his/her immediate supervisor and the Radiation Safety Committee.
13. Supervise and assist in decontamination of all minor spills.
14. Schedule routine medical examinations in accordance with established policy; help establish criteria and make arrangements for such examinations, as may be required in emergency situations.
15. Enforce ALL written directives of the Radiation Safety Committee.
16. Stop any operation or deny access of any individual (s) to radiation sources in the interest of safety. Such action MUST be reported verbally and in writing to the Radiation Safety Committee as soon as possible.
17. Grant exception to the rules (or impose more stringent restrictions) in emergency situations only, when in the judgment of the Radiation Safety Officer such action is necessary to reduce risk to serious injury or economic loss. Such actions MUST be reported verbally and in writing to the Radiation Safety Committee as soon as possible.
18. Maintain files of Federal, State, and local licenses and registrations concurred with radiation sources and to initiate applications for renewals and/or amendments of it.
19. Determine whether a radiation incident requires a report to any governing body and to prepare such reports for the approval of the Radiation Safety Committee. Exception: If an immediate report is required, the Campus Radiation Safety Officer SHALL (with knowledge and approval of OEHS, if possible) file such report with the appropriate authorities and SHALL provide copies to the Radiation Safety Committee.
20. Be familiar with the Federal, State, and local laws relating to radiation and be aware of changes in such laws as they occur in order to inform the Radiation Safety Committee when such changes make modifications of policy desirable and in order to institute required immediate changes in the Radiation Safety Program.

**C. RESPONSIBILITIES OF LABORATORY SUPERVISOR**

In addition to assuming **ALL** the responsibilities of an individual radiation user, the Laboratory supervisor **SHALL**:

1. Be responsible that ALL personnel, particularly new personnel, who have access to radiation sources under his/her jurisdiction are properly instructed and that they possess the necessary skills and disposition to cope with radiation safety.
2. He/she must insure that people in his/her are know what they need to know about:

 a. This Manual as it applies to their work.

 b. Applicable Federal, State, and local regulations.

 c. The nature of his/her radiation sources and their particular hazards.

 d. Proper use of instruments in the area - especially their limitations.

 e. Routine procedures for handling work safely.

 f. Emergency procedures.

 g. Availability functions and services of the Office of Environmental Health and Safety.

1. Determine the type of radiation sources, equipment and facilities and procedures needed for his/her work.
2. Prepare for his/her personnel specific written routine(s) and/or emergency procedures applicable to his/her operations when necessary or desirable.
3. Insure that the procedures for purchase, acquisition, use, and transfer of radioactive materials are followed in work under his/her supervision. This included keeping accurate records of inventory and disposal of sources or portions thereof.
4. Routinely check protective equipment and instruments to insure they are working properly and adequately performing their intended functions.
5. Actively seek the assistance of and cooperate with the Radiation Safety Officer in solving radiation safety problems unique to his/her situation and in correcting violations of the rules and regulations imposed by Federal, State and local regulatory agencies.
6. Provide whatever action and information necessary with respect to his/her operations to assist the Radiation Safety Officer in complying with existing laws and license requirements (maintenance of records, preparation of reports, etc.).
7. Obtain the prior approval of the Campus Radiation Safety Officer before individuals age 18 and under are allowed to work in a radiation laboratory.

**D. RESPONSIBILITIES OF THE INDIVIDUAL USER:**

The individual user is the one ultimately responsible for the safe use of the radiation sources to which s/he has access. S/he **SHALL**:

1. Keep his/her exposure as low as practical.
2. Wear assigned personnel monitoring devices in an approved manner.
3. Be familiar with and comply with ALL sections of this Manual applicable to his/her work.
4. Be familiar with the nature of his/her area’s radiation sources, the extent of their potential risk and use the proper means of coping with them safely.
5. Monitor his/her area frequently for contamination.
6. Clean up minor spills IMMEDIATELY.
7. Dispose of radioactive waste in an approved manner.
8. See that sources, containers, and the area are properly labeled and posted.
9. Assist his/her supervisor in maintaining required records and inventories.
10. Prevent unauthorized persons from having access to radiation sources in his/her area.
11. Protect service personnel, allowing no maintenance or repairs of area facilities or equipment unless approved by the area supervisor and/or the Radiation Safety Officer
12. Notify his/her supervisor and the Radiation Safety Officer of unexpected difficulties.
13. Be prepared to handle accidents or injuries with common sense and in the spirit of Emergency Procedures, Section II, and Part J. S/he SHALL notify and seek assistance of his/her immediate supervisor and Radiation Safety Officer as soon as possible in emergencies.
14. Take no action that would interfere with the responsibilities of his/her laboratory supervisor (see Section I, Part C).

**SECTION II: RULES AND RECOMMENDED PROCEDURES FOR RADIATION SAFETY**

**A. REGULATIONS IMPOSED BY LAW (FEDERAL AND STATE)**

The Federal and State regulations are voluminous and many of them concern matters which have limited bearing on AAMU’s work or responsibilities. Some which affect the AAMU are only of administrative concern while other impose certain rules, standards and limitations having direct bearing on our radiation safety program. Most usage of radiation sources in Alabama under the jurisdiction of the Office of Radiation Control, State of Alabama, Department of Public Health and their Statues and Regulations. Some of the provisions directly concern only the Radiation Safety Committee and the Radiation Safety Officer, but many of them apply directly to the individual users. However, instead of attempting to edit or paraphrase these regulations, complete copies are available to each department with radiation users.

It is, of course, the responsibility of the laboratory supervisors and individual users to assist in all matters related to compliance with the rules and regulations that govern the use, storage or disposal of radiation sources as requested by the Radiation Safety Committee or the Office of Environmental Health and Safety.

The Radiation Safety Officer will inform you of any such regulations that apply directly to your operations.

**B. MONITORING PROCEDURES:**

1. Always avoid unnecessary exposures.
2. Personnel monitoring devices (film badges, thermo luminescent dosimeters, etc.) are to be assigned at the discretion of the Office of Environmental Health and Safety and in accordance with Alabama Statutes and Regulations.
3. Each person assigned such a device SHALL normally wear it between hip and shoulder level outside his/her clothing while in the area where radiation is expected.
4. When needed, finger dosimeters SHALL be worn (underneath protective, gloves) on the hand in a position where the highest exposure is likely but without undue interference with manual dexterity.
5. Self-reading dosimeters are recommended whenever the level of radiation is suspected to be above normal or subject to rapid changes in time and space. They are to be worn at the discretion of the laboratory supervisor.
6. Personnel monitoring devices are assigned to a specific individual and may not be used by any other individual.
7. Warning signs must be posted and alarms or interlocks used in accordance with Alabama Statutes and Regulations.
8. When entering an unfamiliar posted area, it is wise to monitor the radiation levels with an appropriate instrument to establish the need for limiting stay time, supplementing shielding, etc.
9. Personnel should frequently monitor themselves and their work for contamination with suitable instruments during progress of the work. Smear sampling may be necessary in high background areas. NO person or object should leave the laboratory without being monitored.
10. Consideration should be given to the need for continuous air monitoring or routine air sampling.
11. Whole body counting, blood counts, urinalysis, breath analysis, skin and eye examinations will be required for all personnel designed by the Radiation Safety Committee.
12. NO planned exposure of an individual to ionizing radiation in excess of 100 mrem within any 24-hour period may take place without express, written, prior authorization of the Office of Environmental Health and Safety.
13. Declared pregnant workers are limited to an effective whole body dose commitment of 500 mrem during the period of gestation. Questions regarding declared pregnancy should be referred to the Office of Environmental Health and Safety.

**C. LABORATORY PROCEDURES:**

1. To prevent accidental entry of radioactive materials into the body, high standards of cleanliness and good housekeeping MUST be maintained in all laboratories where radioactive material is present.
2. Visitors are NOT allowed without approval of laboratory supervisor.
3. Wash hands and arms thoroughly before handling any object that goes to the mouth, nose, or eye (e.g., cigarettes, cosmetics, and foods). Keep fingernails short and clean.
4. Smoking and eating in radioisotope laboratories is forbidden. Refrigerators WILL NOT be used jointly for foods and radioactive materials.
5. One or more trial runs beforehand with non-radioactive materials are recommended for new procedures and new personnel to test effectiveness of procedures and equipment.
6. Use shielding when desirable.
7. DO NOT work with radioactive materials if there is a break in the skin below the wrist.
8. Always use gloves when handling more than a few hundred counts per minute. Wear protective clothing (lab coats, masks, shoe covers) as needed.
9. Tritium workers: change gloves every hour when working with 50 mill curies or more.
10. Never pipette by mouth. Use rubber bulbs, syringes, or mechanical devices.
11. Clean up minor spills immediately. For major spills follow emergency procedures.
12. Whenever possible, operations with radioactive materials should be conducted in a hood, dry box, or some other type of closed system. Operations with materials susceptible to atmospheric distribution, such as boiling, evaporating, distilling or ashing MUST be done in a hood with airflow of approximately 100 linear feet per minute. Work with activities of more than a few hours half-life should be done over a tray. Work with finely divided powder must be done in a hood or closed system.
13. Table and bench tops should be of a non-porous, chemical resistant material. Working surfaces shall be covered with absorbent paper regardless of the type of surface.
14. When work is completed each person WILL clean up hi/her own work area and arrange for disposal or proper storage of ALL radioactive materials and equipment.
15. Vacuum pumps used in systems containing radioisotopes MUST NOT be permitted to exhaust into room air or out windows.
16. Exhaust stacks MUST NOT be vented near operable windows or building air intake vents.
17. Laboratories SHALL provide special radioactive waste containers. These SHALL bear the words “CAUTION, RADIOACTIVE WASTE” and a warning to janitors against handling.
18. Cleaning crews should NOT touch benches and instruments, etc., but are permitted to clean floors and windows only. Laboratory personnel are responsible for the rest of the housekeeping.
19. Repairs such as plumbing, etc. should NOT be undertaken unless the Radiation Safety Officer has been notified.
20. When use and storage of radioactive materials is to be terminated at a facility, notify the Radiation Safety Officer, which must make a terminal survey before an area can be released for other uses.

**D. RULES FOR USING RADIOISOTOPES IN ANIMALS:**

1. The areas in which animals are keep MUST be posted in accordance with the requirements of the Alabama Statutes and Regulations.
2. Cages and pens MUST bear labels on which are listed: the isotope used the quantity and date administered, measured external radiation levels, and the name of the responsible individual. These cages and pens should be separated from those housing non-radioactive animals.
3. Ventilation should be adequate to handle possible evolution of airborne radioactivity. This may, in some instances, require the use of a fume hood or self-contained controlled environmental systems.
4. Disposal of excreta via sewer may be permissible with the prior approval of the Radiation Safety Officer.
5. If excreta are mixed with bedding materials, it SHALL be handled as dry radioactive waste.
6. The Radiation Safety Officer MUST approves disposal methods for carcasses.
7. Animal caretakers SHALL be instructed and adequately trained by the laboratory supervisor with respect to general and specific handling procedures, dose levels, occupancy time limits and other special conditions. It is preferable that research personnel provide all animal care taking duties whenever possible.
8. Administration to animal outpatients and other non-University-owned animals SHALL approved by the Radiation Safety Officer. The Radiation Safety Officer will establish the criteria for the release to the owners in each case.

**E. STORAGE OF RADIOACTIVE MATERIALS:**

1. Radioisotope laboratories and storage areas (rooms, cabinets, safes, etc.) MUST BE LOCKED AT ALL TIMES, when not in actual use to prevent theft and unauthorized use of radioactive materials.
2. Radioactive materials stored in occupied areas SHALL be shielded in accordance with ALARA. A good rule for selecting storage containers and in designing equipment is that the radiation level be less than 200mR/hr at accessible surfaces and less than 10 mR/hr at one meter from the source, provided the normal operating distance to frequently occupied areas is such that no one is likely to exceed 10 % of the permissible radiation doses (Alabama Statutes and Regulations) or 100 mrem in a single month.
3. Unbreakable containers are recommended for storage of radioactive liquids. Bottles and other breakable containers used for storage MUST be kept in non-breakable, leak-proof containers or trays capable of containing the entire volume of liquid waste stored therein.
4. Radioactive gases and volatile forms of radioisotopes should be stored in a well-ventilated area, preferably in a hood or dry box.
5. All active samples including calibration sources regardless of strength should be clearly labeled giving information about the content as well as the name of the person or area

responsible for the sample. They MUST also carry the words “CAUTION RADIOACTIVE MATERIALS”. The Radiation Safety Officer reserves the right to take possession of unlabeled sources.

**F. TRANSPORTING RADIOACTIVE MATERIALS OUTSIDE THE LABORATORY**

1. Spills of radioactivity in areas such as corridors, stairs, and sidewalks are generally more serious than similar spills in laboratories because of the difficulty in controlling access to the contaminated area. Therefore, extra precautions, i.e... Double containers or special packing, are necessary when transporting radioactive material from one laboratory or storage room to another.
2. The outer container in which radioactive material is transported should be sealed and should be unbreakable material. When the nature of the work requires frequent and routine transporting of radically between laboratories and storage areas, it is strongly suggested that special equipment designed for maximum safety and ease of handling is acquired.
3. When a radioactive liquid is transported in a breakable container, it must be surrounded by enough absorbent material to readily soak up all the radioactive liquid.
4. A warning sign or label shall be attached to the outside of the container if a quantity of radioactive material greater than one mCi is being transported or if the radiation level at any accessible surface of the container is greater than 5 mR per hour gamma equivalent.
5. A remote-handling device SHALL be used in carrying a container of radioactive material whose surface radiation is greater than 200 mR per hour. The device shall be constructed so as to provide enough distance or shielding to reduce the radiation level to less than 200 mR per hour at the operator’s position. Ease of handling and sureness of operation SHALL be prime consideration in the design of such devices so as to reduce time of exposure. Crucible tongs are generally neither sure nor quick.
6. To lessen the chance of mishaps and to reduce random exposure to members of the general population, movement of radioactivity should be restricted to periods when traffic in corridors and on stairs is light. Make transit time short. Avoid necessary stops along the way. Never leave radioactivity unattended in any place but a locked storage area. Also do not store radioactivity anywhere but authorized radiation laboratories and storage areas.

1. Check the container for contamination after removal of the source. This will not only prevent re-use of contaminated containers but will serve as a check for seriously leaking sources.
2. If a spill should occur outside the laboratory, do not leave the area unattended unless it is necessary to render immediate emergency attention to personnel involved in the spill. Post a guard and restrict access to the contaminated area until such time as procedures outlined in Section II, “Emergencies,” can be complied with.
3. Transportation off campus must comply with Department of Transportation regulation. Consult with the Radiation Safety Officer for details and approval.

**G. RADIOACTIVE WASTE MANAGEMENT (GENERAL)**

The Radiation Safety Officer operates a central waste disposal facility for each type of radioactive waste generated at AAMU. General procedures for the transportation, handling, and storage of wastes are described in this document. In special circumstances, the Radiation Safety Officer may impose additional procedures if necessary.

**NOTE:** Laboratory Supervisors MUST ensure, prior to the procurement of any radioactive materials, that a method of disposal of the materials either presently exists or can be worked out to the satisfaction of the Radiation Safety Committee.

1. Each Radioisotope Laboratory Supervisor MUST maintain accurate records of the type, quantities, and form of radioisotopes that are placed in the radioactive waste that is released from his/her radioisotope laboratory. Otherwise, the Radiation Safety Committee cannot approve the disposal of such waste. Records kept by the Laboratory Supervisor may be based on either calculations or on measurements.
2. Radioactive waste containers should be stored as close to the work area as possible to minimize the probability of spilling during the transfer of the waste to the containers.

1. Waste containers SHALL NOT be stored in hallways, stairwells or other uncontrolled areas.
2. Radioactive waste containers should be covered at all times when not in use.

1. Regardless of its contents, each radioactive waste container SHALL be labeled with a “CAUTION RADIOACTIVE MATERIALS” label or sticker.
2. When handling or transferring radioactive waste, the individual should wear a laboratory coat and disposable gloves.
3. Radioactive wastes containing carcinogens, biohazards, or very hazardous chemicals must be inactivated, if possible, and packaged in such a way that they present minimal hazards to people who handle the wastes.

 **G.1 SOLID RADIOACTIVE WASTE MANAGEMENT**

Generally, shipment to and subsequent burial at low-level radioactive waste disposal sites around the United States dispose of solid radioactive wastes. Since availability of these sites is subject to technological, political and social factors, AAMU cannot assume that these disposal sites will be available. Consequently, all radioisotope users are asked to make a conscious effort to **MINIMIZE** the volume of radioactive wastes generated in their laboratories.

1. Specifically, solid waste which contain short-lived radioisotopes with half lives less than ninety (90) days should not be disposed of as radioactive wastes. Instead, these wastes should be held for decay until the normal radioactivity levels have become indistinguishable (statistically) from background levels.
2. Then the materials may be disposed of in the non-radioactive trash provided that all of the “Radioactive Material” labels have been removed or destroyed. A standard end-window type Geiger counter may be used to monitor for beta and gamma emitters. This method cannot be applied whenever tritium or any alpha emitters might be present in the waste. In any case, the Radiation Safety Officer is available for advice on monitoring.

1. Solid wastes, which might contain long-lived isotopes with a half-life greater than ninety days (90) or alpha-emitting isotopes of any half-life, SHALL be treated as solid radioactive waste.
2. It is the Laboratory Supervisor’s responsibility to secure proper storage for radioactive wastes generated in his/her laboratories.
3. The Radiation Safety Committee generally will provide the storage space for materials, which contain large quantities of radioisotopes, or for wastes that contain material that is in a highly dispersible or otherwise unusually hazardous form.
4. Every solid radioactive waste container SHALL be marked with a “CAUTION RADIOACTIVE MATERIALS’ sign and labeled with any other labels which the Radiation Safety Officer deems necessary.
5. NO LIQUID may be disposed of in the solid waste.
6. ALL solid radioactive waste containers MUST BE LINED WITH PLASTIC BAGS.
7. Solid radioactive waste should be serrated into three (3) categories as follows:

 a. Glass and plastic items which cannot be easily decontaminated.

 b. Paper waste, and

 c. Short-lived waste to be held for decay. (This waste may contain glass, plastic, and paper mixed together).

 **G.2 LIQUID RADIOACTIVE WASTE**

There are basically two (2) types of liquid radioactive wastes generated by research laboratories at AAMU. The most common liquid waste is aqueous in which the waste materials are either dissolved in water or else evenly distributed in a liquid which is mainly composed of water. Such waste can be disposed of by dispersal into the sewage system (if low-level) or by other methods as determined by the Radiation Safety Committee. The other, less common, form of liquid waste is liquid scintillation cocktail which is composed of volatile flammable, toxic, organic material which cannot be either burned or evaporated. Other liquid waste, which is not soluble or readily dispersible in water, must be treated in accordance with specifications worked out in advance by the Radiation Safety Committee.

All liquid radioactive waste **SHALL** be stored and disposed of according to the following requirements:

1. Non-aqueous (less than ten (10) percent water content) waste SHALL be stored in spill-proof, unbreakable plastic containers of one (1) to five (5) gallon capacity. The Radiation Safety Committee MUST approve the containers before used.
2. Non-aqueous waste SHALL be free of ALL filterable solids before the Radiation Safety Officer can collect it for disposal. For filtering liquid scintillation waste, a 60 mesh metal screen is recommend.
3. The pH range of any aqueous waste SHALL be adjusted to between 6.8 and 8.0.
4. NOTE: There are many special problems involving chemical reactions between mixtures of liquid wastes. The disposal of cyanides into acidic liquid waste will result in the production of hydrogen cyanide, a very toxic gas. Special care also MUST be taken when disposing of tissue which has been disgusted in nitric acid, as oxides of nitrogen may be formed that could cause the waste container to explode. The Laboratory Supervisor MUST ensure that chemical reactions will not occur in liquid waste containers.
5. Low activity aqueous waste may be disposed of through the sewer by flushing down laboratory sink drains. Rules and regulations limit the amounts and concentrations of radioactivity that may be disposed of in this manner. According to AAMU regulations, may release, annually, a total of five (5) curies of H-3, one (1) curie of C-14, and a total of one (1) curie of all other isotopes, combined.
6. Since there are several individual radioisotope laboratories at AAMU, it is imperative that the Radiation Safety Officer be made aware of ALL individual releases of radioactive waste. Thus, NO AQUEOUSRADIOACTIVE WASTE may be disposed of through the sewage system without prior approval.
7. The radiation Safety Committee should be consulted in the disposal of three aqueous wastes.
8. A special sink for washing contaminated glassware should be designed and appropriately labeled.
9. Organic solvent wastes or liquid scintillation cocktail shall not be released into the sewage system under any circumstances. All liquid scintillation counting wastes SHALL be turned over to the Radiation Safety Officer for disposal. To prepare the waste for disposal, the user must determine the type of isotopes, the concentrations (uCi/ml), and the chemical form of the waste. This information MUST BE ATTACHED TO THE WASTE CONTAINER BEFORE ITWILL BE PICKED UP.

**NOTE:** The Radiation Safety Officer reserves the right to refuse to accept any materials if, in the opinion of the Safety Committee, the materials have been improperly prepared or packaged, or if the RSO feels that the movement of the materials would pose an unacceptable hazard to AAMU personnel or to the public.

**G.3 LIQUID SCINTILLATION COUNTING VIALS, GLASSWARE,**  **AND PLASTIC CONTAINERS**

1. Liquid scintillation counting vials should be washed, decontaminated if necessary (see below), and either recycled or discarded as non-radioactive dry waste.
2. Vials which contained media in which the concentration of C-14 or H-3 was originally less than 0.5 uCi/ml need not be decontaminated and should be disposed of with the regular, non-radioactive solid waste after having been properly emptied and dried.
3. After contaminated containers have been washed, a representative sample of the batch of containers just washed should be counted to determine the effectiveness of the washing. If the average count rate is less than twice the background level, the containers may be disposed of in the non-radioactive waste. Containers which cannot be sufficiently decontaminated must be disposed of in the solid radioactive waste after having been properly emptied and dried.

1. The Radiation Safety Officer will collect containers only if they cannot be decontaminated. It is conceivable that certain unique situation might present themselves in some laboratories. In such cases, exceptions to these procedures may be possible based upon prior approval by the Radiation Safety Committee.
2. Other than the obvious exceptions of Pasteur pipettes, syringes (glass or plastic), and hypodermic needles, items that may have come into connect with radioisotopes should not be placed into a radioactive sharps container without prior approval of the Radiation Safety Committee by routine washing (or an overnight soaking) with an industrial strength detergent.

 **G.4 DISPOSAL OF RADIOACTIVE ANIMAL CARCASSES**

 Radioactive animal carcasses are disposed of by incineration. Although there is no limit on the concentrations of radioactivity in the animal tissues, there is a limit that is imposed by AAMU relating to the maximum concentrations in the exhaust of the incinerator chimney. Thus, it is very important that the actual tissue concentration of radioactivity in the carcasses be known so that the concentration expected in the chimney effluent may be calculated by the radiation Safety Committee staff. The Radiation Safety Committee reserves the right to prohibit the incineration of certain animal carcasses if the incineration of the carcasses will create unacceptable levels of radioactivity in the ashes or in the incinerator exhaust.

1. All carcasses must be frozen and double bagged in opaque plastic bags which area at least four (4) mils thick and labeled with “RADIATION TAPE’. (The tape may be obtained from the suppliers of laboratory equipment).
2. NO more than ten (10) kg of carcasses may be places in each bag.
3. Large animals (greater than ten (10) kg) MUST be cut into pieces each weighing no more than ten (10) kg. The pieces, frozen and bagged, must be packaged in heavy cardboard boxes or steel drums. The containers must be properly labeled and securely sealed before they may be transported to the incinerator.
4. If more than fifty (50) kg of carcasses is to be transported in one day, the carcasses must be transported by the user under the direct supervision of a member of the Radiation Safety Committee.
5. Parcels which have been improperly packaged or which are observed to be leaking SHALL NOT be transported.
6. The Radiation Safety Committee does not provide plastic bags, steel drums, cardboard boxes, or storage space. The user is responsible for picking up steel drums after the contents have been incinerated.
7. Under NO circumstances will ANY radioactive carcasses be incinerated until the following information has been given to the Radiation Safety Officer:

 a. Name of Radioisotope Laboratory Supervisor,

 b. Radioisotope laboratory location.

 c. Date of Package

 d. Species of animal(s) in each package,

 e. Total number of animals in each package,

 f. Average body weight of carcasses in each package (**NOTE**: that the total mass of carcasses in each package **MUST NOT** exceed ten (10) kg),

 g. Quantity (uCi) of each radioisotope present at the time the package was sealed and tagged. (Decay of short-lived isotopes should be taken into account), and

 h. Average tissue concentrations (uCi per gm) of radioisotopes in each package.

**NOTE:** This information **MUST** be provided at least twenty-four (24) hours before incineration is take place. That the total mass of carcasses in each package **MUST NOT** exceed ten (10 kg).

 g. Quantity (uCi) of each radioisotope present at the time the package was sealed and tagged (Decay of short-lived isotopes should be taken into account). And

 h. Average tissue concentrations (uCi per gm) of radioisotope in each package.

The radiations Safety Officer WILL provide the tags to be used to specify the above information. Each tag has three (3) copies. The hard copy SHALL be attached to the package (if packages are placed in a container for storage and/or transportation, the hard copy should be attached to the outside of the container), the green copy is for the user’s records, and the white copy MUST be received by the Radiation Safety Committee, at least twenty-four (24) hours before incineration is to take place.

1. The user SHALL make all arrangement for scheduling incineration. For incineration of large quantities of carcasses (as defined above) the user must be prepared to provide manpower to assist with carcasses disposal.
2. ALL radioactive animal carcasses, which for some reason cannot be incinerated, SHALL be specially packaged and prepared for disposal according to the radiation safety Committee’s instructions.

**NOTE: UNDER NO CIRCUMSTANCES SHALL ANY ANIMAL INTO WHICH RADIOISOTOPES HAVE BEEN INCORPORATED EVER BE TURNED OVER TO A RENDERING PLANT FOR DISPOSAL, REGARDLESS OF THE CONCENTRATIONS OF RADIOACTIVITY IN THE CARCASS AT THE TIME OF DISPOSAL.**

1. Laboratory supervisors are responsible for providing appropriate storage of ALL carcasses, portions of carcasses, tissues and/or serums awaiting incineration.

 **G.5 NON-ACCEPTABLE METHODS FOR THE DISPOSAL OF**  **RADIOACTIVE WASTES**

1. NO LIQUIDS may be disposed of in the solid wastes.
2. DISPOSAL BY BURIAL IS THE SOIL. Under no circumstances SHALL personnel using radioisotopes bury any quantity of radioactive waste in the soil.
3. DISPOSAL INTO SEWAGE SYSTEM. Under no circumstances SHALL radioactive waste be released into the sewage system without the authorization of the Radiation Safety Committee.

 **G.6 RADIATION MACHINES**

1. All radiation protection rules contained in foregoing sections of this Manual apply equally well to the ionizing radiation emitted by any machine or device. By definition, “Radiation Machine” includes cyclotrons, beta Tron, Van De Graaff and other electron heavy ion accelerators, electron microscopes, x-ray machines, vacuum switches, high voltage rectifiers and other device capable of producing ionizing radiation outside the components of the device.
2. The Laboratory Supervisor SHALL register radiation machines with the Radiation Safety Committee. Since an installation’s shielding plans and operating restrictions are best discussed and most easily modified during architectural planning stages, it is advisable to discuss potential radiation machine hazards with the Radiation Safety Committee before purchase, construction, or installation.
3. The Committee is authorized to require the use of such equipment and procedures as it deems necessary to insure radiation safety, for example: shielding, safety interlocks, warning signs and devices, operating restrictions, radiation area monitors, personnel monitoring.
4. A complete radiation survey SHALL be made and found satisfactory by the Radiation Safety Officer:

 a. For each new installation before it begins routine operations,

 b. For each old installation, before resuming routine operations whenever a machine, the installation, or an operating procedure is modified in a manner resulting in an increase in intensity, penetration or distribution of the radiation output

1. Where necessary, written routine operating procedures and emergency procedures (subject to approval of the Committee) SHALL be provided for the radiation machine operators. It is the responsibility of the Laboratory Supervisor to request a radiation survey from the Radiation Safety Committee in the above situations.

 **G.7 LASER REGISTRATION**

It is the responsibility of the Laboratory Supervisor to ensure that **ALL** Class 3b and Class 4 lasers are registered with the Radiation Safety Officer and OEHS.

It is strongly recommended that laser warning signs and/or safety interlocks be used where significant laser hazards exist.

**ALL** laboratories **WILL** maintain a file of current recommended laser safety codes and practices. Copies of the AAMU “Laser Safety Manual” **WILL** be made available on request from OEHS. Since laser uses and design are rapidly developing and changing, the radiation Safety Officer will appreciate any assistance that the many lasers users on campus can offer in preserving this file from the dangers of creeping obsolescence.

 **G.8 EMERGENCY PROCEDURES**

In any radiation emergency, Personnel Protection comes first, confinement of radioactivity next.

In each case, the Radiation Safety Officer (858-4091) MUST be notified as soon as possible. However, the emergency may demand other immediate action by those on the scene before this can be done. It is impossible to draw up a set of specific rules and procedures that would cover each eventually. Therefore, the following paragraphs present a set of general guidelines, which each individual faced with an unexpected hazardous situation, will remember and modify as circumstances and common sense dictate.

It is further hoped to motivate the reader to develop a safety-oriented attitude that actively anticipates potential hazards and accidents with an eye towards both prevention as well as predisposition to appropriate response to the unexpected. The laboratory supervisor in particular may find it useful to draw up a written emergency plan suited to his/her own facility and operations. S/he might prearrange to have on hand specific equipment and supplies uniquely required by his/her operation to minimum hazards and enhance recovery. For example, chemical compounds in use might require special decontamination agents.

 **1. SERIOUS INJURY AND EXPOSURE OR CONTAMINATION**

In the event that personnel have received high radiation exposure or radioactive contamination in addition to physical injury requiring immediate medical assistance, call (**911**). When the ambulance arrives, inform emergency personnel that the patient might be contaminated by radioactive material.

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 **2. FIRE OR EXPLOSION IN RADIOISOTOPE AREA**

In case of fire or explosion, call (**911**). If possible, stay on the scene to acquaint fire officer in charge with the nature of the radiation hazard present and to assist him/her as required. Also, follow instructions for **INTERMEDIATE AND HIGH LEVEL SPILLS** listed below.

 **3.** **HIGH RADIATION EXPOSURE WITHOUT CONTAMINATION**

In case of simple overexposure, do what can be done to terminate or limit the exposure and to prevent others from being exposed. If there is overexposure to **ALL** or any part of the body, the individual **MUST** notify the campus Radiation safety Officer (858-4091.

 **4. INTERMEDIATE AND HIGH LEVEL RADIOACTIVE SPILLS**

In case of a serious accident involving contamination of personnel or equipment, (including 1 and 2 above) the following steps should be taken in the order listed.

 **4.1 PROTECT PERSONNEL**

 a. If hazard is extreme (high radiation level or possibility of air contamination), evacuate the area immediately; close and lock the door.

 b. Rid yourself of contamination; remove contaminated clothing and wash contaminated parts of the body thoroughly with detergent.

 c. Flush out any wounds with copious amounts of water.

 d. Warn fellow workers and keep others out of the area.

 **4.2 CONFINE CONTAMINATION**

 a. Localize area of spill. Right tipped container; drop absorbent material at edges of liquid spills.

 b. **DO NOT** loiter in the area of a dry spill without respiratory protection. Shut off or close ventilating system if possible and turn off fans and blowers.

 c. **DO NOT** track contamination all over the area. Remove shoes or don shoe covers at the edge of contaminated area when summoning help.

 d. If contamination is widespread outside the laboratory, it may be necessary to call the University Police (5555/5556) to assist in establishing traffic control.

 e. Check all objects and clothing for contamination before leaving adjacent area. This includes clothing, etc. not worn during the accident.

 f. Call the Radiation Safety Officer (858-4091 or some member of the Radiation Safety Committee as soon as possible. **DO NOT** attempt immediate decontamination unless the situation threatens to become much worse.

 g. In **ALL** cases, consult the **EMERGENCY CALL LIST** posted in every Radiation laboratory and attached as APPENDIX “A”

 **4.3 DECONTAMINATE**

 a. Abortive attempts at decontamination can make things much worse. Unless immediate action is demanded to safeguard personnel and equipment decontamination should be done under the supervision of the Radiation Safety Officer.

 b. The individuals causing the contamination **WILL** be required to perform the major portion of the decontamination. The Radiation Safety Officer WILL determines the procedures and equipment to be used and **WILL** render such assistance as necessary.

 c. **ALL** personnel and areas involved **MUST** be monitored to assure adequate decontamination before normal work is resumed.

In each case, after the emergency has passed, the individual involved **SHALL** cooperate fully with the Radiation Safety Officer in preparing the Federal, State and local authorities require.

**SECTION III: PURCHASE, RECEIPT, AND TRANSFER OF RADIOACTIVE MATERIALS**

The Radiation Safety Committee is responsible for the approval of purchase, receipt, transfer and disposal of all radioactive materials on the AAMU campus. Radioactive materials **MAY NOT be** purchased or transferred on the AAMU campus, regardless of total amount or concentration, except as specifically authorized by the Radiation Safety Committee through the Office of Environmental Health and Safety.

 **A. PURCHASE OF RADIOACTIVE MATERIALS**

Radioactive materials procurements will be approved **ONLY** if a Radiation Permit has been granted to the Radiation Laboratory Supervisor. The Permit, which is issued to the Radiation Laboratory Supervisor by the AAMU Radiation Safety Committee, contains the conditions and limits under which the approved user may possess and use the specific radioisotopes being purchased. Purchasers of material must notify the Radiation Safety Officer prior to purchase. Contact the RSO at the information below

**Radiation Safety Officer**

**Office of Environmental Health & Safety**

**Facilities Bldg.**

**256-372-4090/256-924-0249**

Purchase requisitions **MUST** be routed to the Radiation Safety Officer for final authorization before they are forwarded to the Purchasing Office. To ensure expeditious handling of the order, the user should make sure that the following information is provided on the Purchase Requisition:

1. The name and signature of the Radiation Laboratory Supervisor who will be responsible for the materials.
2. The isotope being ordered.
3. The amount of the activity in millicurie units being ordered, and
4. The chemical form of the isotope being ordered.

The Purchasing Office **WILL NOT**, under **ANY** circumstances, approve a requisition for radioactive materials unless the Purchase Requisition has been routed through the Radiation Safety Committee for approval.

**NOTE:** Radioactive material MUST be purchased via a University purchase requisition. Departmental purchase requisition **WILL NOT** be accepted.

 **B. RECEIPT OF RADIOISOTOPES**

**ALL** radioactive materials ordered by approved users on the AAMU campus **SHALL** be delivered directly to the Radiation Safety Officer at the Office of Environmental Health and Safety (OEH&S)

1. The Radiation Safety Officer **WILL** monitor **ALL** shipments in accordance with regulations established by the Office of Radiation Control, State of Alabama, and Department of Public Health.
2. After each shipment of radioactive materials has been checked and found to be in compliance with ALL applicable rules and regulations, it WILL be delivered to the user.

1. Shipments containing materials that may be volatile, gaseous, or readily dispersible SHALL be opened in a fume hood.
2. The user to determine whether it might be leaking SHALL check the inner container. A simple swipe test WILL usually sufficient to make this determination.

**ALL** radioactive materials ordered by approved users on the AAMU campus **SHALL** be delivered directly to the Radiation Safety Officer at the Center for Irradiation of Materials (CIM).

1. The user **SHALL** notify CIM immediately if there is a problem with the shipment.
2. The user MUST dispose of the shipping container in an appropriate manner. If contamination is present, the container **WILL** be disposed as radioactive material. If the container is disposed in the non-radioactive waste, any “radioactive materials” labels, which might be on the container, **MUST** be either removed or defaced by the user.

 **C. TRANSFER OF RADIOISOTOPES**

**ALL** transfers of radioactivity between authorized users within AAMU are regarded as internal transfers. The Radiation Safety Officer **MUST** discourage internal transfers of radioactive materials in order to maintain its ability to control the distribution and use of radioactivity at AAMU. In certain specific cases, however, internal transfers **MAY be** authorized on a limited basis. Under **NO** circumstances will it be permissible for a researcher to generally dispense radioactivity on a routine basis to other researchers.

The following guidelines describe the conditions under which authorization to dispense radioactivity may be obtained. In urgent cases verbal authorization can be obtained by phone.

 **TRANSFERS**

1. Request permission by calling or writing to the Radiation Safety Officer stating the following:

a. Radiation Permit numbers and Name of the individual to receive the materials.

 b. Location where materials will be used/stored (must be areas authorized by the, Radiation safety Officer for use/storage of radioactive material),

 c. Isotopes and amounts (mCi) to be transferred,

 d. Schedule of transfers, and

 e. Reason for transfers.

1. You WILL be required to maintain records of ALL transfers including isotopes, amounts dates and documentation of contamination surveys of packages.
2. Prior to any transfer, the Radiation Safety Officer MUST verifies that the receiver is authorized to possess and use the isotopes and amounts being transferred. If the transfers have been authorized by the Radiation Safety Officer, the receiver WILL have been issued an inventory number (T-number) for the transfer. You MUST record this T-number and include it in your inventory summary to be submitted to the Radiation Safety Officer at a later date.
3. Ensure that proper transportation and packaging procedures are followed (see Radiation Safety Manual).

 **RECEIVER**

1. Call or write to the Radiation Safety Officer 372-4090) in order to obtain an I-number for the transfer. NOTE: If your Radiation Permit does not cover the isotope, amounts or forms of the materials to be transferred, it WILL be necessary for you to request an amendment.

1. Each procurement will be specifically assigned an I-number by the Radiation Safety Officer. In some cases involving multiple transfers of the same isotope from one user to another, a single I-number may be used for all transfers.

1. Immediately upon receipt of each batch you MUST notify the Radiation Safety Officer, either by phone, or by completing and mailing a delivery card to the Radiation Safety Officer. (Blank delivery cards may be obtained from the Radiation Safety Officer).

1. As with any other radioisotope deliveries, you MUST maintain accurate records of use and disposal.

**SECTION IV: DESIGN AND USE OF PERMANENT RADIOACTIVE SOURCES**

It frequently becomes necessary to prepare sources of a more or less permanent nature for calibrating instruments and for use in long-term experiments. Since these sources are usually subject to considerable handling, it is imperative that the maximum inherent safety be incorporated in the design of such sources and their corresponding handling equipment. The required amount of built-in safety will of course, varies depending on the type of source being prepared. Precautions necessary for a one (1) micro curie source are less exacting than for a similar source of several mill curies. Practices, which are relatively safe for a short-lived source, might be pitifully inadequate when applied to a long-lived source. In addition, source design will depend on the nature of the radiation given off, the chemical and physical form of the source, the biological activity of the source materials, etc.

In work with radioactive sources, the problem of protection has two (2) aspects:

 a. The protection from the direct radiation from the sources, and

 b. The protection of equipment and personnel from contamination from leaking or ruptured sources leading to possible deposition of radioactive material in the body through ingestion or inhalation.

The first is adequately covered by previous sections of the AAMU regulations. This section will discuss criteria for controlling contamination through adequate source design and methods of handling. The following are established as guidelines for the safe use of such fabricated sources as are subject to rather frequent and routine use.

1. ALL radioactive sources whether purchased ready-made or fabricated at the University are subject to inspection and approval by the Radiation Safety Committee. For sources already in existence, a description and annotated drawing SHALL be furnished to the Radiation Safety Officer on request. For each source, a drawing and/or a written description shall be submitted at the request of the Radiation Safety Officer.
2. Fabricated sources SHALL be constructed of breakage resistant materials and the radioactive constituents of each source SHALL be sealed to prevent leakage of the radioactive material (except as provided in Paragraph 3 below). Federal Regulations require that such sources SHALL be routinely tested for leakage at intervals of approximately six (6) months (three (3) months for alpha emitting sources) and also whenever there is reason to suspect leakage of the source.
3. Open sources and fragile sources. Occasionally the nature of an experiment demands that the source be uncovered or that thin films be used in its construction in order to disturb the characteristics of the radiation as little as possible. Such sources, being apt to creep, flake, corrode, rupture, are inherently very hazardous and therefore require special care in the design of the source holders, handling devices and storage containers. It is impossible to specify here design criteria for all sources of this nature. Therefore, it is advisable to discuss any unique problems of this nature with the Radiation Safety Officer before applying for approval of the source.
4. Accurate identification of radioactive sources is a prerequisite for safe handling. Therefore, as a minimum each source MUST be labeled with radiation warning symbols, an identification number, and the words “CAUTION RADIOACTIVE MATERIAL”. The following information should be included on the label whenever possible:

 a. The name of the radioisotope,

 b. It’s chemical form

 c. The source strength in curies or some sub-unit thereof,

 d. The radiation output in mr/hr at the surface or at some measured distance,

 e. The date of measurement, and

 f. Any other information which would enhance the utility or safety of the source. Where practicable, this label should be placed directly on the source or on a durable tag permanently attached to source by chain or rod. It is strongly recommended that provisions be made in the design stage for permanently labeling new sources.

In cases where sources of such fragility or small size are required that adequate labeling of the source itself is impractical, the labeling requirement may be waived upon approval of the Radiation safety Officer. Such a waiver may be obtained provided a system of handling is devised to assure that the unlabelled source is at **ALL** times either in its storage container or experimental apparatus.

1. Storage containers and apparatus in which radioactive sources are used must be labeled.
2. ALL labels MUST be legible at such a distance that a person would receive less than ten (10) mill roentgens in the time required to read the label.

**SECTION V: SURVRYING AND MONITORING RADIATION EQUIPMENT AND MATERIALS**

**DOSSIMETER (RADIATION BADGES)**

NOTE: Alabama A&M is in the process of switching to the INSTADOSE badges. These badges can be read online and used over and over again. Once the badges are implemented. This procedure will change to reflect the new badges.

1. Film Badges are issued to individuals working around radioactive materials and equipment.
2. Badges are mailed to manufacture once a quarter (Every 3 Months) for reading.
3. New badges should be mailed back in return in order continue monitoring.
4. A copy of the results must be sent to the Radiation Safety Officer and a copy kept in his/hers files.

**RADIATION SURVEY EQUIPMENT**

1. Radiation survey equipment is used to provide a quick reference for the amount of radiation exposure is in an area.
2. The Radiation Safety Office has a survey meter in possession and can be called upon in an emergency or requested by AAMU personnel. The RSO can be contacted at 256-372-4090
3. The survey meter must be calibrate yearly. The RSO will keep a copy of certification on file in his/hers office.
4. If AAMU personnel have a survey meter, the meter needs to be certified annually and copy kept on file. The Radiation Safety Officer can help to arrange for the meter to be calibrated.
5. Radiation materials and equipment must be surveyed in accordance with guidelines below.
6. Radiation Materials (liquids or solids) – Each time the products are ordered before unpacking and periodically to ensure no radiation is escaping containment.
7. Non-medical X-Ray Equipment – Once yearly or if the equipment is repaired or serviced.
8. The RSO will contact the responsible person for the equipment to schedule a survey and it is the responsible AAMU personnel to contact the RSO when product is ordered or equipment has been repaired. Contact the RSO at 256-372-4090 or gregory.bryant@aamu.edu.

**GENERAL STATEMENT ON RADIATION HAZARDS**

Alabama A & M University is committed to maintaining radiation exposure to faculty, staff, students, and the public, resulting from the use of radiation sources in teaching and research, AS Low As Is reasonably Achievable (ALARA). The Radiation Safety Committee and the Office of Environmental Health and Safety will advise and assist faculty, staff, and students in ALL matters regarding radiation safety. The Committee **WILL** recommend to the Campus Administration, through the Office of Environmental Health and Safety, policies and procedures to be required for maintaining radiation exposures ALARA through the safe handling, storage, use, transport and disposal of radiation sources and will assist in the interpretation of the rules and regulations of the U.S. Nuclear Regulatory Commission, Office of Radiation Control, State of Alabama, Department of Public Health, U.S. Environmental Protection Agency, U.S. Center for Device and Radiological Health (FDA) and others that pertain to protection against radiation.

Sources of radiation include materials or equipment that is capable of emitting either ionizing or non-ionizing radiation. Ionizing radiation sources include radioactive materials, nuclear reactors, particle accelerators, x-ray machines and electron microscopes. Non-ionizing radiation sources include lasers, high-intensity sources of ultraviolet light, microwave transmitters, and other devices that produce high intensity radio-frequency radiation. Both types are of concern are under the purview of the Radiation Safety Committee and the Office of Environmental Health and Safety.

Policies and procedures for radiation safety are delineated in the Alabama a & M University (AAMU) Radiation Safety Manual, copies of which may be obtained from the radiation Safety Officer and the Office of Environmental Health and Safety. Question regarding radiation hazards should be directed to the Radiation Safety Officer at 256-372-4090).

**POLICY ON CLEANUP OF RADIOACTIVE CONTAMINATION AND ABANDONED RADIOACTIVE MATERIALS**

 Departments are responsible for decontamination of facilities and for identification and proper disposal of radioactive materials abandoned by their personnel.

Situations may arise in which unknown or abandoned radioactive materials and/or contamination are discovered in research laboratories. In such cases it is the responsibility of the Department to perform detailed analysis and appropriately dispose of such materials and/or reduce contamination to acceptable levels as stipulated by pertinent regulatory agencies. It is recognized that Departments are not always able to assume these responsibilities or perform this required task within reasonable time frame. In such cases, Departments may arrange for the services of the Radiation Safety Officer and/or the Office of Environmental Health and Safety on a cost reimbursement basis to accomplish the necessary identification, decontamination and disposal.

Upon discovery of unknown or abandoned radioactive materials or if contamination is discovered in research laboratories, the Radiation Safety Officer WILL request the responsible Department in writing to effect the cleanup within sixty (60) days. After sixty (60) days, the Radiation Safety Officer WILL assumes responsibility and proceeds to finish the task unless the Radiation Safety Committee and the responsible Department agree otherwise. The Department will reimburse the Radiation Safety Officer for the cost incurred in the process. The Radiation Safety Committee will arbitrate any disputes that may arise.

Further questions concerning this policy should be directed to the Office of Environmental Health and Safety at 256-372-4090 or email at gregory.bryant@aamu.edu.