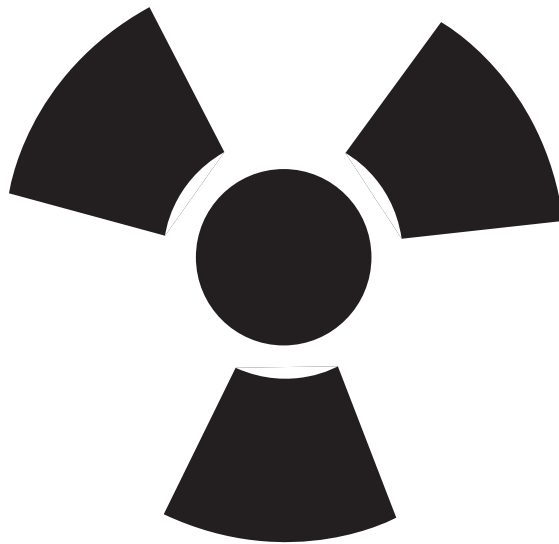


# **RADIOLOGICAL SAFETY MANUAL**



**National Cancer Institute at Frederick**

**Frederick, Maryland 21702**

## Radiation Safety Manual Changes

September 2004

### Page 12

#### **New Verbiage:**

- J. Special Procedures for Radioactive Iodine
  - 1. Radiation Workers performing Iodinations will be required to obtain a thyroid scan within 72 hours of the procedure (but waiting at least 6 hours for distribution of a major part of the iodine to the thyroid). A Baseline Scan shall be performed on new users prior to beginning work with radioactive iodine.

### Page 15

#### **New Verbiage:**

- Q. Personnel Monitoring and Bioassays
  - 1. Radiation Workers who are authorized to manipulate radioisotopes that emit high-energy betas, gamma rays, or x-rays will be issued Dosimetry Device(s). These devices (film badges, TLDs, etc.) are designed to measure one's radiation exposure. The RSO, with the approval of the Radiation Safety Committee, may permit exceptions or may initiate additional requirements to this policy.
  - 2. Radiation Workers who are authorized to manipulate 10 mCi or more of  $^{32}\text{P}$ , as well as workers performing Iodinations will be issued a TLD ring badge.
  - 3. Ring badges will be issued to other Radiation Workers (such as those that belong to X-ray Programs) on a case-by-case basis. Risk will be the determining factor for issuance of these badges.
  - 4. All Radiation Workers who perform Iodinations must meet the special bioassay requirements (See Section III-J of this manual).
  - 5. Radiation Workers who manipulate 10 mCi or more in a single experiment are required to submit a urine specimen to the Radiation Safety Office. The Radiation Safety Office must process these "High-Activity Urine Bioassays" within a 72-hour timeframe. It is the responsibility of the Radiation Worker to notify the Radiation Safety Office that specimens are ready for assay.



# **RADIOLOGICAL SAFETY MANUAL**

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*\*This manual, all forms and applications can be downloaded from the NCI-Frederick Web site. Go to <NCI-FCRDC.gov>, Safety and Environmental Protection Program, Useful Documents and Information, Downloadable Forms.*





# RADIOLOGICAL SAFETY MANUAL

## FOREWORD

The use of radioactive materials and devices that produce ionizing radiation is necessary to conduct research at the National Cancer Institute at Frederick. This manual presents general guidance on the necessary precautions and regulations for the safe handling of such sources.

The use of radioactive materials at the Facility is controlled by the regulations of, and a license issued by, the U.S. Nuclear Regulatory Commission. The contents of this manual are an integral part of that license and, as such, are enforceable by the Commission.

To ensure that radiation sources are being used safely and in a manner that complies with all applicable regulations, a Radiation Safety Committee and a Radiation Safety Office operate at the Facility. This manual sets forth the responsibilities of that Committee and of the Radiation Safety Office. It also details the responsibilities of persons who handle radiation sources and identifies the necessary requirements for the safe use of such materials.

All persons working with sources of ionizing radiation at the Facility must be familiar with the contents of this manual and shall abide by the procedures and policies herein established.

This manual is a preliminary introduction to basic requirements for radiation safety in the laboratory. It is the responsibility of every user to seek out specific training and instruction for procedures employed in his or her laboratory from the supervisor, other trained workers, or the Radiation Safety Office.

Date \_\_\_\_\_

\_\_\_\_\_  
Marjorie C. Strobel, Ph.D.  
Scientific Operations Manager, NCI-Frederick

Date \_\_\_\_\_

\_\_\_\_\_  
Larry O. Arthur, Ph.D.  
Principal Investigator, SAIC Frederick



# **RADIOLOGICAL SAFETY MANUAL**

## **I. Administrative Control**

### **A. Radiation Safety Committee**

#### **1. General**

The NCI-Frederick Radiation Safety Committee was established by the Principal Investigator (PI), Frederick Operations, Science Applications International Corporation (SAIC Frederick), to ensure that all sources of ionizing radiation at NCI-Frederick are used safely and in a manner that complies with all applicable regulations. The Radiation Safety Committee reports to the PI, SAIC Frederick, and directs the operation of the Radiation Safety Office.

#### **2. Committee Responsibilities**

- a. Act for the PI, SAIC Frederick, as the authoritative body on radiological safety.
- b. Review and approve or disapprove all proposed uses of ionizing radiation sources at NCI-Frederick.
- c. Establish policy regarding the safe use of ionizing radiation sources.
- d. Assure that users of radiation sources are meeting applicable regulations and NCI-Frederick policies.
- e. Ensure that all investigators who use ionizing radiation sources are qualified by experience or training to use such sources.
- f. Provide technical supervision of the Radiation Safety Office.
- g. Review all instances of alleged infractions of regulations or policies and recommend appropriate corrective action.
- h. Suspend any project or procedure that it finds to be a threat to health or property.
- i. In the process of reviewing proposed uses of ionizing radiation, the Committee makes no judgement as to the scientific merit of such use. The Committee is concerned only with health and safety.

#### **2. Committee Membership and Meetings**

- a. The Committee shall consist of at least 10 members. Potential Committee members will be nominated to represent the administrative area in which a vacancy exists and will be appointed by the PI, SAIC Frederick.

- b. The Radiation Safety Officer (RSO) is an ex-officio member of the Radiation Safety Committee.
- c. The Radiation Safety Committee shall meet in formal session at least twice per year. The Committee shall maintain complete records of its activities.

B. Radiation Safety Officer (RSO)

1. General

The RSO functions under the technical direction of the Radiation Safety Committee and is the operational agent of the Radiation Safety Committee.

2. Functions and Responsibilities

- a. The RSO formulates and operates a radiological safety program that ensures that the uses of ionizing radiation sources at NCI-Frederick are in compliance with all applicable regulations.
- b. The RSO performs and supervises a surveillance program to ensure that all operations at NCI-Frederick involving ionizing radiation are in compliance with applicable regulations and NCI-Frederick procedures and policies.
- c. The RSO provides periodic reports to the Radiation Safety Committee on the status of the radiological safety program and the surveillance activities.
- d. The RSO approves or disapproves the procurement, shipment, and distribution of all radioactive materials to or from NCI-Frederick.
- e. The RSO receives and inspects all shipments of radioactive materials being delivered to NCI-Frederick.
- f. The RSO approves and signs or disapproves all correspondence to the U.S. Nuclear Regulatory Commission (NRC).
- g. The RSO ensures the proper disposal of all radiological waste streams.

3. Authority

- a. The RSO may enter any laboratory or area where ionizing radiation sources are, or might be, used or stored. This includes areas that might be contaminated.
- b. The RSO may suspend, pending Radiation Safety Committee review, any project or procedure that is in violation of NRC regulations, NCI-Frederick policies and requirements, or which is believed to be a potential threat to health or property.

- c. The RSO may take immediate possession of or establish control over any source of ionizing radiation that is possibly being used or stored in an unsafe manner. Such action is subject to Radiation Safety Committee review.

## C. Principal Investigator

### 1. Definition

A *Principal Investigator* (PI) is a person who is directly responsible for a specific project under an approved radiological program issued in writing by the NCI-Frederick Radiation Safety Committee. The PI has complete authority over all personnel in his/her program, regardless of company affiliation or supervisory status.

### 2. Responsibilities

- a. The PI is personally responsible for the use of ionizing radiation sources possessed under the authority of his/her radiological program.
- b. The PI must ensure that all NCI-Frederick policies, procedures, and regulations are being met. This includes worker supervision and training, maintaining required records (see Appendix I, “Summary of Required Records”), and performance of all required tests.
- c. The PI must provide the RSO with all the information and data requested by the RSO or the Radiation Safety Committee.
- d. The PI must ensure that all persons using radioactive materials under the PI’s radiological program are using the materials safely and that they are kept informed concerning new techniques, procedures, and sources.
- e. The PI must prepare and submit to the RSO any changes in personnel or procedures as an amendment to the radiological program before such changes can be made.
- f. The PI may propose (for RSO approval) that a Radiation Area Supervisor be appointed to assist the PI in the performance of the above-mentioned responsibilities.

## D. Radiation Worker

### 1. Definition

A *Radiation Worker* is a person who voluntarily performs work involving sources of ionizing radiation. Such a person shall know that the work involves the use of ionizing radiation before the work commences. A radiation worker works under the supervision of the PI or Radiation Area Supervisor, regardless of company affiliation or supervisory status.

## 2. Responsibilities

- a. Each radiation worker shall have ready access to a copy of this manual and shall be familiar with the requirements specified in the manual.
- b. A radiation worker shall not use sources of ionizing radiation in a manner that violates NRC regulations, NCI-Frederick policies or procedures, or the conditions specified in the radiological program issued by the Radiation Safety Committee.
- c. A radiation worker shall take all necessary actions that will maintain radiation exposures **as low as reasonably achievable (ALARA)**.
- d. A radiation worker shall seek the assistance of the PI or the RSO whenever there is any doubt or uncertainty about a procedure or policy concerning sources of ionizing radiation.
- e. A radiation worker will immediately report any accident or unusual occurrence involving ionizing radiation sources. This report should be made to the PI or the RSO.
- f. A radiation worker shall not purposefully defeat, disengage, or deactivate any device designed to provide a safe environment with sources of ionizing radiation.
- g. A radiation worker shall comply with all approved radiological safety procedures.
- h. A radiation worker shall report to the PI or the Radiation Safety Committee all uses of radiation sources that are not in accordance with applicable regulations, policies, procedures, or conditions of the Radiological Program.

## II. Administrative Procedures

### A. General

In all operations involving sources of ionizing radiation (radioisotopes, X-ray machines, electron microscopes, accelerators, static eliminators, etc.) the written approval of the NCI-Frederick Radiation Safety Committee must be obtained prior to the procurement, receipt, installation, operation, or use of a radiation source. There are no exceptions to this policy. A program or project using approved sources of ionizing radiation is hereafter referred to as a *radiological program*.

## B. Application Procedure for a Radiological Program

1. The PI prepares the Radiological Program Application. It is suggested that the RSO be consulted for comments and suggestions concerning the application prior to the final preparation of the document.
2. The application is submitted in duplicate through the RSO to the Radiation Safety Committee.
3. The Radiological Program Application form and directions for its completion are included in Appendix V of this manual.
4. Any change in isotope usage not covered in the original program document must be approved prior to initiation. This includes changes in isotopes, increases in activity levels, and substantial changes in protocol design.
5. Except as provided in Part 19 of the NRC Regulations (10 CFR 19), all correspondence to the NRC concerning the use of radioactive materials at NCI-Frederick must be forwarded through the RSO.

## C. Facility Inspection

Prior to Radiation Safety Committee review of an application, the RSO will conduct an inspection to ensure that the facilities and equipment to be used are adequate for the safe use of the radiation sources listed in the application. This inspection may involve a check on ventilation systems, filters, hoods, survey instruments, waste storage techniques, flooring, bench surfaces, shielding, security, handling tools, and safety equipment. The RSO must approve the equipment and facilities prior to Radiation Safety Committee review and approval of the proposed radiological program.

## D. Training

1. Principal investigators and radiation workers must have received training and experience in the use of radioactive materials. The Radiation Safety Committee will evaluate their training and experience relative to the isotopes and possession limits requested in the application for a radiological program. The RSO provides courses in radiation safety and informal instruction dealing with safety techniques, procedures, and requirements of NCI-Frederick.
2. Specific safety procedures for each protocol carried out in a radiological program are the responsibility of the PI, and should be thoroughly reviewed with each new radiation worker, regardless of the worker's prior experience and background.
3. Documentation of the above training must be maintained in the Program file.



4. The RSO is available to assist in the development of safety procedures, as needed.
- E. Procurement of Radioactive Materials (see Appendix II, “Radiological Programs and Procurement of Radioisotopes”)
1. The RSO must approve all requests for the purchase of ionizing radiation sources.
  2. All deliveries of radioactive materials must be made directly to the RSO unless prior arrangements have been made with the RSO for delivery elsewhere.
- F. Inventory and Shipment (see Appendix VI, “Radiological Program Renewal Application”)
1. Each radiological program must maintain a current inventory of radioactive materials. These records must show:
    - a. The receipt of all packages listing the radioisotope, chemical form, and activity
    - b. The use and disposal of all radioactive materials
    - c. The transfer or shipment of radioactive materials
  2. The RSO must be notified prior to all transfers of radioactive materials to other programs within NCI-Frederick or to anywhere outside NCI-Frederick.
- G. Disciplinary Action
1. The Radiation Safety Committee has the authority to terminate any radiological program if the PI or anyone under the PI's supervision fails to comply with NRC regulations, NCI-Frederick policies and procedures, and/or conditions specified in the approved radiological program.
  2. The RSO or the Radiation Safety Committee Chairman can temporarily suspend any worker or program based on the above, subject to review by the Radiation Safety Committee.
  3. The Radiation Safety Committee may alter an approved radiological program in order to maintain the program in compliance with applicable regulations or policies.
  4. The Radiation Safety Committee will provide a means of appeal to the PI, SAIC Frederick, for any principal investigator who does not agree with decisions of the Radiation Safety Committee.

## H. Termination of a Radiological Program

1. Whenever a radiological program is to be terminated or an area is to be returned to non-radiological uses, the RSO must be notified.
2. A radiological program is not terminated until the RSO determines that
  - a. All sources and contamination have been removed;
  - b. All warning signs have been removed;
  - c. The responsibility for existing radioactive sources has been properly transferred;
  - d. All required records and other radiation protection matters have been completed and reviewed;
  - d. The PI has received a written statement from the RSO, confirming that the radiological program has been terminated.

## I. Amendment of Radiological Program

1. Any amendment to a radiological program must be submitted as a written request from the PI to the Radiation Safety Committee through the RSO.
2. A radiological program must be amended when any of the following takes place:
  - a. Personnel changes
  - b. Radioisotope changes
  - c. Activity usage level increases
  - d. Substantial changes are made in the protocol design
  - e. Rooms are added to or deleted from the radiological program.

## III. Rules for the Use of Radiation Sources

### A. General

1. The primary ingredients in the safe handling of radiation sources include:
  - a. Designing the experiment to use minimal quantities of radiation
  - b. Maximizing distance between source and worker

- c. Minimizing exposure time
  - d. Utilizing shielding
  - e. Using radioactive materials in closed systems or well ventilated areas or hoods
  - f. Planning to contain and limit the spread of contamination.
2. Eating, smoking, drinking, and food storage are not permitted in any area where radioactive materials are used or stored.
  3. Mouth pipetting of liquids containing radioactive materials is not permitted under any circumstances.
  4. Protective gloves must be worn whenever radioactive materials are handled.
  5. Work surfaces, trays, etc., shall be covered with plastic-backed absorbent paper (plastic side down) whenever radioactive materials are used or stored.
  6. Whenever possible, remote handling equipment, such as tongs, forceps, clamps, mechanical arms, etc., should be used to handle radioactive materials that produce high exposure rates.
- B. Chemical Fume Hoods, Laminar Flow Cabinets, and Biological Safety Cabinets
1. A chemical fume hood or an approved biological safety cabinet will be used in all radiological operations during which there is a chance that airborne radioactive materials will be produced.
  2. The RSO will determine the type of hood or cabinet, airflow requirements, and filtration requirements.
  3. Radioactive iodine is not to be used in any activity levels in air recirculation hoods.
- C. Shielding and Work Surfaces
1. The RSO should be consulted when sources are to be used that would produce significant exposure rates if they were not shielded. Shielding will be necessary when sources that emit high energy beta particles are used.
  2. All work surfaces where radioactive materials are to be used will be constructed with materials that are nonporous and resistant to attack by solutions used in the experimental procedure. The surfaces must be void of open seams and easy to clean.

3. Floors in areas where radioactive materials are to be used may not consist of bare concrete or other porous material. The RSO should be consulted concerning adequate floor coverings.

#### D. Surveys and Monitoring

1. The user shall perform tests for contamination on working surfaces, floors, hoods, etc., whenever radioactive materials are used or whenever there is a reason to suspect contamination. The tests are normally performed by wiping a surface of the known area with Parafilm M and then determining the activity on the film. The results are to be expressed in activity units per unit area ( $\mu\text{Ci}/100 \text{ cm}^2$ ). Records shall be kept on both positive and negative results. Records kept in terms of "counts" are not satisfactory. A positive (sealed source  $^3\text{H}$  and/or  $^{14}\text{C}$  standards) and negative (background standard) control shall be run to determine efficiency for CPM to DPM conversion.
2. Radioisotope laboratories will be equipped with radiation monitors and/or survey instruments suitable to detect the type of radioactive materials used in the laboratory. The RSO will determine the type and number of such instruments.

#### E. Protective Devices and Clothing

1. Laboratory clothing will be worn in all areas where radioactive materials are used.
2. If laboratory clothing becomes contaminated, it should be placed in a plastic bag. The RSO should be notified and the clothing biologically decontaminated if necessary.
3. Personnel working in areas where airborne radioactive materials are present may be required to wear protective respiratory equipment. The RSO will specify what type of respirator or mask is necessary.

#### F. Maximum Permissible Exposure Rates

1. Definitions
  - a. *Unrestricted Area* means any area in which non-radiation workers can or may be found. The maximum permissible exposure rate anywhere in an unrestricted area is 0.25 millirem per hour. All reasonable efforts should be made to keep exposure rates in unrestricted areas below this limit.
  - b. *Restricted Area* is an area in which only radiation workers are allowed. The maximum permissible exposure rate anywhere in a restricted area is such that no individual will receive in a calendar quarter a dose in excess of:

- (1) 1.25 rems to the whole body, head and trunk, active blood-forming organs, or gonads
  - (2) 3.75 rems to lens of the eye
  - (3) 12.5 rems to extremities
  - (4) 12.5 rems to the skin of the whole body.
- c. A *Radiation Area* is any area accessible to personnel in which the radiation dose rate is such that a major portion of the body could receive in excess of five millirems in one hour.
  - d. A *High Radiation Area* is any area accessible to personnel in which the radiation dose rate is such that a major portion of the body could receive a dose in excess of 100 millirems per hour.
  - e. An *Airborne Radiation Area* is any area in which the airborne radioactivity exceeds the limits prescribed in Appendix B, 10 CFR 20, or where concentrations, averaged over the number of hours in any week during which individuals are present in the area, exceed 25 percent of the limits specified in Appendix B, 10 CFR 20, of the NRC Regulations.
2. Dose to an Embryo/Fetus

During the entire gestation period, the maximum permissible dose equivalent to the fetus from occupational exposure of the declared pregnant female may not exceed 0.5 rem. To declare pregnancy, notify OHS in writing immediately after first indication. Fetal monitoring is conducted after declaration. Whether or not to declare her pregnancy is the woman's choice.

G. Posting Requirements (see Appendix III, "Radiation Warning Signs")

1. All areas where radioactive materials are used or stored shall be conspicuously posted with a standard "Caution – Radioactive Materials" sign.
2. All radiation areas shall also have a posted sign that reads "Caution – Radiation Area."
3. All high radiation areas shall also have posted a standard radiation warning sign that reads "Caution – High Radiation Area."
4. All airborne radiation areas shall also have posted a standard radiation warning sign that states, "Caution – Airborne Radiation Area."

5. All areas where radioactive materials are used shall have posted a Form NRC-3 and a notice indicating the location for inspection of the following:
  - a. NRC Regulations
  - b. NRC License
  - c. All correspondence relating to the License.
6. Radiation caution signs or labels will be attached to all fume hoods, containers, and other equipment that contain or are contaminated with radioactive materials. These signs will have the following information printed on them:
  - a. The radiation Caution symbol
  - b. The words "Caution – Radioactive Materials."
7. At the discretion of the RSO, additional items such as barricades, ropes, and painted warning lines may be required.
8. All sealed sources in excess of 10 times the activities specified in Appendix C, 10 CFR 20, of the NRC regulations or the containers in which they are stored will be marked with a sign or tag containing the following information:
  - a. The name of the isotope
  - b. The dose rate at the surface of the container
  - c. The activity of the source
  - d. The name of the person responsible for the source.

#### H. Radioisotope Storage and Security

1. Unless under direct and immediate observation, storage units containing radioactive materials shall REMAIN locked during working hours. This applies to refrigerators/freezers containing stock isotopes as well as to waste containers. Otherwise, the room or area must be secured.
2. All waste receptacles and storage units (e.g., freezers), which contain radioisotopes and cannot be secured, shall be located in areas where access can be controlled (e.g., lab rooms, equipment rooms, anterooms).

3. Untended lab rooms containing unsecured radioactive material must be locked even during daytime hours. This would apply to lunch breaks, for example, but not to going between neighboring labs briefly to carry out ongoing procedures.
4. The above regulations shall be enforced at the lab and/or program level, regardless of the security status of the building.

**Violations of this policy will be considered on an equal basis with violations of other manual requirements when auditing or reviewing programs for compliance.**

#### I. Waste Disposal

1. Containers for liquid or solid radioactive waste are available from the Waste Management Office.
2. Radiological wastes consisting of short-lived nuclides may be held for decay if the RSO approves of the specific procedures.
3. Radiological waste from biologically contaminated areas must be properly decontaminated before the user removes the waste to a clean area.
4. Solid wastes shall not be placed in liquid waste containers. The activity and the identity of the isotope placed in waste containers must be recorded, dated, and initialed.
5. Do not place liquid radioactive waste into dry waste containers. Liquid radioactive waste must be disposed of in containers approved for liquid waste disposal.
6. The Waste Management Office will dispose of animal carcasses or animal parts containing radioactive materials. These waste materials shall be sealed in polyethylene bags and kept frozen until the Waste Management Office picks them up.
7. No liquid radioactive wastes will be discarded into a sink or drain in any facility of NCI-Frederick. Any radiation above background levels in sinks at NCI-Frederick is in direct violation of our NRC license.
8. The RSO will ensure that all waste materials are disposed of in accordance with NRC regulations.

#### J. Special Procedures for Radioactive Iodine

1. All persons who perform iodinations shall be required to have the iodine content of their thyroids measured prior to the performance of any work involving iodinations. Thereafter, periodic determinations of thyroid iodine burdens will be required at the discretion of the RSO. Persons using bound iodine must have the iodine content of their thyroids measured on a quarterly basis.
2. The iodine concentrations in the breathing zone air of the user and in the exhaust air from the hood will be measured whenever an iodination procedure is performed. The concentrations are determined by passing a known air volume through activated charcoal-filled tubes. The RSO will be responsible for collection of the tubes and their assay. The following information will be provided to the RSO with each sampling tube:
  - a. The rate at which air was drawn through the tube in liters per minute
  - b. The sampling time interval
  - c. The iodine isotope used in the experiment
  - d. The date of the procedure
  - e. The name(s) of the employee(s) performing the iodination.

K. Special Procedures for Radioactive Phosphate

Any use of 10  $\mu\text{Ci}$  in a single container must utilize appropriate shielding to maintain ALARA or must use remote handling equipment (forceps) for the stock container. Contact the RSO for additional information on other shielding requirements.

L. Radiation Alarms and Entry Control Systems

1. All high radiation areas and airborne radiation areas will be equipped with devices that prevent unauthorized entry.
2. All high radiation areas will be equipped with a device that will either:
  - a. Cause the radiation levels to fall below 100 millirads per hour upon entry into the area, or
  - b. Energize a visible or audible alarm signal that will warn the person entering the area and the operational personnel about the unauthorized entry.



#### M. Equipment Decontamination

1. The RSO should be contacted for assistance in all radiological decontamination procedures.
2. The easiest way to solve the problem of equipment contamination is to use procedures that prevent the contamination initially. Sometimes equipment can be protected with plastic or other types of containment that will prevent contamination.
3. If biological materials are involved, the biological decontamination or sterilization must be considered and performed before radiological decontamination. Biological treatment consists of placing the equipment in nonporous containers and then either autoclaving, treating with ethylene oxide, or utilizing methods approved by Biological Safety.
4. The maximum permissible contamination levels for alpha and beta-gamma radiation are 10 and 500 disintegrations per minute, respectively, for an area of 100 cm<sup>2</sup>. These limits are for removable contamination. If the contamination is not removable, then the limits are 300 dis/min/100 cm<sup>2</sup> for alpha activity and 0.1 millirem/hr for beta-gamma radiation.
5. The individual responsible for the contamination will be expected to do most of the cleanup under the supervision of the Radiation Safety Office staff.

#### N. Personnel Decontamination

1. The most important aspect of personnel decontamination is speed. First, all contaminated clothing must be removed and the body monitored to locate contaminated areas. If the contaminated area is small, then the decontamination can be performed in the laboratory. If large areas are contaminated, then the person involved should be dressed in expendable clothing and taken to the showers.
2. Affected areas must be washed with soap and water. Use of a brush or abrasives is not advised. Affected areas should be dried and monitored again for contamination. This procedure should be repeated no more than four times. If contamination persists, the physician at Occupational Health Services, extension 1096, should be contacted.
3. Prolonged use of any one method of decontamination should be avoided because skin irritation might result, which could lead to the absorption of radioactive material into the body through breaks in the skin. Organic solvents should not be used.

O. Testing Sealed Sources for Leaks

Sealed sources containing beta and/or gamma emitting radioactive materials must be tested for leakage every six months. Sealed sources that contain alpha emitting radionuclides must be tested for leakage every three months. The RSO will perform these on all sealed sources having activities in excess of 100 microcuries.

P. Transfer, Shipment, and Storage of Radioactive Materials (see Appendix II, “Radiological Programs and Procurement of Radioisotopes”)

1. The RSO must give approval prior to the transfer of radioactive materials from one program or building to another within NCI-Frederick.
2. Authorized individuals in the Safety Environmental Protection Program (SEPP) will package shipments of radioactive materials to locations not within the limits of NCI-Frederick (Packaging shall be in compliance with Titles 10 and 49 of the Code of Federal Regulations).
3. The RSO (Building 426) makes an initial inspection of all radioactive materials sent to NCI-Frederick. The RSO will open the package, inspect for damage, and test for excessive exposure rates and contamination, in keeping with provisions expressed in 10 CFR 20.1906. Packages passing the inspection will then be delivered to the user who ordered the material.
4. Each program using radioactive materials must have adequate facilities for the storage of the materials being ordered.

Q. Personnel Monitoring and Bioassays

1. All personnel working with radioisotopes that emit photons (gamma rays or X-rays) must be issued and wear a personnel monitor (film badge, TLD, etc.) during working hours. The RSO, with the approval of the Radiation Safety Committee, may permit exceptions or may initiate additional requirements to this policy.
2. All persons working with radioactive iodine must meet special bioassay requirements (See Section III-J, page 13, of this manual).
3. Persons working with 10 millicuries or more of hydrogen-3 (tritium) or phosphorus-32 per experiment are required to submit a urine specimen to Radiation Safety. The specimen shall be submitted within 48 hours for hydrogen-3 experiments and within 12 hours for phosphorus-32 experiments. It is the responsibility of the radiation worker to notify Radiation Safety that specimens are ready for assay.

## R. ALARA Program Statement

### 1. Policy Statement

- a. The management of Science Applications International Corporation, in keeping with the intent of new Part 20, recognizes its responsibility to keep exposures from radiation sources as low as reasonably achievable (ALARA) for employees, visitors, and students and to avoid significant increases in environmental radioactivity.
- b. To accomplish this goal, management will provide information and policy statements to research personnel regarding its commitment to this policy.
- c. Management's program to achieve ALARA will include periodic audits of its radiation program, continued evaluation of Radiation Safety staffing and program requirements, and the presentation of programs which enhance the training and continuing education of personnel involved in the use of radioactive material. Management will also delegate sufficient authority to the Radiation Safety Office, through the Radiation Safety Committee, to enforce the policies which define the ALARA program.

### 2. Specific ALARA Program Criteria

#### a. Goals Relating to Exposure Control

SAIC Frederick will endeavor to maintain exposure doses equal to or less than 5% of authorized limits. Any values in excess of this goal will be investigated to determine the cause. Suggestions to alter protocols and/or procedures to achieve the 5% goal will be made.

#### b. Monitoring

10 CFR lists specific monitoring requirements for both external radiation exposure [20.1502(a) and 20.1502(a)(3)] and internal radiation exposure [20.1502(b)]. However, it is the intent of SAIC Frederick to monitor these individuals approved to use high energy beta- and/or gamma-emitting isotopes. These monitoring criteria will exceed the described requirements of 10 CFR for external monitoring.

Bioassays and air sampling will be used to evaluate potential internal and airborne concentrations of isotopes, respectively. These values will in turn be used to compute the committed effective dose equivalent (CEDE) as required.

Records of all monitoring procedures and associated exposure values will be kept as part of each individual's exposure history. NRC Form 5 or an equivalent will be used for the record keeping.

A review of results from our present monitoring program for the past 20 years shows that exposure values in excess of limits specified in Table 1 of Regulatory Guide 8.34 are not likely. In fact, an estimation of a possible occupational dose for an individual at our Facility would be below 100 mRem (1 mSv) total per year. A majority of individuals would have zero exposure, as has been documented in the yearly statistical reports from our film badge supplier.

#### IV. Accidents Involving Radiation

##### A. Radioactive Material Spill

1. The following general procedures shall be followed when a radioactive material is spilled.
  - a. Provide necessary emergency first aid to all serious injuries.
  - b. Evacuate all personnel to an area removed from the effects of the spill and close all entrances to the spill area.
  - c. If airborne radioactive materials are suspected, close all doors. Turn off hoods and safety cabinets that do not exhaust to the outside.
  - d. Immediately call the Radiation Safety Officer on extension 1451. After hours, call Protective Services at extension 1091.
  - e. Keep all persons known or suspected of being contaminated confined to one area to prevent the further spread of contamination. Do not allow other persons to enter this area.
2. The RSO will immediately dispatch personnel and necessary equipment to the scene of the incident and shall perform the following upon arrival at the scene:
  - a. Ascertain that all personnel have been evacuated from the hazard area, ensure that entry into the area has been restricted, and ensure that all serious injuries have received medical attention.
  - b. Monitor all personnel involved in the incident to determine the extent of the contamination. The RSO will initiate necessary personnel decontamination procedures. The PI or other knowledgeable person may monitor immediately if deemed essential.

- c. Evaluate the hazard area.
- d. Supervise the decontamination and return it to normal operating conditions.
- e. Investigate the cause of the incident and report to the Radiation Safety Committee on the cause as well as actions taken to prevent such an incident in the future.

B. Fires or Explosions Involving Radioisotopes

1. When a fire or explosion occurs involving radioisotopes, the RSO will be notified immediately, and the proper damage control office will be called.
2. The RSO will monitor all damage control equipment and personnel for contamination before permitting these items/people to leave the area. The only exception to this policy is in the event that personnel are seriously injured. The medical personnel involved will be informed that the person is or might be contaminated.
3. All damage control personnel will be equipped with dosimeters and respiratory protective devices when entering such an area. This policy shall not prevent entry in order to perform a life-saving rescue.
4. The Fire Department will:
  - a. Maintain familiarity with the location of all high radiation areas, airborne radiation areas, and radiation areas.
  - b. Train personnel to recognize the different radiation caution signs and understand the meanings of such signs (See Appendix III, "Radiation Warning Signs," for examples of signs).
  - c. Notify the RSO whenever a fire involves radioisotopes.
  - d. Wear dosimetric and respiratory equipment when responding to an incident where radioactive materials are used.
5. The Protective Services personnel will:
  - a. Notify the RSO of any radiation accident during off-duty hours.
  - b. Be thoroughly familiar with the radiation caution signs and the meanings of such signs (See Appendix III for examples of such signs).

6. The Occupational Health Services Department will:
  - a. Observe the precautions and procedures prescribed by the physician in handling patients who are or may be contaminated with radioactive materials.
  - b. Wear the necessary dosimetric and protective equipment as instructed by the RSO and the physician.
  
7. The Radiation Safety Officer will:
  - a. Inform the Fire Department about the location of all high radiation areas, airborne radiation areas, and radiation areas.
  - b. Furnish dosimetric and protective equipment to damage control and security personnel as required.
  - c. Keep Protective Services up to date with respect to telephone numbers and the names of personnel to be contacted when a fire or explosion occurs during off-duty hours.
  - d. Prepare all reports that may be required by the NRC and other regulatory agencies.



## **APPENDICES**





## **APPENDIX I**

### **SUMMARY OF REQUIRED RECORDS**

The Principal Investigator and the Radiation Safety Officer are jointly responsible for the maintenance of the following required records:

1. Receipt, use and disposal of radioactive materials
2. Transfer or shipment of radioactive materials records
3. Contamination test results
4. Laboratory monitoring tests
5. Records indicating the instruction of radiation workers in proper experimental procedures
6. Personnel monitoring and bioassay results
7. Sealed source leak test results
8. Records of tests on alarms or entry control devices
9. A copy of the current Radiological Program and all applications and amendments for that program



**APPENDIX II**

**RADIOLOGICAL PROGRAMS AND**

**PROCUREMENT OF RADIOISOTOPES**

**I. RADIOLOGICAL PROGRAMS**

A. Radioisotopes

1. All operations involving the use of radioisotopes at NCI-Frederick must be performed under an approved radiological program. Approval must be received prior to the beginning of any radiological operation or the procurement of radioisotopes and other sources of ionizing radiation. The program director shall submit for approval a Radiological Program Application (see Appendix V) to the NCI-Frederick Radiation Safety Committee. Submitted through the Radiation Safety Officer, the application contains such information as:
  - a. The project wishing to use or procure radioisotopes.
  - b. The full names, including middle names, social security numbers, and birth dates of the Radiation Area Supervisor and all operational personnel, as well as a Training and Experience form for each person (See Appendix IV).
  - c. The radioisotope(s), its chemical and physical forms, and the amount of activity (e.g.,  $\mu\text{Ci/ml}$ ) to be used during each experiment, as well as the total amount of activity (inventory) of each isotope to be maintained under the program.
  - d. A complete description of the proposed radiological operations to be performed (Radiological Protocols).
  - e. The location by building and room number or area in which the radiological operations are to be performed.
  - f. A complete list of radiation monitoring and other equipment available for the proposed program, including protective equipment available in the radiation area.
  - g. The radiation safety precautions to be used.
  - h. A description of proposed waste storage space and handling methods.

## *APPENDIX II (continued)*

- i. The signature of the Principal Investigator in charge of the activity.
  2. The radiological program will be approved on the basis of the application and the available equipment and facilities, as well as the radiation experience of the operating personnel and the responsible investigator.
  3. The NCI-Frederick Radiation Safety Committee will certify approval and assign a Radiological Program number to the proposed program through the Radiation Safety Officer. Radiological operations shall not begin until the proposed program has been returned to the requestor with an endorsement granting approval for the program.
- B. Equipment That Produces Ionizing Radiation for Non-Medical Purposes
1. All operations involving the use of accelerators (Van de Graff generators, cyclotrons, betatrons, etc.), X-ray machines, static elimination devices, and other equipment that produce ionizing radiation will be approved by the Committee prior to their installation and operation. Approval will be given by means of a Radiological Program application that shall be submitted in duplicate through the Radiation Safety Officer to the NCI-Frederick Radiation Safety Committee and will describe the proposed operation, including the following information:
    - a. The project wishing to use the machine
    - b. The completed training and experience forms (see Appendix IV) for all proposed personnel
    - c. The type of machine to be used, including the operating characteristics (voltage, amperage, filters, targets) as well as the manufacturer, model, and serial number
    - d. A complete description of the operations to be performed
    - e. The location, by building and room number, in which the machine is to be installed, and a complete floor plan showing adjacent areas, proposed position of the machine, the console, and shielding
    - f. A complete list of radiation monitoring and other equipment available for the proposed test program
    - g. The radiation rules and precautions to be used in the proposed test plan

## ***APPENDIX II (continued)***

- h. The signature of the supervisor or principal investigator in charge of the activity.
2. The program will be approved on the basis of the available equipment and facilities, as well as the radiological experience of the operating personnel and the responsible investigator.
3. The requestor shall not begin the described operations until the proposed plan has been approved and returned by the NCI-Frederick Radiation Safety Committee.

### **II. PROCUREMENT OF RADIOACTIVE MATERIAL**

A proposed radiation program must be approved before a request for procurement approval is made.

- A. The procurement of all radioactive materials and machines capable of producing ionizing radiation will be accomplished only with the prior approval of the Radiation Safety Office and Committee. The materials and equipment mentioned above fall into four general categories with regard to procurement:
  1. Materials produced by or under the auspices of the Nuclear Regulatory Commission and requiring a Nuclear Regulatory Commission Specific License.
  2. Materials procurable under a Nuclear Regulatory Commission General License.
  3. Other radioactive materials subject to agreement with State requirements (Maryland is an agreement state).
  4. Apparatus and equipment capable of, or containing materials capable of, producing ionizing radiation. These include X-ray machines, particle accelerators, certain cathode-ray tubes, electron microscopes, and many other devices.
- B. The procurement of items in all four categories listed above will be initiated only with prior approval of the radiological program. Information concerning the procedure for the procurement of items in the above categories is available from the Radiation Safety Office.
- C. The Radiation Safety Office will be notified immediately when a shipment containing radioactive materials arrives at the Facility. Small items will be picked up by the Radiation Safety Office, Building 426, which will deliver them to the end user after a contamination check of contents and preparation of necessary forms. Upon receipt of larger items, notify the Radiation Safety Office immediately for clearance prior to delivery.

## *APPENDIX II (continued)*

### **III. ISOTOPE INVENTORY AND SHIPMENT**

- A. The Radiation Safety Office will request isotope inventories for control purposes and reserves the right to request periodic reports concerning the use of isotopes or equipment. Staff in each radiological program shall keep accurate records of receipt, expenditure, and relocation of radioactive materials for which that program is responsible.
  
- B. **Transfer of radioactive materials requires prior approval by the Radiation Safety Office.** Transfer of any amount of radioactive material to unauthorized areas is prohibited. Shipments of radioactive material from NCI-Frederick to other destinations **must be cleared in advance** through the Radiation Safety Office to assure conformance with Nuclear Regulatory Commission, Department of Transportation, Postal, and other shipping regulations as well as with Radiation Safety Office inventory requirements.

## **APPENDIX III**

### **RADIATION WARNING SIGNS**

#### **RADIATION CAUTION SIGNS AND LABELS**

All radiation caution signs and labels shall be the conventional radiation caution colors (magenta or purple on a bright yellow background) and shall display the radiation caution symbol, the design of which is shown in 10 CFR 20.901 (31 January, 1986).

All radiation caution signs for radiation areas shall have the radiation caution symbol and the words:

**CAUTION**

**RADIATION AREA**

**DOSE RATE AT THIS POINT**

**IS**

---

All radiation caution signs for high radiation areas shall have the radiation caution symbol and the words:

**CAUTION**

**HIGH RADIATION AREA**

**DOSE RATE AT THIS POINT**

**IS**

---



All radiation caution signs for air-borne radiation areas shall have the radiation caution symbol and the words:

**CAUTION**

**AIR-BORNE RADIOACTIVITY AREA**

**DO NOT REMAIN IN THIS AREA**

In all radioactive materials areas where the radiation levels are below the requirements listed for a radiation area, a radiation caution sign will be used that shall have the radiation caution symbol and the words:

**CAUTION**

**RADIOACTIVE MATERIALS**

In addition to the preceding requirements, radiation caution signs may display further warnings, such as "Keep Out"; "Danger, Radioactive Contamination"; etc., whenever such warnings are appropriate. In all cases, the Radiation Safety Office will be responsible for the posting of all radiation areas.

**APPENDIX IV**  
**NATIONAL CANCER INSTITUTE AT FREDERICK**  
**RADIOLOGICAL TRAINING AND EXPERIENCE**  
*(This form must be typed)*

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**Privacy Act Notification:** Collection of this information is authorized by the Code of Federal Regulations, Title 10, Parts 19 and 20, by the U.S. Nuclear Regulatory Commission Materials license granted to the OTS Contractor at NCI-Frederick. Providing your social security number is voluntary. However, failure to report it may result in your not being permitted to work in areas using radioactive materials. The information is used to track your radiation exposure, use of radioactive materials, and training in radiation safety. Additional disclosures of the information may be made: to Federal and/or State agencies responsible for licenses, inspections or oversight governing the use of radioactive materials or to ensure that safe and healthful work conditions are maintained for employees; to contractors for performance of a task in accordance with the purpose for which the records were collected; to the Department of Justice or to a court for litigation purposes when Health and Human Services (HHS) determines that the litigation is likely to affect HHS or any of its components; for an appropriate research purpose as noted in the system notice; and radiation exposure and/or training and experience history may be transferred to a new employer.

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**TO :**    **RADIATION SAFETY OFFICE**

**DATE:** \_\_\_\_\_

**RADIOLOGICAL PROGRAM:** \_\_\_\_\_

Please amend the applicant to use radioactive isotopes under the conditions of the program document, and within the limits specified in Section "F" of this application.

The following information will be used to determine whether the applicant will be authorized to use radioactive isotopes at NCI-Frederick.

New Applicant: \_\_\_\_\_  
                                  (First)                   (Middle)                   (Last)                   (Employee No.)

Birth Date: \_\_\_\_\_ Social Security Number \_\_\_\_\_

Present Position (Title): \_\_\_\_\_

Location (Building/Room): \_\_\_\_\_

Employer:    Government \_\_\_\_\_ SAIC \_\_\_\_\_ Other \_\_\_\_\_

***APPENDIX IV (continued)***

For the following, please supply as much detail as possible. Use additional pages, as needed.

**Educational Background**

<b>College/University</b>	<b>Address</b>	<b>Degree</b>	<b>Year awarded</b>

**Formal Experience**

<b>Name of course/Institution sponsoring course</b>	<b>Length of Course</b>	<b>Dates of attendance</b>

**On-the-Job Training**

<b>Time (weeks, months, years)</b>	<b>Radionuclides</b>	<b>Activities used</b>	<b>Location</b>

**Type of Training**

1. Principles and practices of radiation protection (where and when):
2. Radioactive monitoring techniques and instruments used:





**APPENDIX V**  
**RADIOLOGICAL PROGRAM APPLICATION**

The required information for the establishment of any new radiological program can be supplied in the following document. This document has been created to simplify and to expedite the radiological application process by ensuring that all pertinent information as outlined in the *Radiological Safety Manual* is supplied.

In addition, a Training and Experience form (See Appendix IV) for each individual requesting authorization to use radioactive isotope usage must accompany the Radiological Program Application.

**PROGRAM SUMMARY**

<b>Principal Investigator:</b>				
Organization:				
Program Type:	Isotope	X-Ray	EM	Other
Project Name:				

<b>Principal Investigator:</b>	
Degrees:	
Primary Radiological Training:	

<b>Radiation Area Supervisor:</b>	
Degrees:	
Primary Radiological Training:	

***FOR RADIATION SAFETY OFFICE AND COMMITTEE USE***

Organization Director: \_\_\_\_\_ Date: \_\_\_\_\_

Radiation Protection Officer: \_\_\_\_\_ Date: \_\_\_\_\_

Radiation Safety Committee Chairman: \_\_\_\_\_ Date: \_\_\_\_\_

Approved Radiation Program Number: \_\_\_\_\_ Program Expiration Date: \_\_\_\_\_



***APPENDIX V (continued)***

**Protocol and Isotope Authorizations**

In the following table, list protocols which will be used within the requested radiological program. Requested radioisotopes and authorized limits for program inventory as well as the maximum use per experiment should be included. **In addition to listing protocols, attach to the Radiological Program Application a copy of all radiological protocols.**

<b>PROTOCOLS</b>		
<b>Name</b>	<b>Isotope used</b>	<b>Activity (mCi)</b>

**Inventory of Isotopes**

<b>Maximum Inventory (mCi) for Each Isotope to Be Kept in Lab at Any One Time</b>	
<b>Isotope</b>	<b>Amount</b>



## *APPENDIX V (continued)*

### **Training/Protocol-specific Training**

In accordance with NRC/NCI-Frederick regulations, all authorized users of radiological isotopes will complete the training courses provided by the Radiation Safety Office.

In addition, the Principal Investigator or Radiological Area Supervisor will oversee the training of specific laboratory procedures for laboratory personnel and completion of the required courses. **The program will appropriately maintain the Protocol Specific Training Document, prepared by the Radiation Safety Office (based upon protocols provided by the newly established radiological program).** This will be done by ensuring that all authorized isotope users within the radiological program read and sign the Protocol Specific Training Document. As new radiological protocols are developed, copies will be kept on file within the document.

### **Radiological Areas for the Use and/or Storage of Radiological Materials**

<b>Building</b>	<b>Room</b>

### **Radiation Monitoring Equipment**

Beta and gamma survey meters will be available for use during isotope manipulations and for mandatory, monthly contamination surveys. All personnel will have access to a liquid scintillation counter to quantify results of surface contamination surveys.

All procedures will be carried out in a manner that will keep exposures As Low As Reasonably Achievable (**ALARA**). Shielding will be provided and used as necessary. Additionally, eye protection, remote handling devices and protective clothing will be used when appropriate.

The Radiation Safety Office is being provided with a current and accurate list of all Radiation Detection Instruments (e.g., Geiger counter, LS counter) that will be used for monitoring within the laboratory. The information includes the model number; serial number and NIH number if applicable.

***APPENDIX V (continued)***

The following chart contains information regarding monitoring equipment that will be used by laboratory personnel.

<b>MONITORING EQUIPMENT</b>		
<b>Model</b>	<b>Serial #</b>	<b>NIH#</b>

**Radiation Safety Precautions To Be Used**

All radiological procedures will be conducted in accordance with the NCI-Frederick ALARA program. Isotope usage will be kept to a minimum, and appropriate safety equipment and personal protection equipment will be used.

**Waste Storage and Handling Methods**

Solid radioactive waste will be stored in an appropriate dry radioactive waste container and appropriately shielded in room \_\_\_\_\_. Liquid waste will be stored in an appropriate liquid radioactive waste container and appropriately shielded in room \_\_\_\_\_. High activity, low volume waste will be stored according to Radiation Safety Office instructions. Waste will be disposed of in accordance with NCI-Frederick protocols.

\_\_\_\_\_  
***(Principal Investigator's Signature)***

\_\_\_\_\_  
***(Date)***



## APPENDIX VI

### RADIOLOGICAL PROGRAM RENEWAL APPLICATION

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All Principal Investigators are required to renew their Radiological Programs on a five-year cycle. In an attempt to facilitate the program's renewal effort, the Radiation Safety Office will compile and supply for the initial renewal all pertinent information regarding each Radiological Program in electronic format to all approved Radiological Program Principal Investigators.

Each Principal Investigator shall review the provided information and make any appropriate changes within the document. After these changes have been made, please send a dated and signed **hard copy** of the corrections to the Radiation Safety Office. **In addition, an updated Training and Experience form for each individual must be submitted.**

The Renewal Application form and a Training and Experience form for each individual will constitute the program's Radiological Program Renewal Application.

If any assistance is needed in this matter, please contact the Radiation Safety Office at extensions 1902 or 5730.

---

<b>Project:</b>
Radiological Program Number:
Principal Investigator:
Radiological Area Supervisor:
Date of Radiological Program Renewal:

***APPENDIX VI (continued)***

The following table indicates the authorized radiological personnel and their program information as it has been previously provided to the Radiation Safety Office.

<b>RADIOLOGICAL PERSONNEL</b>								
<b>Name</b>	<b>SSN#</b>	<b>DOB</b>	<b>Badge # Type</b>	<b>NCI-Frederick 8 Training Date</b>	<b>NCI-Frederick 6 Training Date</b>	<b>Date on Program</b>	<b>Auth. Isotope</b>	<b>Activity (mCi) per/exp</b>

**APPENDIX VI (continued)**

**Protocol and Isotope Authorizations**

The following table indicates all approved protocols, authorized radiological isotopes and their maximal use per experiment, and the authorized limits for program inventory for Radiological Program \_\_\_\_\_ - \_\_\_\_\_ as is on file in the Radiation Safety Office.

<b>AUTHORIZED INVENTORY Activity (mCi)/PER EXPERIMENT (mCi)</b>							
<b>PROTOCOL</b>	<i>(Example)</i> <sup>3</sup> H	<sup>14</sup> C	<sup>32</sup> P	<sup>35</sup> S			
<i>CAT Assay</i>		<i>1.00</i>					
<b>TOTAL INVENTORY</b>		<i>1.00</i>					

**Training / Protocol Specific Training**

In accordance with NRC/NCI-Frederick regulations, all authorized users of radiological isotopes are mandated to complete all training courses provided by the Radiation Safety Office. Please refer to the Authorized Personnel chart to verify that all personnel have satisfied these training requirements. If an individual is lacking a training course, that individual will be notified that he or she must attend the next course being offered.

**In addition to completion of the required courses, it is the responsibility of the Principal Investigator and/or Radiological Area Supervisor to oversee and document the training of specific laboratory procedures for laboratory personnel. Protocol-specific training will be accomplished by using the Protocol Specific Training Document supplied to the radiological program by the Radiation Safety Office and thereafter, maintained by the program.**

**APPENDIX VI (continued)**

**Authorized Radiological Areas**

<b>Building</b>	<b>Room</b>

**Radiation Monitoring Equipment**

Beta and gamma survey meters are available for use during isotope manipulations and for mandatory contamination surveys. All personnel will have access to a liquid scintillation counter to quantify surface contamination. All procedures will be performed to keep exposure As Low As Reasonably Achievable (**ALARA**). Adequate shielding will be provided and used as necessary. Additionally, eye protection, remote handling devices and protective clothing will be used when appropriate.

Please provide the Radiation Safety Office with a current and accurate list of meters (e.g., Geiger Counter) used for monitoring within your laboratory. Include the model number, serial number and NIH number (when possible) for protective equipment according to the laboratory procedure being used.

<b>MONITORING EQUIPMENT</b>		
<b>Model</b>	<b>Serial #</b>	<b>NIH#</b>

**Radiation Safety Precautions To Be Used**

All radiological procedures will be conducted in accordance with the NCI-Frederick ALARA program. Isotope usage will be kept to a minimum, and appropriate safety equipment and personal protection equipment will be used.

*APPENDIX VI (continued)*

**Waste Storage and Handling Methods**

Solid radioactive waste will be stored in an appropriate dry radioactive waste container and appropriately shielded in room \_\_\_\_\_. Liquid waste will be stored in an appropriate liquid radioactive waste container and appropriately shielded in room \_\_\_\_\_. High activity, low volume waste will be disposed of according to Radiation Safety instructions. Waste will be disposed in accordance with NCI-Frederick protocols.

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*(Principal Investigator's Signature)*

---

*(Date)*





## APPENDIX VII

### SURVEY METER/GEIGER COUNTER PROCUREMENT NOTIFICATION

Notification is being made to the Radiation Safety Office of newly acquired radiation monitoring equipment so that appropriate calibrations may be maintained.

**Return Completed Document to the Radiation Safety Office.**

Radiological Program Number:
Radiological Principal Investigator:
Building and Room Location of Equipment:

MONITORING EQUIPMENT		
Model	Serial #	NIH #

\_\_\_\_\_  
*(Principal Investigator's Signature)*

\_\_\_\_\_  
*(Date)*



## APPENDIX VIII

### REQUEST FOR CUMULATIVE RADIATION EXPOSURE RECORD

In order to maintain an accurate exposure history, it is necessary for the NCI-Frederick Radiation Safety Office to receive as the record of cumulative radiation dose, an up-to-date NRC Form 4, or its equivalent, from your most recent employer for work involving radiation exposure.

The individual for whom the exposure was measured must request his/her exposure history in writing.

Please complete and sign the request below, and sent it to your most recent employer for whom radiological work was performed.

-----

To Whom It May Concern:

Pursuant to 10 CFR 19.13, "Notification and Reports to Individuals," and 20.2104, "Determination of Prior Occupational Dose," I am formally requesting my occupational radiation exposure history.

Name of former employer: \_\_\_\_\_

Period of employment: \_\_\_\_\_

Social Security number: \_\_\_\_\_

Prior occupational dose is to be in the form of an up-to-date Form 4 or its equivalent.

Please send report to:      Radiation Safety Office  
   SAIC Frederick  
   NCI-Frederick  
   P. O. Box B, Building 426  
   Frederick, MD 21702

Sincerely,

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print your name)