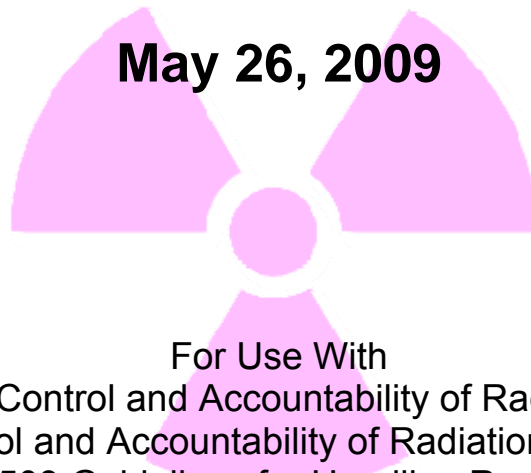


Radiation Safety Policy Manual



May 26, 2009



For Use With
Procedure 9501 Control and Accountability of Radioactive Materials
Procedure 9502 Control and Accountability of Radiation Generating Equipment
Procedure 9503 Guidelines for Handling Radioactive Spills

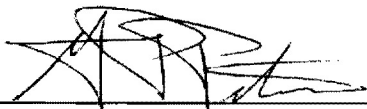
**Office of Radiological Safety
(404) 894-3605**

INTRODUCTION

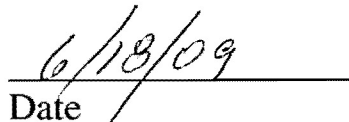
The rules and regulations that govern the use of radiation and radioactive material on the Georgia Tech campus are contained in the State of Georgia Rules and Regulations, Chapters 290-5-22 and 391-3-17.

This Radiation Safety Manual is written for the purpose of administering the above rules and regulations at Georgia Tech by clearly specifying the requirements which shall be adhered to by researchers. Further, this Manual defines the level of compliance required by individuals who wish to utilize radiation or radioactive materials in their research and teaching programs at Georgia Tech.

The requirements of this Radiation Safety Manual have the authorization of the President of Georgia Tech. Knowledge of and adherence to these procedures is the responsibility of every individual who utilizes radioactive materials and radiation producing devices. All users shall cooperate with the Radiation Safety Committee, and the Radiation Safety Officer, who have administrative responsibility for radioactive material research and radiation safety issues on the Georgia Tech campus.



G.P. "Bud" Peterson, President
Georgia Institute of Technology



Date

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1. RADIATION SAFETY COMMITTEE

A Radiation Safety Committee (RSC) has been established by the President of Georgia Tech. The RSC is responsible for maintaining the health and safety standards associated with the use of radioactive materials and ionizing radiation producing devices on the Georgia Tech campus and conforming to the regulations of State of Georgia.

1.1 Membership

The Radiation Safety Committee shall be composed of senior technical personnel who provide experience in radiological safety and radiation protection, including a representative of Georgia Tech Administration and a representative from various colleges, departments, groups, or activities that use ionizing radiation. The Radiation Safety Officer (RSO) will be an ex-officio member of the RSC.

1.1.1 The President shall appoint members to the committee for periods of up to three years on staggered terms. *Membership is limited to two terms. After two terms, a three year absence from committee membership is required. Appointments will be based on calendar years.

1.1.2 A quorum will consist of a simple majority of RSC members that must include the chairperson and the RSO or their designee.

1.1.3 The chairperson of the RSC and the RSO cannot be the same person.

1.2 Scope

The Georgia Tech Radiation Safety Program encompasses the use of all Ionizing Radiation Producing equipment and Radioactive Material for all campus facilities including the Institute of Paper Science and Technology (IPST) and Georgia Tech Research Institute (GTRI) and any field sites within the state of Georgia. The Program does not approve the use of Ionizing Radiation Producing equipment and Radioactive Material outside the state of Georgia.

1.3 Responsibilities

1.3.1 The Committee shall meet quarterly and more often when situations arise

* The number of committee members is unlimited.

that need attention.

- 1.3.2 Approvals by the Committee are signified by the receipt of a simple majority vote of approval by the eligible voting members of the Committee.
- 1.3.3 The Committee shall review and approve or disapprove all proposed experiments and tests utilizing radioactive material in excess of exempt quantities and exempt concentrations and all other types of ionizing radiation on the Georgia Tech campus.
- 1.3.4 The Committee shall review and approve proposed radioactive materials and radiation producing equipment operating procedures and health physics procedures for the Georgia Tech campus. It shall also review and approve revisions to already existing procedures. Minor modifications to procedures and supporting forms which do not change the original intent of the procedure may be approved by the Radiation Safety Officer. Individuals on the Committee will serve as technical content experts providing consultation to the RSO.
- 1.3.5 The Committee shall review reportable occurrences and take appropriate action.
- 1.3.6 The Committee shall review and approve proposed changes to the ionizing radiation facilities (e.g. shielding, ventilation) pursuant to regulations of the State of Georgia as contained in Chapters 290-5-22 and 391-3-17 of the State Rules and Regulations.
- 1.3.7 The Committee shall audit, on an annual basis, the Office of Radiological Safety for adequacy and operational records for compliance with internal rules, radiation safety equipment performance, procedures, regulations, and license conditions. The audit results will be sent to the President of Georgia Tech.
- 1.3.8 Minutes of the Committee meetings, including any recommendations or occurrences, shall be recorded and distributed to all committee members and the President's Office. Committee minutes will also be filed in the Office of Radiological Safety (ORS) office.
- 1.3.9 The Committee shall review and approve all applications for the use of ionizing radiation on the Georgia Tech campus including radioactive materials and radiation generating devices.
- 1.3.10 The Committee may delegate authority to the Chairperson or a Subcommittee to act in its behalf between normal meeting dates in certain matters. In such a case, at the next meeting of the Committee, the full

membership will review the action and provide guidance (e.g., authorization for a new AU to use radioactive materials).

1.3.11 The Committee shall review and approve all revisions to the Radiation Safety Policy Manual.

1.4 Radioactive Material

Radioactive Material (RAM) includes all materials that emit ionizing radiation with a specific concentration greater than 10^{-6} $\mu\text{Ci/g}$ (GA 391-3-17.02(21) (a)) or having an atomic number greater than 83. Environmental samples are exempt.

1.5 Radiation Producing Equipment

Radiation producing equipment/radiation producing devices (X-ray) includes all equipment that has the potential for emitting ionizing radiation (X-rays) in excess of 0.5 mR/hr at 5 cm.

2. RADIATION SAFETY OFFICER

2.1 Appointment

The Radiation Safety Officer (RSO) is appointed by the Associate Vice-President for EH&S. The RSO is qualified to advise others on safety matters pertaining to ionizing radiation due to his/her level of education, training and experience. The RSO shall supervise and administer the radiation safety program of the Georgia Institute of Technology.

2.2 Responsibilities

- 2.2.1 The RSO shall act in a supervisory/administrative capacity in all aspects of the Georgia Tech's radiation measurement and radiation protection activities including personnel monitoring, maintenance of exposure records, survey methods, waste disposal, decontamination, and radiological safety practices.
- 2.2.2 The RSO shall review and recommend all activities and procedures which involve actual or potential exposure of personnel to radiation or the release of radioactive materials to the environment.
- 2.2.3 The RSO shall be available to consult with all users of ionizing radiation so as to provide advice in radiological safety matters.
- 2.2.4 The RSO shall maintain an inventory of all radioactive material (sources) and radiation producing equipment on the Georgia Tech campus.
- 2.2.5 The RSO shall implement a radiation survey program for the Georgia Tech campus as deemed appropriate in the interest of radiation safety. Appropriateness in this instance shall be based on adherence to and compliance with regulatory requirements.
- 2.2.6 The RSO shall maintain records of radiation surveys and exposures of personnel to ionizing radiation as may be required to demonstrate compliance with state and federal regulations and other industry good practices.
- 2.2.7 The RSO shall assist Authorized Users in the training of users of radionuclides and ionizing radiation producing machines. The ORS shall provide an introduction to general radiation safety in the laboratory while the Authorized User shall provide specific on-the-job training for each employee/student working under their direction.

- 2.2.8 The RSO shall obtain, issue, collect and record the results of all personnel monitoring devices deemed necessary to determine the level of personnel exposure (>10% of permissible exposure limits) to radiation.
- 2.2.9 The RSO shall report to the Radiation Safety Committee, any radiation hazards, serious infractions of rules, or other radiological incidents. The RSO shall initiate, recommend, provide and verify the corrective actions and implementation of corrective actions.
- 2.2.10 The RSO shall communicate regularly with the Georgia Tech Administration regarding program implementation and compliance status.

2.3 Authority

- 2.3.1 The RSO has the authority and responsibility to interrupt or suspend any activity that involves the use of radiation if the methods and/or procedures used in such experiments in his/her professional opinion are deemed to be unsafe and/or contrary to regulations. Such interruption/suspension shall remain in effect until resolved by the Radiation Safety Committee.
- 2.3.2 The RSO has the authority and responsibility to review and approve proposed experiments and tests utilizing exempt quantities and exempt concentrations of radioactive material [Ref. GA Regs. 391-3-17.02(21a) and (b).]
- 2.3.3 The RSO has the authority and responsibility to review and approve minor changes in Authorized User Form A approvals (e.g. room changes, minor changes in procedure provided the change does not diminish radiation safety).
- 2.3.4 The RSO has the authority to designate and delegate a health physicist as an Associate Radiation Safety Officer.
- 2.3.5 An Associate RSO has signing authority in the absence of the RSO.
- 2.3.6 An Associate RSO may have specific authority for a given area of responsibility.

3. RADIATION WORKER

3.1 Definition

A Radiation Worker is a member of the Georgia Tech faculty, staff or student population that has completed radiation training provided by the Office of Radiological Safety. Radiation Worker status must be obtained to work under the supervision of an Authorized User. Authorized Users must also obtain Radiation Worker status to be approved as an Authorized User.

3.2 Responsibilities

- 3.2.1 Follow policies and procedures issued by the Radiation Safety Committee and the Office of Radiological Safety.
- 3.2.2 Be familiar with and use established emergency procedures
- 3.2.3 Report suspected radiation overexposures to the RSO
- 3.2.4 Independently use radiation sources after completing and passing radiation safety and source specific operational training.
- 3.2.5 Routinely wear issued dosimetry.

4. AUTHORIZED USER

4.1 Definition

An Authorized User (AU) is a Georgia Tech faculty or staff person who obtains written authorization from the RSO, and the Radiation Safety Committee to use radioactive material and/or radiation producing equipment in research, educational and service activities at Georgia Tech.

4.2 Responsibilities

- 4.2.1 The AU is responsible for using ionizing radiation in accordance with written procedures which conform to State and Federal rules and regulations. The requirements are specified in this Manual and Procedures 9501, Control and Accountability of Radiation Sources, and 9502, Control and Accountability of Radiation Producing Devices. The manual, procedures and regulations are available in the Office of Radiological Safety.
- 4.2.2 The AU is responsible for ensuring that students and assistants/technicians under his/her supervision adhere to procedures, rules and regulations, the requirements of this Manual and the requirements of Procedures 9501 and 9502.
- 4.2.3 The AU is responsible for providing specific laboratory training for those individuals working under his/her direct supervision to ensure the worker's personal safety.
- 4.2.4 The AU shall maintain up-to-date inventory of the radioactive materials or radiation producing equipment for which he/she is responsible. The AU must also maintain records of periodic survey results of the work areas.
- 4.2.5 The AU is responsible for preparation and holding of radioactive waste material designated for disposal. While in the laboratory, radioactive waste material shall be stored in appropriate containers as recommended by the Office of Radiological Safety. The AU is also responsible for providing the appropriate paperwork regarding radioactive waste material to the Office of Radiological Safety at the time of waste pickup.
- 4.2.6 The AU is responsible for posting appropriate radiation signs and labeling containers of radioactive material with the standard radiation warning symbol in their laboratory area where the material is used.
- 4.2.7 The AU shall post in the laboratory area; directions for notification of

responsible parties should an abnormal situation arise. Where applicable, the AU (or other individual) should contact the Office of Radiological Safety for assistance.

4.3 Acquisition of AU Status

Members of the Georgia Tech faculty and scientific staff are eligible to apply for AU status. Instructions for application are contained in Procedures 9501 and 9502, along with the method and conditions of approval. Procedure 9501 also delineates the responsibilities of the AU in detail. Procedures and the requisite forms are available from the Office of Radiological Safety or may be downloaded from the ORS website at <http://www.ors.gatech.edu>.

4.4 Procurement of Radioactive Materials and/or Radiation Producing Equipment

The method of radioactive materials or radiation generating equipment acquisition is described in Procedures 9501 and 9502. All radioactive material is to be received by the ORS for an initial survey to ensure that leakage did not occur during transportation and that the new radioactive material is added to the inventory database. The Purchasing Department at Georgia Tech will not process requisitions for X-ray units without RSO approval.

4.5 Shipment, Sales or Surplus of Radioactive Material and/or Radiation Producing Equipment

The Radiation Safety Officer must approve all shipments, sale or surplus of radioactive materials and/or radiation producing equipment. Radioactive material will only be sent to or from campus via the Office of Radiological Safety in accordance with established procedures and regulations.

4.6 Contracted Radiological Services

4.6.1 All sources of ionizing radiation on the Georgia Tech campus are subject to this policy manual. Contracted services, e.g. mobile X-ray units, gamma imagers, lead paint analyzers or any ionizing radiation source must, prior to use, notify the Office of Radiological Safety with a copy of each of the following:

- State of GA license or equivalent
- Policy and Procedures
- Training Records

4.6.2 Contractors using their own radiation sources are responsible for their own

personnel dosimetry and training. If Georgia Tech sources of radiation are identified, Georgia Tech will provide monitoring.

4.6.3 The Radiation Safety Officer may do an on-site survey where ionizing radiation is being used or suspected of use.

5. OFFICE OF RADIOLOGICAL SAFETY

5.1 Staff

5.1.1 The RSO may be supported by Associate Radiation Safety Officers having duties delegated to them by the RSO.

5.1.2 The RSO is supported by a staff of health physicists who assist in the maintenance and control of the Georgia Tech Radiation Safety Program.

5.2 Corrective Action Levels

5.2.1 Level V—ORS Staff Observations. For example, routine safety reminders or potential safety infractions. The observations are to be recorded on survey forms and called to the attention of the radiation worker. No follow-up action is required.

5.2.2 Level IV—RSO reportable. For example, recurring potential safety infractions will be noted on the survey forms, and be reviewed by the RSO. The RSO will contact the Authorized user (AU) and request immediate correction. No follow-up is required.

5.2.3 Level III—Investigation Level. For example, exposure to radiation in excess of ALARA levels (See Section V. ALARA) or recurring RSO reportable incidents. The RSO will evaluate the incident in writing and recommend remedial action to the AU. The RSC will review the completed remedial action.

5.2.4 Level II—Violation. For example, reportable violations to the State of Georgia or infractions of Georgia Tech procedures. The RSO will prepare a written notification and/or response. The Authorized User will provide written response with remedial action. The RSC will review the remedial action.

5.2.4.1 The AU must immediately report stolen, lost or missing licensed radioactive material to the RSO. The RSO will contact the Georgia Tech Police Department and a formal police investigation will be conducted.

5.2.5 Level I—Cease Operations. The RSO terminates the user authorization Form A. A new Form A must be prepared and approved by the RSC before activities may be resumed.

5.3 Corrective Action Response

When an Authorized User is required to submit a written statement or explanation to the Chairperson, Radiation Safety Committee, the response should be addressed to the Georgia Tech Radiation Safety Officer within 30 days of the date of the letter transmitting the notice of Corrective Action (Notice).

This reply should be clearly marked as a "Reply to a notice of Corrective Action" and should include: (1) the reason for the corrective action, or, if contested, the basis for disputing the corrective action, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved.

If an adequate reply is not received within the time specified the Authorized User's request application may be modified, suspended, or revoked.

6. ALARA

In keeping with currently accepted practices in Radiation Protection throughout the industry, and as mandated in GA DNR Reg. 391-3-17.03(4)(b), all personnel exposure to radiation shall be maintained at the lowest level which can be practically, economically, and reasonably achieved - As Low As Reasonably Achievable.

This policy and practice is called ALARA and shall be rigorously applied to all operations utilizing ionizing radiation on the Georgia Tech campus. ALARA investigational levels at Georgia Tech are 20% of regulatory limits. The management of Georgia Tech is committed to the ALARA philosophy and to ensuring that work involving radiation is accomplished in a safe and controlled fashion.

7. PERMISSIBLE DOSE LIMITS FOR PERSONNEL

To implement the ALARA policy, all unnecessary radiation exposure of personnel shall be considered undesirable and, therefore, shall be maintained at the lowest reasonably achievable level. In no case shall an occupationally exposed person be purposefully permitted to exceed the permissible dose limits. The specific dose limits are:

7.1 Annual Dose Limits

7.1.1 The Total Effective Dose Equivalent (TEDE) for radiation workers at Georgia Tech shall not exceed 5 rem per year.

7.1.2 The sum of the Deep Dose Equivalent and the Committed Dose Equivalent to any individual organ or tissue (other than the eye) shall not exceed 50 rem per year.

7.1.3 The dose to the eye shall not exceed 15 rem per year.

7.1.4 The shallow dose equivalent to the skin and extremities shall not exceed 50 rem per year.

7.2 Embryo/Fetus Dose Limits

7.2.1 Female radiation workers who become pregnant and declare the pregnancy in writing to the RSO shall be limited to a dose of 500 mrem for the gestational period of the fetus.

7.2.2 The female worker who chooses to declare her pregnancy should inform her supervisor (AU) and the RSO. Appropriate steps to limit exposures and to ensure that exposure of the embryo/fetus shall not exceed 500 mrem per gestation period will be determined cooperatively by the AU and the RSO. Based upon the work activity of the declared pregnant worker, the RSO has the authority and responsibility to designate work activities of the declared pregnant worker to ensure that no dose limits are exceeded.

7.3 Radiation Dose Limits of Minors

7.3.1 No person under 18 years of age will be permitted to work with any radiation source unless the RSO and RSC have granted special approval prior to any work and written approval from the person's parents or legal guardian has been obtained.

8. PERSONNEL MONITORING

Any person who enters a radiation area whose access is controlled or who is likely to receive >10% of a permissible limit, shall wear appropriate devices for measuring personnel exposure. These devices shall be provided by the Office of Radiological Safety. Procedure 9314 Personnel Dosimetry provides more detail on personnel monitoring.

8.1 Personnel Monitoring Devices

Personnel monitoring devices worn for permanent record purposes will normally be either film badges, optically stimulated luminescent dosimeters or thermoluminescent dosimeters (TLDs). However, the use of calibrated pocket ionization chambers or electronic dosimeters are also permissible.

8.2 NVLAP

Any dosimetry device provided to personnel for permanent record keeping purposes (dose of record) shall be from a laboratory that is certified by the National Voluntary Laboratory Accreditation Program (NVLAP).

8.3 Dosimeter Exchange Frequency

- 8.3.1 Personnel monitoring devices employed for the purpose of monitoring radiation resulting from beta, gamma-ray, x-ray and neutron radiation shall be changed and processed at least once per quarter.
- 8.3.2 If a personal exposure in excess of permissible limits is suspected to have occurred, the RSO shall be notified immediately so that the device may be processed to ascertain the individual's exposure level. An exposure evaluation will be performed by the RSO who shall initiate corrective action to preclude recurrence of the event.
- 8.3.3 If personnel lose a dosimeter, they should call the ORS immediately and request another dosimeter. Regulations require that a record of the lost dosimeter be maintained. Thus, each employee must file a lost badge report and estimate their radiation exposure during the lost dosimeter period.

8.4 Location of Dosimeter

- 8.4.1 All personnel monitoring devices shall be worn on the front of the body between the neck and the waist.
- 8.4.2 In some instances, the trunk of the body may not be the highest radiation exposure area on an individual. If so, the individual shall wear a dosimeter at the most exposed area on the body (e.g., hand) or as specified by Office of Radiological Safety.

8.5 Worker Registration

- 8.5.1 It is the responsibility of the Authorized User (AU) to notify the Office of Radiological Safety when a new individual begins work in their laboratory.
- 8.5.2 Notification should be initiated through use of the Worker Registration Form B which contains sufficient detail to permit the RSO to determine whether or not a dosimeter is needed for that individual. Worker Registration Forms are available at the ORS.
- 8.5.3 Multiple Form B's are required if the radiation worker is working for multiple Authorized Users.
- 8.5.4 Radiation Worker – An individual who has demonstrated by examination his/her ability to understand and handle radioactive materials or radiation producing devices and has received approval from the Radiation Safety Officer.
- 8.5.5 Senior Radiation Worker
- 8.5.5.1 Defined. Senior Radiation Worker - A radioactive worker who has additional special training and is permitted by the radiation safety officer to do special tasks.
 - 8.5.5.2 A person having a specific X-Ray training comparable to a manufacturer's course to trouble shoot an X-Ray unit.
 - 8.5.5.3 Specially trained radiation worker who oversees a lab or group of radiation workers.

8.6 Storage of Dosimeters

- 8.6.1 When not in use, dosimeters shall be stored in areas where they are

protected/shielded for radiation or extremes in temperature and/or humidity.

8.6.2 Dosimeters should be kept in the laboratory or office and not taken home.

8.7 Records

8.7.1 Personnel monitoring records shall be maintained at the ORS and are permanent records of Georgia Tech.

8.7.2 Any individual wishing to know his/her exposure level may contact the RSO for an appointment to view his/her exposure records at any time.

8.7.3 Any employer may request the exposure history of an individual who has been monitored for radiation exposure at Georgia Tech from the Office of Radiological Safety. All such requests must be accompanied by a signed request from the individual who was monitored.

9. POSTING OF RADIOLOGICAL AREAS AND LABELING OF CONTAINERS

9.1 Airborne Radioactivity Area

An Airborne Radioactivity Area is an area (room, enclosure or operating area) where the concentration of radioactivity in the air is in excess of the Derived Air Concentration (DAC's) quantities specified in (App.) B, 10 CFR 20 or to such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours. These quantities are specified for each nuclide and chemical classification.

9.1.1 Posting of Airborne Radioactivity Areas

Any room, enclosure or operating area in which the concentration of airborne radioactivity exceeds the permissible amounts specified in Step A.1., above, shall be posted as an airborne radioactivity area. The area shall be posted with a sign bearing the standard radiation caution symbol and the words: CAUTION - AIRBORNE RADIOACTIVITY AREA.

9.1.2 Permissible Personal Exposure to Airborne Radioactivity

Georgia Tech personnel shall not be exposed to concentrations of airborne radioactive material in excess of those specified in step A-1 above without prior approval of RSO.

9.1.3 Permissible Limit on the Rate of Personal Exposure to Airborne Radioactivity

9.1.3.1 The maximum rate at which persons may be exposed to airborne radioactivity is specified in App. B, Table 1, 10 CFR 20. Two thousand (2000) DAC-hrs is equivalent to a committed effective dose equivalent of 5 rems.

9.1.3.2 The determination of the potential exposure level will include the intake of the radionuclide(s) through the skin, as well as inhalation and/or ingestion to ensure that the amount equivalent to that specified by the regulations is not exceeded.

9.1.4 Determining Compliance

9.1.4.1 For determining compliance with the regulations concerning personnel exposure to airborne radioactivity, the following methods are acceptable:

- Sampling air for radioactivity content in the breathing zones of workers;

- measurements of radioactivity in the body (whole body counting);
- excretion of radioactivity from the body (urine or fecal analyses); or
- any combination of these methods.

9.1.4.2 Personnel exposure estimates and regulatory compliance will normally be determined by the RSO or his/her designee.

9.1.4.3 Personnel exposures equivalent to less than two Derived Air Concentration (DAC) hours per day or 12 DAC-hours per week need not be tracked. Exposures in excess of these quantities must be tracked to ensure that the 40 DAC-hour per any 7 consecutive days is not exceeded.

9.1.4.4 Personnel who wear respiratory protection devices shall be enrolled in the EHS Respiratory program and be included in the bioassay program.

9.1.5 Engineering Controls

As a component of the ALARA (See Section V.) program, all reasonable measures shall be employed to utilize process or engineering controls to limit concentrations of radioactive material in air to maintain levels below those that delimit an airborne radioactivity area.

9.1.6 Respiratory Protection

9.1.6.1 Use of respiratory protection devices to limit personnel exposure to airborne radioactivity requires the approval of the RSO.

9.1.6.2 Work in airborne radioactivity areas shall be controlled by a Radiation Work Permit.

9.2 Contamination Surveys

All laboratories and facilities where radioactive materials are used or stored shall be surveyed periodically to detect changes in radiation levels and/or prevent the spread of radioactive contamination.

9.2.1 Authorized User (AU) Responsibility

It shall be the responsibility of the AU to institute a program requiring laboratory personnel to routinely monitor themselves and the laboratory area in which they are working for loose radioactive material. When contamination above background levels is detected the AU shall have that contamination removed before any activity in the laboratory area is allowed to proceed.

9.2.1.1 When contamination is identified in excess of 100 cpm above background using a hand held portable GM counter with a pancake probe, the AU will immediately decontaminate the area and notify the ORS for an evaluation and permission to proceed with routine functions.

9.2.1.2 Any contamination on or within a person shall be reported to the RSO immediately so that an analysis and proper assessment can be made.

9.2.2 Office of Radiological Safety Responsibility

It shall be the responsibility of the Office of Radiological Safety to conduct periodic radiological surveys of rooms where greater than exempt quantities are stored or used. Records of these surveys shall be maintained and shall be made available for review by the AU upon request. Official records may not leave the ORS at any time.

9.2.3 Action Levels for Contamination

Radiation Type	Immediate/Weekly Surveys (GM Counter)	Immediate/Weekly Surveys (Smears)	Quarterly Surveys (Smears)
alpha emitters (α)	N/A	20 dpm/100cm ²	20 dpm/100cm ²
beta emitters (β), except ³² P	N/A	100 dpm/100cm ²	100 dpm/100cm ²
³² P	<100 cpm above bkg.	100 dpm/100cm ²	100 dpm/100cm ²

9.2.4 Instrumentation

9.2.4.1 The AU is required to purchase an appropriate radiation monitoring instrument, if necessary.

9.2.4.2 Calibration services are provided for most radiation detection instruments (GM and scintillation probes) by ORS.

9.2.4.3 The calibration frequency for all survey instruments shall be annually. Annually means once every 12 months or no later than the last day of the same calendar month of the following year [DNR 391-3-17-01(2)3].

9.3 Radiation Areas

9.3.1 Definition

A Radiation Area shall be declared to exist for all areas where there is radiation originating from licensed radioactive materials at levels sufficient to deliver to a human body a dose in excess of 5 mrem in one hour at 30 cm.

9.3.2 Posting of Radiation Areas

Each Radiation Area shall be posted with a sign showing the standard radiation caution symbol and the words: CAUTION - RADIATION AREA or DANGER - RADIATION AREA.

9.3.3 Other Requirements for Radiation Areas

9.3.3.1 Radiation areas must have a defined control area. A control area is an area that can be limited by the licensee for any reason.

9.3.3.2 Radiation areas may have a Restricted Area. A Restricted Area is an area that is limited by the licensee. It is for the purpose of protection.

9.4 High Radiation Areas

9.4.1 Definition

A High Radiation Area is any area that has a radiation source capable of irradiating a major portion of a human body with a dose in excess of 100 mrem in one hour at 30 cm.

9.4.2 Posting of High Radiation Areas

Each High Radiation Area shall be posted with a sign bearing the standard radiation caution symbol and the words: CAUTION - HIGH RADIATION AREA or DANGER - HIGH RADIATION AREA.

9.4.3 Access Control of High Radiation Areas

Positive control shall be established over each entrance or access point to a High Radiation Area. Any one of the several options listed below is acceptable for exhibiting positive control over the area.

9.4.3.1 Each access point may be equipped with a control device that will cause the radiation level to decrease below 100 mrem/hour upon entry of the area by personnel, or

9.4.3.2 Each access point may be equipped with a control device that emits a conspicuous visible or audible alarm signal so that the supervisor of the individual, as well as the individual himself, is made aware of the fact that entry into a High Radiation Area has occurred, or

9.4.3.3 Each access point must be maintained locked except during periods when access to the area is required. Positive control must be exercised over each individual entry.

9.4.4 Other Requirements for High Radiation Areas

9.4.4.1 When access control is established over a High Radiation Area, the control shall not prevent an individual from leaving a High Radiation Area.

9.4.4.2 If a High Radiation Area is established for 30 days or less, direct surveillance to prevent unauthorized entry may be substituted for the requirements elaborated above in Step D.3.

9.4.4.3 All High Radiation areas are Restricted Areas. Personnel with access to Restricted Areas will undergo Annual Refresher Training.

9.5 Radioactive Materials Area and Labeling

9.5.1 Definition

A Radioactive Material Area is any area where sources of radiation are used or stored in quantities in excess of 10 times the quantities listed in Appendix C, 10 CFR 20.

9.5.2 Posting of Radioactive Materials Areas

Rooms, areas and equipment where sources of radiation are used or stored which meet the criteria stated in Step E.1 above, shall be conspicuously posted with a sign bearing the standard radiation caution symbol and the words: CAUTION- RADIOACTIVE MATERIAL or DANGER - RADIOACTIVE

MATERIAL. Any laboratory containing radioactive material in excess of two times the natural background may be posted with a CAUTION -RADIOACTIVE MATERIAL sign.

NOTE: An exception to this requirement is radioactive materials prepared for transport and packaged and labeled in accordance with the Department of Transportation.

9.5.3 Containers Holding Radioactive Materials

9.5.3.1 It is the responsibility of each AU to ensure that each container in which radioactive material is used or stored is labeled with the standard radiation symbol and the words: CAUTION - RADIOACTIVE MATERIAL. The label shall be durable and clearly visible.

9.5.3.2 In addition to Step E.3.a., labels on containers or radioactive material must also provide sufficient information to permit an individual to minimize exposures. Examples of appropriate data to include with the label are: isotope, quantity of radioactivity and the date the quantity was determined.

9.5.3.3 There are limited exemptions to the labeling requirements in Step E.3.1 and E.3.2. Contact the RSO for exemption approval.

9.5.3.4 When containers are appropriately labeled for transport, additional labels are not required.

9.6 Georgia Tech Radioactive Materials Laboratory Classification

9.6.1 General Guidelines – (All Laboratories)

9.6.1.1 The laboratory shall contain facilities for washing hands.

9.6.1.2 There shall be adequate shielding for the radioactive materials used.

9.6.1.3 There shall be adequate space and shielding for storing and securing all radioactive materials and radioactive waste

9.6.1.4 Personnel are required to survey themselves when leaving the laboratory.

9.6.1.5 Personnel are required to perform surveys at the conclusion of an experiment and document a weekly survey, at a minimum, when radioactive material is used.

9.6.1.6 Survey meters must have been calibrated within the last year and should bear a calibration sticker that indicates the relative efficiency for the isotopes used.

9.6.1.7 There shall be a telephone in the laboratory.

9.6.2 Neighborhood Laboratory (Low Level) Criteria

9.6.2.1 Must meet general guidelines plus have controlled access/egress.

9.6.2.2 Laboratory design shall be similar to those of a good quality, modern chemical/biological/physics laboratory.

9.6.2.3 Normal ventilation is usually sufficient. The use of gaseous radioactive materials is prohibited. Hoods housing radioactive materials must be separately marked.

9.6.2.4 Localized security of radioactive material is required (including storage areas such as refrigerators, freezers, or drawers and waste containers).

9.6.2.5 Laboratory is not personnel restricted for radiological control purposes. Thus, all personnel with access capability must have an orientation briefing regarding radiation safety and what to do in case of an accident involving radioactive materials.

9.6.2.6 When using radioactive material, the area shall be posted with a cone, tape, rope, or some other barricade bearing the uniform radiation symbol and the words "Caution – Radioactive Materials", "Caution – Radiation", or equivalent.

9.6.2.7 Personnel monitoring is normally not required. Area monitoring may be necessary.

9.6.2.8 Radiation exposures must be kept less than 2 mR/hr at one foot from a radiation source and less than 0.4 mR/hr (ALARA) anywhere in the room.

9.6.2.9 Each Authorized User in the laboratory must have an appropriate survey meter, if necessary. The efficiency of the survey meter for the isotope in use may be noted on the meter.

9.6.2.10 No unattended, unsecured radiation experiments may be performed. Similarly, all radioactive waste containers and storage containers must be locked when unattended.

9.6.3 Enclosed Laboratory (Intermediate Level) Criteria

9.6.3.1 A laboratory designated for radioisotope use which is locked when unoccupied.

9.6.3.2 Airborne activity should be kept as low as reasonably achievable through the use of fume hoods or glove boxes. Fume hoods shall have a minimum face velocity of 100 linear feet per minute. Gas, water, and electrical outlets should be operated from outside the hood. Fume hoods shall have a label certifying airflow test within the previous year.

9.6.3.3 The room should be kept at a slightly negative pressure with the exhaust via a fume hood.

9.6.3.4 Laboratory should be designed and constructed for radiological control and safety (e.g. metal cabinets, smooth floors, etc.)

9.6.3.5 Personnel monitoring is normally required.

9.6.3.6 Area should be restricted only to radiation workers. Exposures must be kept below 5 mR/hr at one foot from a radiation source and should be less than 2 mR/hr anywhere in the room.

9.6.3.7 Counting rooms should be located in an enclosed laboratory.

9.6.4 Secured Access Laboratory (High Level) Criteria

9.6.4.1 Designated, single purpose enclosed laboratory specifically designated for use of radioactive materials.

9.6.4.2 Airborne activity should be kept as low as reasonably achievable through the use of fume hoods and glove boxes.

9.6.4.3 Fume hood face velocities should be a minimum of 100 linear feet per minute. Exhaust should be through appropriate filters.

9.6.4.4 Personnel monitoring is required.

9.6.4.5 An emergency procedure shall be posted and all workers must attend an annual refresher training that includes emergency preparedness.

9.6.4.6 Secured Access areas are in Radiation Control Zones (RCZ) and are radiation worker restricted. The door to the facility will have a quarterly updated personnel access list posted. Workers will successfully pass a RCZ worker examination.

9.6.4.7 A Radiation Work Permit must be approved for each experiment.

9.6.5 Multipurpose Radiation Instrumentation Laboratories

- 9.6.5.1 The laboratory must be listed by the AU on an approved Form A.
- 9.6.5.2 One Authorized User shall be responsible for the use of the counting laboratory.
- 9.6.5.3 The AU shall be provided with a list of all approved authorized users with access to the counting laboratory.
- 9.6.5.4 The AU shall be provided with a list of approved isotopes to be used in the counting laboratory.
- 9.6.5.5 An instrument specific logbook shall be kept in the counting laboratory at all times.

9.6.6 Radionuclide Hazard Classification

	Low Hazard	Intermediate Hazard	High Hazard	Very High Hazard			
	H-3 Tc-99m U-238 U-Nat	Ba-133 C-14 Cd-109 Co-57 Co-58 Cr-51 Cs-137 Fe-55 Fe-59 Gd-153 I-129 I-133 K-42	Kr-85 Mn-54 Na-24 Ni-63 P-32 P-33 Pm-147 S-35 Sr-85 Sr-89 Tc-99 Xe-133 Zn-65	Bi-207 Ca-45 Cl-36 Co-60 Cs-134 Eu-152 Eu-154 Ge-68	I-125 I-131 Na-22 Sb-124 Sr-90 Th-232 Th-Nat TI-205	Am-241 Cf-252 Cm-243 Cm-244 Np-237 Pb-210 Po-210 Pu-236 Pu-238	Pu-239 Pu-242 Ra-226 Ra-228 Th-228 Th-230 U-232 U-233 U-235
Lab Type	Use Limit (mCi)	Use Limit (mCi)	Use Limit (mCi)	Use Limit (mCi)			
Low (Neighborhood Lab)	< 5	< 0.5	< 0.05	< 0.01			
Intermediate (Enclosed Lab)	5 – 50	0.5 – 5	0.05 – 1.0	0.01 – 0.5			
High (Restricted Lab)	> 50	> 5	> 1.0	> 0.5			

9.6.6.1 Other Limits

Storage = Use Limit * 10

Sealed Source = Use Limit * 100

9.6.6.2 References

Handbook of Laboratory Safety, N. Steere, Ed., CRC Publishing, p. 255, 1967.

Handbook of Health Physics and Radiological Health, 3rd Edition, B. Schlein, L. Slaback, and B. Birkey, Eds., Williams and Wilkins Publishing, p. 11-2 to 11-5, 1998.

10. GENERAL INFORMATION

10.1 Procedure 9501, Control and Accountability of Radioactive Sources

Instructions, responsibilities, accountabilities and the description of an Authorized User are available from the Office of Radiological Safety.

10.2 Procedure 9502, Control and Accountability of Radiation Generating Equipment

Instructions, responsibilities, accountabilities and the description of an Authorized User are available from the Office of Radiological Safety.

10.3 Procedure 9303, Guidelines for Handling Radioactive Spills

Instructions on how to handle radioactive spills.

10.3.1 Minor (Small) spills involve:

10.3.1.1 No personal contamination

10.3.1.2 Spill is confined to a laboratory

10.3.1.3 Less than 1.0 mCi of radioactivity

10.3.2 Major (Large) spills involve:

10.3.2.1 Personal contamination

10.3.2.2 Spills in multiple laboratories or areas outside the approved radioactive room.

10.3.2.3 Any ionizing radiation exposure greater than 2 mR/hr.

10.3.2.4 Greater than 1.0 mCi of radioactivity.

11. RADIATION, RADIOACTIVITY, CONTAMINATION, EMERGENCY RESPONSE

11.1 General Response

11.1.1 Initial Response

11.1.1.1 Shout out ALARM to co-workers

11.1.1.2 Respond to acute medical needs

11.1.1.3 Move to edge of room

11.1.1.4 Secure room

11.1.1.5 Discard contaminated apparel

11.1.1.6 Use laboratory safety shower

11.1.2 Notification (Telephone at room's edge)

11.1.2.1 Radiation Safety Officer (RSO) (4-3605 or 4-3621)

11.1.2.2 Campus Police 4-2500

11.1.2.3 Your supervisor

11.1.2.4 Emergency Telephone Roster

11.1.3 Assess the accident

11.1.3.1 Direct radiation (e.g. X-Ray overexposure)

11.1.3.2 Contamination (e.g. C-14 spill)

11.1.3.3 Direct radiation plus contamination

11.1.3.4 No personnel contamination

11.1.3.5 Personnel contamination

11.1.3.6 Radionuclide, quantity, solvents

11.1.4 Mitigate Contamination (Follow RSO instructions)

11.1.4.1 Exit room using "Step Off Pad"

11.1.4.2 Develop plan or implement spill procedure for decontamination and estimate of radiation dose.

11.1.4.3 Implement plan.

11.1.4.4 Conduct surveys, RSO reviews, and when area is free from contamination release room back to supervisor.

11.1.5 Follow-up

11.1.5.1 Worker writes up incident report.

11.1.5.2 Supervisor reviews incident report and develops a recurring preventative action.

11.1.5.3 Responding Health Physicist writes up safety report.

11.1.5.4 RSO reviews documentation and responds to Administration, Radiation Safety Committee, and to regulatory agencies.

11.2 Radiation Emergency Response Basics

11.2.1 Policy Manual Highlights

11.2.1.1 Primary Goal is prevention of accidents and emergencies

11.2.1.2 PRIORITIES: Public>Personnel>Property

11.2.2 Supporting Procedures

11.2.2.1 6010 General Rules and guides for Handling Emergencies

11.2.2.2 6040 Response to Fire

11.2.2.3 6090 Personnel Monitoring in Emergency Situations

11.2.2.4 6100 Emergency Notification

11.2.2.5 6110 Response to Adverse Weather, Tornadoes, and Hurricanes

11.2.2.6 6120 Response to Bomb Threat

11.2.2.7 9303 Radioactive Material Spills

11.2.3 Office of Radiological Safety (404-894-3605)

11.2.3.1 Available Emergency Response Team

11.2.3.2 Conducts Annual Emergency Drill

11.2.3.3 Trains Faculty, Staff, Students, Fire Fighters and Police

11.2.4 Decontamination

11.2.4.1 Decontamination will take place on site under supervision of radiation staff

11.2.4.2 For medical emergencies, treat acute medical needs immediately.

11.2.5 The Office of Radiological Safety maintains Emergency Telephone Rosters

12. GENERAL RADIOACTIVITY LABORATORY SAFETY RULES

12.1 Radioactive Materials

When working with radioactive materials the following rules shall be observed:

- 12.1.1 Nothing by Mouth - No pipetting by mouth. No application of cosmetics. No smoking, eating, or drinking in the laboratory.
- 12.1.2 Protective Clothing - With non-sealed sources wear laboratory coats and use gloves. Safety eyewear is recommended. Additional protective apparel can be used as appropriate. Coats should be buttoned. Remove gloves and laboratory coat when contaminated or leaving the area.
- 12.1.3 Monitor - After every experiment and before leaving the laboratory, monitor the experimental area, your hands, feet and lab coat. Decontamination should be performed immediately.
- 12.1.4 Shielding - Use adequate (appropriate thickness) shielding for the experiment (Lucite or Plexiglas for betas and lead for gamma or X-rays).
- 12.1.5 Volatile - Potentially volatile radionuclides should only be used in an approved (> 100 lf/m face velocity) hood. Keep the hood face as far down as practical. Dry all chromatograms in hood.
- 12.1.6 Equipment - Never handle radioisotopes with your hands. Always use tongs, tweezers or hemostats of the appropriate length. Line laboratory benches and trays with disposable absorbent material to facilitate decontamination.
- 12.1.7 Security - All radioactive materials (including radioactive waste) must be secured from unauthorized use, loss or theft. Doors to radioisotope laboratories must be closed and locked when personnel are not present.
- 12.1.8 Two-man Recommendation - You should not work with non-sealed sources alone in the laboratory. Single occupant laboratories should have a telephone in the room.
- 12.1.9 Labeling - All unattended radioactive materials must be labeled with radioisotope, quantity, date, and potential solvent or reactivity hazard.
- 12.1.10 Radioactive waste - Separate all radioactive waste by physical form (solid, liquid, scintillation vials, sharps) and by half-life, i.e. less than or equal to 120 days or greater than 120 days. NEVER discard radioactive

materials down the sink or sewer. Call for radioactive waste pick-up whenever containers are full or when experiment is finished.

12.2 X-ray Generating Equipment

When working with X-ray generating devices, the following safety features should be considered:

- 12.2.1 Persons working with X-ray generating equipment should always be aware of any potential danger associated with a given device. In particular, hands and other body parts should always be kept out of the beam.
- 12.2.2 Safety eyewear shall be worn at all times when working with low energy output X-ray equipment.
- 12.2.3 A current knowledge of the various radiation levels at all places around the X-ray generating device should be maintained and posted in the facility. Periodic surveys to confirm that the radiation fields have not changed should be performed by the AU.
- 12.2.4 Port closures should be double checked before moving the beam stop, collimator, or the main body of an instrument or before changing a specimen.
- 12.2.5 Specific procedures on the operation of the X-ray generating equipment shall be developed by the AU and posted in the vicinity of the device. These instructions are to be followed when operating the device.
- 12.2.6 AUs are responsible for providing laboratory specific training to those individuals working under their direction. A training roster should be maintained by the AU.
- 12.2.7 Regulations covering X-ray generating devices are contained in the State of Georgia Rules and Regulations for x-rays, Chapter 290-5-22. All x-ray units must be registered with the GA State DHR.
- 12.2.8 At no time are interlocks or other safety features to be bypassed.

12.3 General Laboratory Safety

Radiation exposure typically will not be the only potential safety hazard in a laboratory setting. Therefore, Radiation Workers must adhere to all other applicable Georgia Tech requirements regarding general safety, lab safety, chemical safety, biological safety and any other related requirements. The Georgia Tech Department of Environmental Health & Safety can be contacted for assistance with these requirements.

13. RADIOACTIVE WASTE DISPOSAL

13.1 Temporary Storage

Radioactive waste is permitted to be stored in the laboratory or wherever generated for short periods of time.

13.1.1 SOLID WASTE shall be stored in tightly capped, labeled plastic or metal containers. When not in use, the lids shall be in place at all times.

13.1.2 LIQUID WASTE shall be stored in capped chemical resistant plastic bottles. When not in use, the lids shall be in place at all times.

13.1.3 SHARPS WASTE shall be stored in separate, approved containers.

13.1.4 BIOLOGICAL WASTE shall be stored in separate, approved containers.

13.1.4.1 All biological waste should be rendered sterile before waste pick-up, or

13.1.4.2 The AU should be prepared to freeze and store the waste for up to one year or ten half-lives—which ever comes first.

13.1.4.3 Prior approval from the Radiation Safety Committee is required before producing biological waste.

13.1.5 Liquid Scintillation VIAL Waste shall be stored in separate approved containers. They may be stored in cardboard trays, or plastic buckets.

13.1.6 MIXED WASTE (Radioactive waste mixed with ignitable or flammable materials; outside a pH range of 2-12.5; reactive with water; or toxic chemical) shall have prior approval from the Radiation Safety Committee before production, shall be labeled as to its toxic nature and be maintained separate from routine radioactive waste.

13.1.7 ANIMAL TISSUE WASTE will be disposed of per State of GA Chapter 391-3-17 Rule .03(13)(d) or through a licensed radioactive waste broker and shall have prior approval from the Radiation Safety Committee before it is generated.

13.1.8 No radioactive waste shall be removed from the generating lab until the appropriate paperwork is completed as prescribed in Procedure 9501. The required information includes types and quantities of radioactive material present in the waste to be removed.

- 13.1.9 Should a situation arise where radioactive waste cannot be handled in the manner described above, the RSO and the AU shall agree on a different arrangement which will be satisfactory in meeting all State and Federal requirements concerning use of radioactive materials.
- 13.1.10 Records of waste disposal shall be maintained by the AU. Inventory information provided to the ORS shall be maintained current so that regulatory requirements can be adequately met.
- 13.1.11 It is the responsibility of each AU to ensure that minimal quantities of radioactive waste are generated. It is Georgia Tech policy to reduce, when and where possible, the volume of radioactive waste produced.
- 13.1.12 The ORS shall be responsible for picking up radioactive waste from the AU laboratories. Removal of radioactive waste may be requested by the AU.

13.2 Waste Handling

- 13.2.1 Waste shall be collected from the campus laboratories by members of the ORS. Prior to removal, the collecting agent shall ensure that the paperwork is properly completed with the source number, the radionuclide(s) of concern and the quantities in the container.
- 13.2.2 Radioactive waste shall be brought to the waste handling room at the ORS. In this facility, radioactive waste shall be prepared for shipment, held for decay in storage, or disposed of following all relevant regulations.

14. TRAINING

Radiation safety training is required for all radiation workers prior to the use of radioactive materials or radiation producing machines. The ORS shall be responsible for providing general training in the basic principles of radiation and radiation safety. Since each laboratory is unique, it is not feasible for the ORS to provide specific operational training to all individuals. Therefore, the Authorized User is responsible for providing laboratory specific training for individuals who work under their authority or students in teaching laboratories. At a minimum training shall include:

14.1 General Topics

- 14.1.1 Knowledge of State and Federal regulations under which the laboratory work is being performed and the rights of the individual as radiation workers.
- 14.1.2 Familiarity with the requirements of the Georgia Tech Radiation Safety Policy Manual.
- 14.1.3 Services of the ORS which provide control over all Authorized Users (AU) and assistance in matters related to radiation safety.
- 14.1.4 Basic radiation terminology
- 14.1.5 Biological effects of ionizing radiation
- 14.1.6 Protective measures
- 14.1.7 Administrative controls
- 14.1.8 Storage, inventory and security
- 14.1.9 Personnel dose monitoring program
- 14.1.10 Accident, incident, and emergency guidelines

14.2 Radioactive Materials Topics

- 14.2.1 General radioactive materials safety
- 14.2.2 Proper personal protective equipment (PPE) use when working with loose radioactive material
- 14.2.3 Personal and workplace contamination survey program

14.2.4 Radioactive material ordering, receipt, and package opening guidelines

14.2.5 Radioactive waste maintenance

14.2.6 Transportation

14.2.7 Hands-on training

14.3 Radiation Producing Machines Topics

14.3.1 Basic X-ray production

14.3.2 General X-ray safety precautions

14.3.3 Description of different types of x-ray sources

14.3.4 X-ray leakage survey program

14.4 Refresher Training

In addition to the initial radiation safety training, refresher training shall be completed on the following schedule.

14.4.1 Radioactive material users

Initial training for radioactive material users is valid for 3 years from the date of training. Online refresher training must be completed annually thereafter.

14.4.2 Radiation producing machine users

Initial training for radiation producing machine users is valid for 2 years from the date of training. Online refresher training must be completed annually thereafter.

15. BIOASSAY

15.1 Participation

Persons who may be exposed to loose radioactive materials such that the potential exists for significant intake shall participate in a bioassay program. The participation may be part of a routine program or may take place under special circumstances or conditions. In either case, participation in a bioassay program shall be determined by the RSO after evaluation of the work/activities of the individual. Bioassays are for the purpose of regulatory compliance, not health assessment.

15.2 Frequency

Participation requirements for each individual in the bioassay program shall be sent to the responsible AU in writing on the bottom of the Worker Registration Form B (see Procedure 9501). Individuals may also be requested to participate in the bioassay program on a temporary basis, i.e., when an event has occurred. Failure to participate as requested may result in suspension of privileges to work with radioactive materials on the Georgia Tech campus.

15.3 Mandatory Bioassay Participation

Bioassays shall be performed at least monthly for all individuals exposed to levels of tritium as follows:

- 15.3.1 Open Bench Operations - >1 Ci-H₃ gas or >100 mCi tritium as HTO or as a labeled organic compound.
- 15.3.2 Fume Hood Operations - > 10 Ci but < 100 Ci pure H₃ gas and > 1 Ci tritium but < 10 Ci as HTO or as a labeled organic compound.
- 15.3.3 Glove box - > 100 Ci H₃ as a gas and > 10 Ci H₃ as HTO or as a labeled organic compound.

16. BIBLIOGRAPHY

Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation.

Title 10, Code of Federal Regulations, Part 19, Notices, Instructions and Reports to Workers; Inspections.

Georgia Department of Human Resources, Rules and Regulations for X-ray, Chapter 290-5-22.

Georgia Department of Natural Resources, Rules and Regulations for Radioactive Materials, Chapter 391-3-17.