RADIATION SAFETY MANUAL

RADIATION SAFETY COMMITTEE
UNIVERSIDAD CENTRAL DEL CARIBE
BAYAMON, PUERTO RICO

2019 REVISION

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A. PROGRAM FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURES AS LOW AS REASONABLY ACHIEVABLE (ALARA)

I. ADMINISTRATIVE COMMITMENT

a) Ultimately responsibility and authority for all institutional activities, including those of radiation health and safety, rest with the President of the Universidad Central del Caribe (UCC) or his/her designee. The President will establish, implement and maintain an internal review system for the UCC that complies with the standards and regulations of the United States Nuclear Regulatory Commission (NRC) as specified in the institution's NRC Materials License as amended.

b) The administration of this institution is committed to the program described in this manual for keeping exposures (individual and collective) as low as reasonably achievable (ALARA). In accord with this commitment, an administrative organization is hereby established to oversee radiation safety and to develop the necessary written policy procedures and instructions to foster the ALARA concept within the institution. This organization will include a Radiation Safety Committee (RSC) and a Radiation Safety Officer (RSO).

c) A formal annual review of the radiation safety program, including ALARA considerations, will be performed. This will include review of operating procedures and past exposure records, inspections, etc., and consultations with the radiation safety staff or outside consultants.

d) Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposures unless the cost, in the institution's judgment, is considered to be unjustified. The institution will be able to demonstrate that, if necessary, improvements have been sought, that modifications have been considered and that these have been implemented where reasonable. Where modifications have been recommended but not implemented, the institution will be prepared to describe the reasons for not implementing them.

e) In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

II. RADIATION SAFETY COMMITTEE (RSC)

a) Review of proposed radioisotope users and uses

1) To utilize radioisotopes at UCC, a researcher must either a) be an authorized user of radioisotopes or b) work under the direct supervision of an authorized user. Authorized users at UCC are listed by name on the U.S. Nuclear Regulatory Commission (NRC) Materials License. Only the NRC can give final approval for a new authorized user of radioisotopes at UCC in the form of an amendment to the current license. An authorized user may utilize only those radioisotopes listed in the license and only for the uses specified in the license. Only the NRC can give approval for an authorized user to use approved radioisotopes in a way that is not specified in the current license in the form of an amendment to the current license.

b) Application to become an authorized user of radioisotopes

1) If a researcher at UCC wishes to become an authorized user of an approved radioisotope, he/she must submit RSC FORM 001 to the RSC. RSC FORM 001 may be submitted for only one approved radioisotope. The RSC will be responsible for determining any hazard that may arise from the intended use of the designated radioisotope and will assist the applicant to complete the application.

2) The RSC will thoroughly review the qualifications of each potential authorized user with respect to the type and quantity of radioisotope material and uses for which he/she has applied to assure appropriate measures to maintain exposure ALARA (RSC FORM 004).

3) Once approved by the RSC, the RSC Chairman will submit the application to the NRC as a proposed amendment to the current NRC Materials License.

4) Once approved by the NRC, the RSC Chairman will assign a permit number to the authorization, sign the form and send a copy to the applicant. The RSC will maintain a file of the authorization along with documentation of NRC approval.

c) Application to use radioisotopes under the direct supervision of an authorized user

1) If a researcher at UCC wishes to purchase or use an approved radioisotope under the direct supervision of an authorized user, he/she must first submit RSC FORM 002 to the RSC. FORM 002 must also be signed by the designated supervising authorized user, who must have a permit for the radioisotope identified in the application. RSC FORM 002 may be submitted for only one approved radioisotope. The RSC will be responsible for determining any hazard that may arise from the intended use of the radioisotope and will assist the applicant to complete the application.

2) The RSC will thoroughly review the qualifications of each potential user with respect to the type and quantity of radioisotope material and uses for which he/she has applied to assure appropriate measures to maintain exposure ALARA (RSC FORM 004).

3) Once FORM 002 is approved by the RSC, the RSC will sign the form, assign a permit number and send a copy to the applicant and to the designated authorized user. The RSC will maintain a file of the authorization.

d) Application to use a different radioisotope or to change significantly the use of a radioisotope

1) If an authorized user at UCC or a researcher working with radioisotopes under the supervision of an authorized user wants to utilize a different approved radioisotope or wants to make a significant change in radioisotope quantity, chemical form, use or storage location or experimental procedures, the user must notify the RSC and must submit RSC FORM 002 to the RSC. The RSC will thoroughly review the application to assure appropriate measures to maintain exposure ALARA and that the experimental protocol falls under the approved uses specified in the UCC materials license (RSC FORM 004).

e) Delegation of authority

1) The judicious delegation of RSC authority is essential to the enforcement of an ALARA Program. The RSC will delegate sufficient authority to the RSO for enforcement of the ALARA concept.

2) The RSC will support the RSO in those instances where it is necessary for the RSO to assert this authority. Where the RSO has been overruled, the RSC will record the basis for its action in the minutes of the committee's quarterly meeting.

f) Review of the ALARA Program

1) The RSC will encourage all authorized users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

2) The RSC will perform a quarterly review of occupational radiation exposure with particular attention to instances where investigational Levels in Table I below are exceeded. The principal purpose of this review is to assess trends in occupational exposure as an index of the ALARA Program quality and to decide if action is warranted when investigational levels are exceeded. (See Paragraph VI)

3) The RSC will evaluate the institution's overall efforts for maintaining exposures ALARA on an annual basis. This review will include the efforts of the RSO, authorized users, and workers as well as those of the administration.

g) Composition and Frequency of Meetings

1) The RSC membership will include i) the committee Chairperson, who is appointed to that position by the President of the University, ii) the RSO, iii) at least one representative from each academic department of the university which either is currently using or has used in the past radioisotopes for research purposes, iv) one representative of the university administration to be named by the President of the university upon consultation with the committee Chairperson and v) the Radiation Safety Technician, who will be an *ex oficio* member of the RSC.

2) The RSC will meet as often as necessary, but not fewer than one time each calendar year.

3) Quorum for any regular or special RSC meeting will be a majority of current regular and *ex oficio* members or their designated representatives having been duly notified in writing of the meeting at least one week in advance of the meeting date.

III. RADIATION SAFETY OFFICER (RSO)

a) General responsibilities

1) The RSO will advise the RSC in all matters concerning safety and compliance with regulations.

2) The RSO will visit the facilities at least once a month to evaluate the Radiation Safety Program progress, perform radiation safety inspections of the radioisotope laboratories and radioactive waste storage areas, review records and produce reports to the RSC with recommendations, if necessary.

3) The RSO will have full authority to stop, without consultation, any procedure using radionuclides which he/she deems unsafe. The RSO will have no disciplinary authority, which resides instead with the President.

The following outline delineates the RSO's general responsibilities for ensuring radiation safety in the UCC:

4) General surveillance over all radionuclide activities at the UCC including the procurement, use and disposition of radioactive materials.

5) Periodic surveys and smears of all areas using radioactive materials.

6) Maintaining and operating a personnel-monitoring service suited to the needs of the radioisotopes being used.

7) Maintaining calibration services for survey instruments and monitoring devices used.

8) Supervision and coordination of the waste disposal program, including the keeping of temporary radioactive waste storage records, the collection and processing of solid waste for ultimate disposal off-site and incineration.

9) Maintaining a periodic inventory of all radionuclides and storage of those radioactive materials not in continual use at the institution.

10) Notifying individuals and the proper authorities whenever a radiation exposure or situation reaches maximum permissible levels and recommending appropriate remedial action.

11) Supervising decontamination procedures in cases of contaminating accidents.

12) Furnishing consulting services to personnel at all levels of responsibility on any aspect of radiation protection.

13) Organizing training courses for new personnel and continuing education of personnel and trainees (See Section c) below)

14) Serving as an active member of the Radiation Safety Committee.

b) Annual and Quarterly Review

1) Annual Review of the Radiation Safety Program:

The RSO will perform an annual review of the Radiation Safety Program for adherence to ALARA concepts. Reviews of specific procedures may be conducted on a more frequent basis.

2) Quarterly Review of Occupational Exposures

The RSO will review at least quarterly the external radiation exposures of authorized users and workers to determine that their exposures are ALARA in accordance with the provisions of Paragraph VI of this program.

3) Quarterly review of Records of Radiation Level Surveys

The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.

c) Educational Responsibilities for the ALARA Program

1) The RSO will schedule briefings and educational sessions to inform workers of ALARA Program efforts.

2) Each employee who completes training will receive a certification form (RSC Form 011). A record of employee attendance will be maintained in the RSC files.

3) The RSO will assure that authorized users, workers and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that the administration, the RSC and the RSO are committed to implementing the ALARA concept.

d) Cooperative Efforts for Development of ALARA Procedures:

1) Radiation workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

2) The RSO will be in close contact with all users and workers in order to develop ALARA procedures for working with radioactive materials.

3) The RSO will establish procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and encourage the use of those procedures.

e) Reviewing Instances of Deviation from Good ALARA Practices:

1) The RSO will investigate all known instances of deviation from good ALARA practices and, if possible, determine the causes. When the cause is known, the RSO will require changes in the program to maintain exposures ALARA.

2) The RSO will report all significant instances of deviation from ALARA concepts to the RSC for review.

IV. AUTHORIZED USERS

a) Responsibility of the authorized user toward the workers whom he/she supervises

1) The authorized user will be responsible to explain the ALARA concept and the authorized user's commitment to maintain exposure ALARA to all those employees and students whom he/she supervises and who will be working with radioisotopes.

2) The authorized user will ensure that those employees and students under his/her supervision, who are subject to occupational radiation exposure, are trained and educated in good health physics practices and in maintaining exposures ALARA. The authorized user may delegate this responsibility to the RSO if he/she chooses to do so. The authorized user must assess and document this training by completing RSC FORM 012 and submitting the form signed by both the trainee and the authorized user to the RSC. In addition, the authorized user will ensure that those employees and students who are working with radioisotopes under his/her supervision attend the radiation safety seminars which are offered by the RSC.

b) New protocols or changes in protocols involving potential radiation exposures

1) The authorized user will consult with and receive the approval of the RSC for any new protocol that involves radioisotope use before ordering or using radioactive materials. A new protocol is defined as any protocol not previously approved by the RSC or a previously-approved protocol that proposes to utilize a different radioisotope or to make a significant change in radioisotope quantity, chemical form, use or storage location or experimental procedures.

2) The authorized user will evaluate all new protocols before using radioactive materials to ensure that exposures will be kept ALARA. This may be enhanced through the application of trial runs.

V. PERSONS WHO RECEIVE OCCUPATIONAL EXPOSURE

a) The worker will be instructed in the ALARA concept and its relationship to his/her working procedures and work conditions.

b) The worker will know what resources are available, if he/she feels that ALARA is not being promoted on the job.

VI. ESTABLISHMENT OF INVESTIGATIONAL LEVELS FOR OCCUPATIONAL EXTERNAL RADIATION EXPOSURES IN ORDER TO MONITOR INDIVIDUAL EXPOSURE

This institution hereby establishes investigational levels for occupational external radiation exposure which, when exceeded, will initiate review or investigation by the Radiation Safety Committee and the Radiation Safety Officer. The investigational levels that are adopted are listed in Table I below. These levels apply to the exposure of individual workers.

TABLE I

ALARA INVESTIGATIONAL LEVELS FOR EXTERNAL RADIATION EXPOSURE

SITE	LEVEL I	LEVEL II	LEVEL III
1. LENS OF EYE			
mRems/quarter	90	120	410
mRems/quarter	280	370	1250
2. EXTREMITIES			
mRems/month	500	1250	4100
mRems/quarter	1500	3750	12500

The basic regulations governing penetrating radiation such as X-Rays and Gamma Rays as would be measured by a film or TLD badge are given in units of rems per calendar quarter (a thirteen week period). The Radiation Safety Officer will review and record the results of personnel radiation exposure reports, not less than once in any calendar quarter, as is required by 10 CFR 20, 20.401.

The following actions will be taken at the Investigational Levels as stated in Table I

a) Quarterly exposure of individuals to less than Investigational Level I:

Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table I values for the Investigational Level I

b) Personnel exposures equal to or greater than investigational Level I, but less than investigational level II:

The RSO will review the exposure of each individual whose quarterly exposure equals or exceeds investigational Level I and will report the results of this review at the first RSC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the exposure is required unless deemed appropriate by the RSC. The RSC will, however, consider each such exposure in comparison with those of others performing similar tasks, as an index of ALARA program quality and will record

the review in the committee's minutes.

c) Exposure equal to or greater than Investigational Level II:

The RSO will investigate in a timely manner the cause(s) of all personnel exposures equaling or exceeding Investigational level II and, if warranted, take action. A report of the investigation, actions taken, if any, and a copy of the individual's Radiation Exposure Record will be presented to the RSC meeting following completion of the investigation. The details of these reports will be recorded in the committee minutes. Committee minutes will be sent to the administration of this institution for review. The minutes, containing details of the investigation, will be made available to NRC inspectors for review at the time of the next inspection.

d) Reestablishment of an individual occupational worker's Investigational Level II above that listed in Table I but below Investigational Level III:

In cases where a worker's or worker group's exposures need to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis that it is consistent with good ALARA practices for that individual or group. Justification for a new Investigational Level II will be documented.

The Radiation Safety Committee will review the justification for and must approve all revisions of Investigational Level II. In such cases, when the exposure equals or exceeds the newly established Investigational Level II, those actions listed in Paragraph (c) above will be followed, especially when radiation exposure would equal or exceed Investigational Level III.

B. GENERAL SAFETY RULES

I. DESIGNATION OF AREAS

No exposure guide or permissible dose should be considered as an allowable outer limit which can be approached with complete safety. Every practical effort must be made to keep exposures as far below the guides as is consistent with program efficiency and economy. The UCC ALARA Program implies that the RSC and the RSO will assist in determining the laboratory areas in which certain operations can be carried out and will assist in planning procedures that will minimize personnel exposures. A continuous monitor on procedures will be provided where this seems indicated.

1. An Unrestricted Area means an area, access to which is neither limited nor controlled by the licensee. An unrestricted area cannot have radiation levels above twice background or surface contamination levels above twice background as determined by the current counting equipment being used.

2. A Restricted Area means an area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area. A restricted area should not have radiation levels above twice background or surface contamination levels above twice background as determined by the current counting equipment being used. If the limits are exceeded, contact the RSO to review the area to see if additional shielding materials are needed or to assist in changing work procedures to control contamination.

3. A Radiation Area means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

4. A High Radiation Area means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or 30 centimeters from any surface that the radiation penetrates. (Due to the type of research programs using radionuclides at UCC, high radiation areas are not foreseen.)

5. An Airborne Radioactivity Area means a room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations(1)in excess of the derived air concentrations (DACs) specified in appendix B, to §§ 20.1001-20.2401, or (2) 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. (Due to the type of research programs using radionuclides at UCC, airborne radioactivity areas are not foreseen.)

II. LABORATORY PRACTICE

1. It is not possible to present here in detail all of the techniques and procedures applicable to the proper use of radioactive materials and other sources of ionizing radiation. Some of the more important requirements and safety practices are given below. The initial training of a new employee who will work with a radioisotope is provided by the supervisor who is authorized to use the isotope. A form (RSC FORM 011) must be filled in by the supervisor and signed by the trainee. The RSO will supply refresher instructions to all UCC employees on a yearly basis.

2. Each entrance into an area where radioactive materials are used or stored in such a manner as to make that area a Radiation Area, or an Airborne Radioactivity Area, shall be conspicuously marked with a sign identifying the area in accordance with the definitions given above.

3. The signs shall remain in place as long as the area conforms to the definitions. Signs will be removed by the Radiation Safety Officer only after performing appropriate radiation surveys.

4. If radiation signs are continuously violated, administrative steps should be taken to control the entrance of unauthorized individuals to a radiation area.

5. Containers in which radioactive materials are being stored or transported shall be marked with appropriate labels. Each label shall identify the nuclide, the activity within the container, the date of the activity estimate, and the initials of the responsible custodian.

6. If radioactivity is stored in an unrestricted area for a short period of time, it must be in a locked compartment to prevent accidental access by unauthorized persons.

7. When not in use, original containers of radioactive material should be kept in their individual lead shields in the designated storage area.

8. All radioactive solutions are kept in covered containers (lead shielded when necessary) and labeled with the name of the compound, radionuclide activity and date.

9. Stock solutions or sources in use may be kept in the laboratory area inside sufficient shielding to reduce the exposure dose-rate to <1 mR/hr at the closest access point outside the shield.

10. Manipulations involving radioactive materials shall be carried out inside glove boxes or hoods as far as is practicable. Radioactive gases shall be used and stored only in areas approved by the Radiation Safety Officer.

11. Handling of radioactive gases, radioiodine solutions or other material creating an airborne radioactivity hazard, must be done inside exhaust hoods approved by the Radiation Safety Officer.

12. As extensive use as possible should be made of protective devices such as trays, glass plates, or absorbent paper in order to prevent contamination of permanent building structures, bench tops, floors, etc.

13. Each authorized user of radioactive nuclides must make or request from the RSO monthly surveys of his/her area to search for radioactive contamination and report this to the RSO (see Sec. F; use RSC FORM 003).

14. No detectable contamination of any building component can be tolerated. The Radiation Safety Officer shall be consulted upon discovery or suspicion of contamination and follow instructions.

15. Equipment used with radioactive materials shall not be released to other workers, sent to a shop for repairs or modifications, or to surplus, and shall not be discarded until it is demonstrated by the RSO assistant to be free of contamination.

16. Repairs or modifications of contaminated equipment shall be done under the supervision of the Radiation Safety Officer.

17. Protective gloves of surgical rubber or disposable plastic and lab coats must be worn at all times when working with radioactive materials.

18. Each Division or Department of the UCC shall provide its employees with gloves, lab coats and other protective equipment such as plexiglass shields & lead aprons according to the work area, nuclides, and duties.

19. Protective equipment such as laboratory coats, surgical or disposable gloves, film badges, shielded syringes, etc. should not be worn outside the laboratories or radioactive areas.

20. Mechanical or manual pipette-filling devices shall always be used with radioactive solutions. Never use the mouth to pipette radioactive solutions.

21. Smoking, eating, drinking, and use of cosmetics are forbidden in areas where unsealed radioactive materials are used.

22. Signs must be placed on refrigerators, where radioactive material is kept, prohibiting storage of food or drink in them.

23. Liquid radioactive wastes shall not be disposed into the regular laboratory sewage system unless they are known to conform to the requirements specified by the RSO (see Sec. H).

24. Solid radioactive waste should be collected in appropriate containers provided for it, stored in the laboratory and/or transported to the transient storage following instructions of the RSO (see Sec. H).

25. In case of spillage of radioactive material, alert nearby personnel, confine the spill, block off and mark the area, notify the laboratory supervisor and the RSO immediately, and follow specific posted decontamination procedures (see Sec. G}.

26. All personnel who have worked with radioactive materials should monitor themselves for radioactive contamination before leaving a restricted area. If contamination above background is found, appropriate action should be taken.

C. ORDERING AND RECEIVING OF RADIOACTIVE MATERIAL

The following procedures are to be followed in the acquisition of radioactive material. In developing these procedures every attempt has been made to achieve simplicity for all the radionuclide activities in the research laboratories of the UCC while at the same time complying with all applicable regulations and the requirements of general safety.

I. ORDERING

a) The authorized user fills out the UCC Requisition Form. The requisition form must include the name, quantity (in Curies or derivative thereof), chemical and physical form, the manufacturer of the radioactive material requested, the authorized user's name, signature and authorization number (approval number assigned to the user by the RSC on FORM RSC 001).

b) The completed UCC Requisition Form is sent to the Chairman of the Radiation Safety Committee who checks that:

1) User is authorized for material requested.
2) The quantity requested is within maximum possession limits stipulated in the NRC Materials License.

c) The RSC Chairman adds the NRC Materials License Number to the requisition, signs the requisition and sends it to the Purchasing Department. No requisition for radioisotope purchase or transfer may be processed without these steps.

II. RECEIVING

a) Radioactive material is delivered to the UCC Receiving Office. All shipments of radioactive material carry a standard radiation label by U.S. law in addition to the name of the user who placed the order.

b) Receiving personnel should deliver the container of radioactive material to the authorized user along with a UCC Receiving Form as soon as possible. If the material is delivered during nonworking hours, the person receiving the material may leave it in a locked area in the receiving office until the next working day.

c) The authorized user or user staff inspects the package for leaks or contamination following the procedure outlined on the Radioactive Shipment Receipt Report (RSC FORM 005).

d) If the package is damaged, the RSO or RSC Chairman must be informed immediately.

e) If the package condition is acceptable, the user must fill out RSC FORM 005 and make two copies. One copy is maintained in the user's file. The original, along with a copy of the packing slip, goes to the RSC Chairman. The third copy, along with the receiving form that must be signed by the RSC Chairman or RSO, is sent to the Receiving Office.

f) Upon receipt of radioactive material the Authorized User must complete a Radioisotope Original Source Stock Inventory Sheet (RSC FORM 013) for each new stock and attach RSC 013 to the front of the compartment where the stock will be stored.

D. PERSONNEL MONITORING AND BIOASSAYS

I. GOOD PRACTICES IN THE USE OF PERSONNEL MONITORING DEVICES

1. A film badge or any other personal dosimeter must be worn by all persons who are likely to receive a dose in excess of the applicable values specified in 10 CFR 20.1502 (a). Dosimeters are not necessary for personnel who work only with tritium (H-3) and/or carbon-14.

2. The Radiation Safety Officer (RSO) will recommend the type of monitoring device appropriate in each case.

3. In areas where hands and forearms are expected to be overexposed, the regular whole body badge will be supplemented with wrist or finger ring TLD badges.

4. Pocket ionization chambers or short term film badges will be provided to each individual frequently visiting the radiation area.

5. In working areas where a film badge is mandatory, a request for personnel monitoring services must be made in writing by the authorized user to the Radiation Safety Committee (RSC) for any new employee prior to beginning radioisotope work.

6. Film badges and finger rings {if necessary) will be changed quarterly by the RSC.

7. Personnel exposure records to ionizing radiation are submitted by the processing laboratory to the RSC Chairman. This information will be maintained in the RSC files and will be made available to the RSO as well as to the individual upon request.

8. The RSC and the RSO will perform a quarterly review of the Occupational Radiation Exposure Reports according to the ALARA Programs (Sec. A).

9. Film badges must be worn at all times while in indicated UCC radiation areas. They must not be left in or on desks, laboratories, coats or benches. Routinely, each employee shall leave his/her badge in the rack provided whenever he/she leaves the radiation area and shall pick it up from the rack on returning to work.

10. The badges must be worn, face outward, outside of all the clothing on the part of the body where the greatest radiation exposure is anticipated. This will usually be at about chest level.

11. Personnel monitoring devices will be issued to representative members of visiting groups who will remain together during a guided tour to a radiation area. Service or contracted personnel (telephone, instruments, construction, typewriter repair, etc.) on occasional visits to a controlled area are considered as visitors.

12. The RSO will submit a copy of the yearly total Radiation Exposure Report reproduced by the Processing Laboratory to all UCC radiation employees.

13. If the above-mentioned reports are not available, the RSO will keep employees informed on radiation exposure at any one time.

II. BIOASSAYS

1. Bioassay procedures may be recommended by the RSO in some areas where low-energy beta emitters are being handled and stored.

2. Nevertheless, the anticipated amount and physical and chemical forms of beta-emitters used and procedures followed within the UCC probably will not require bioassay procedures.

3. Any person handling more than 1 mCi of radioiodine must have a measurement of thyroid uptake the following day, in accordance with NRC regulations. Results of the employee's thyroid uptake procedures will be recorded and filed by the RSO.

E. OCCUPATIONAL RADIATION EXPOSURE LIMITS

I. GUIDE FOR EMPLOYEES

a) There is no particular radiation dose at which injury suddenly occurs and which could, therefore, be defined as "maximum permissible". Radiation sources have been used in medicine and industry for more than 60 years and this experience has been supplemented in the past 20 years by extensive studies on the damaging effects of radiation. As a result of this experience and research, responsible organizations such as the National Council of Radiation Protection and Measurements (NCRP), the Federal Radiation Council (FRC) and the more recent ALARA Program of the NRC have been able to set a series of guides or recommended limits of radiation exposure considered to be acceptable in connection with an occupation.

b) The UCC operates under the dosage schedule given by the U.S. CFR 10 20.1201. However, the RSC and the RSO will ensure implementation of the ALARA Program in the UCC. Therefore, the guide limits established in U.S.10 CFR 20.1201 have been substituted by the lower Investigational Levels shown in Table 1 of the ALARA Program (see Sec. A). Any radiation received for medical reasons is not be counted as an occupational exposure.

c) A beta exposure below an average energy of 700 kev will not penetrate the lens of the eye; therefore, the applicable limit for these energies would be that for the skin of the body.

d) It is well clarified that an occupational emergency dose should not be repeated within one calendar year. The Radiation Safety Officer attempts to control operations so that no individual receives a radiation dose approaching the guide limits given in Table 1, but without imposing undue restrictions on the activities for which the UCC radionuclides program was established.

e) Any employee, who works with radioisotopes and is pregnant or is considering becoming pregnant, should contact the RSO or the RSC Chairperson 1) to obtain a copy of USNRC Regulatory Guide 8.13: *Instruction Concerning Prenatal Radiation Exposure* and 2) to be advised regarding the employee's and employer's rights and responsibilities. Once an employee's pregnancy is declared in writing (see 8.13 form letter), arrangements must be made 1) to assure that the dose to her fetus during the entire pregnancy period does not exceed 0.5rem(5mSv) and 2) to avoid substantial variation above a uniform monthly exposure rate.

f) The RSC will keep current and cumulative exposure records on all radiation personnel who require monitoring. Upon a change of employment, the exposure records will be made available to the new employer upon a written request of the individual concerned.

II. GUIDE FOR STUDENTS

a) Individuals below the age of 18 must be excluded from occupations involving radiation exposure. Students form a special group because they are not employees covered by the usual provisions of workmen's compensation, but may nevertheless be subjected to radiation exposure by assignment. The guides in 10 CFR 20.1207 will be used as exposure guides for the UCC students for whom the institution has accepted responsibility.

b) Students of any age shall not receive an exposure exceeding 0.5 rem per year in addition to natural background and medical exposures. If a teacher 18 years of age or over is routinely exposed to

work involving radiation, he/she becomes an occupational radiation worker and the corresponding exposure limits apply.

c) Students under 18 years of age should not receive more than 0.1 Rem per year from educational activities. It is recommended that each experiment be so planned that no student receives more than 0.1 Rem while carrying it out.

d) A student will not become an approved user of radionuclides at the UCC. The student's immediate supervisor will be responsible to keep any students potential radiation exposure ALARA.

F. METHODS AND FREQUENCY OF CONDUCTING SURVEYS

I. CLASSIFICATION OF AREAS

a) Low Level:

Areas where *in vitro* testing is carried out, where injection of small animals is done and where sample counting is performed.

b) Medium Level:

Areas used for storage of highly radioactive solutions, for handling gamma- and high-energy beta-emitters capable of producing overexposure of personnel and for radiochemical labeling procedures and hoods used for radio-iodination procedures.

c) Hoods:

The Hood which will be used for the handling of volatile radioisotopes is located in Basement Room 046. This hood's specifications are: Full size fiber glass with 3/4 hp motor providing a minimum of 1140 cfm at 1/211static pressure. Manufactured by LabConCo. Model no 70703, S/N 30290. It uses a charcoal filter with the following specifications: High Efficiency Particulate Air Type filter for radioisotope and bacteriological applications. Rated for 1000 cfm air flow with initial 1.0 static pressure drop. Replaceable HEPA media removes 99.97% of all particles 3 microns or greater. Furnished complete with clamping frame and duct connections. Unit measures 28" X 28".

During all radiation procedures and/or any other handling of unsealed volatile radioisotope, a G.M. survey meter with audible speaker will be placed with the tube cap off in a location of the same room as, but far from, the hood. Accidental releases of airborne radioactivity can be detected by an increase in the audible count rate of the instruments.

Mechanical operation of the hood is monitored visually by the user before the handling of radioisotopes and the face velocity will be measured annually.

II. FREQUENCY OF SURVEYS

Low level: Monthly

Medium Level: Weekly

III. METHOD OF SURVEY

a) Radiation Level Survey

1) Each area is monitored with a Geiger-Muller (GM) survey meter recently calibrated having sensitivity ranges of 0.0 to 0.2 and 0 to 2000 mrem/hr. Each authorized user has a monitor available to him/her in his/her department to perform the surveys.

2) The results of the survey will be recorded on RSC FORM 003 which must contain a sketch of each area.

b) Removable Contamination Survey

1) Monthly wipe tests are carried out by the RSC or RSO in all areas where radioactivity is stored or handled in unsealed form.

2) Test samples are analyzed as follows:

For low energy beta emitters: Liquid Scintillation Counting techniques.

For high energy beta emitters and for all gamma emitters: End window G.M. measurement system.

Wipe-test procedures in radiation level determination will be done on a routine basis by a qualified person under the supervision of the director of the laboratory.

3) The results of the survey will be recorded on RSC FORM 003 which must contain a sketch of each area surveyed.

IV. ACCEPTABLE LIMITS (TRIGGER LEVELS)

a) Unrestricted Area:

Radiation levels must be less than twice background
Removable contamination must be less than twice background
(< 200dpm/100cm^2)

b) Restricted Area:

Radiation levels: twice background
Removable contamination: 1000 dpm/100cm^2

c) Specific cleanup is required in any area where a wipe-test sample shows 100 dpm/100cm^2 above the control sample. A sample above 1000 dpm/l00cm^2 defines a contamination zone. The routine use of that zone is restricted until released by the RSO (See Sec. G).

V. RESPONSIBILITY

a) A signed report of each survey (RSC FORM 003) is sent to the RSC Chairman and reviewed by the RSC/RSO as soon as completed. When any of the results exceed the acceptable limits, the RSO communicates immediately with the director of the laboratory involved in order to initiate corrective action. When necessary, the RSO will make spot checks of the radiation safety conditions in the lab.

b) Originals of all reports are filed by the RSC and copies are sent to each authorized user only when decontamination procedures are necessary or upon request.

G. DECONTAMINATION AND EMERGENCY PROCEDURES

I. MINOR SPILLS

a) Individuals who cause contamination of an area floor, equipment, etc. will be responsible for carrying out the necessary decontamination procedures and for taking the necessary steps to prevent the spread of the contamination to other areas.

b) The RSO or a representative of the RSC will assess the extent of such contamination and supervise the necessary decontamination procedure.

c) If a serious radiation problem develops, the employee should contact the physician in charge of a Nuclear Medicine Laboratory and the RSO shall direct the proper action to be taken in carrying out the decontamination procedures necessary to reduce hazards.

d) An area or a piece of equipment will be considered contaminated if a wipe test reveals concentrations greater than twice background (> 200dpm/100cm^2) for beta or gamma.

II. EQUIPMENT AND AREA DECONTAMINATION

a) All spills of radioactive materials shall be cleaned up prior to wet mopping or scrubbing. If necessary, the contaminated areas shall be painted or varnished to prevent possible spread of contamination.

b) Liquids should be blotted with absorbent paper. Rubber gloves shall be worn during such decontamination procedures.

c) When the area has dried it shall be monitored and a wipe test taken to insure the permissible level of contamination is not exceeded.

d) All material contaminated by the spill shall be disposed of according to specific instructions provided for the collection and disposal of radioactive waste.

III. EMERGENCY PROCEDURES

a) Notify persons in the immediate area that a spill has occurred.

b) Cover the spill with absorbent paper.

c) Limit access to the area to only those persons dealing with the spill.

d) Survey potentially contaminated personnel before they disperse and decontaminate as necessary.

e) Notify the incident to the RSO or to a representative of the RSC and to the laboratory supervisor and follow recommendations.

IV. MAJOR SPILLS

a) Notify all persons not involved in the spill to vacate the room at once. Limit the movement of displaced persons to confine the spread of contamination.

b) Cover spill with absorbent paper.

c) Switch off all fans and close windows.

d) Vacate room.

e) Close the door to the room. Prevent entry into the room.

f) If the spill is on the skin, flush thoroughly.

g) If the spill is on clothing, discard outer or protective clothing at once.

h) Notify immediately the RSO and the laboratory supervisor.

i) Survey (G.M. survey meter) personnel involved. Immediately initiate decontamination of personnel as necessary, using mild soap and lukewarm water.

j) Contaminated area must not be occupied until released by the RSO.

V. DOCUMENTATION

In the event of a contamination event, the RSO or the supervising representative of the RSC, will be responsible to complete an Incident Report utilizing RSC Form 014. This must be signed by the RSO or by the RSC representative.

H. RADIOACTIVE WASTE COLLECTION, STORAGE AND DISPOSAL

I. GENERAL REGULATIONS

a) The RSO is responsible for the ultimate disposal of all radioactive wastes generated at UCC. Authorized users and their personnel may never dispose of either solid or liquid radioactive material.

b) Radioactive waste going into the atmosphere must comply with 10 CFR- Part 20- App. B

c) The RSO will be notified promptly if there has been any violation of the provisions of this section.

II. RESPONSIBILITIES OF THE AUTHORIZED USER LAB

a) It will be the responsibility of all authorized users in the UCC who produce radioactive wastes to cooperate in carrying out the objectives and policies outlined by this manual, to follow procedures to collect wastes safely and to provide information concerning the nature of wastes for subsequent transport to the transient storage facility.

b) Solid radioactive materials must never be discharged by users or workers into wastebaskets or other containers which would permit the contamination of the regular institutional trash. Liquid containing radioactive materials must never be discharged by users or workers into the general sewerage via lab sinks.

c) In all labs where radioactive waste is generated, suitable receptacles must be readily available to receive the waste. All receptacles should be clearly identified as to radioisotope.

d) Radioactive waste containers should be classified according to methods of eventual disposal or of long-term storage and kept in separate containers. The following classifications will be used:
   i) Liquid waste
   ii) Solid waste
   iii) Contaminated animal carcasses
   iv) Airborne waste

e) Different radioisotopes should not be mixed in the same container unless this is unavoidable due to the experimental procedures used. If mixing occurs, the waste containers must be labelled for all radioisotopes present.

f) Each solid radioactive waste container in the lab of origin should be lined with a plastic bag, in such a fashion that the top of the bag is folded over the edge of the container, leaving at least two inches of bag hanging on the outside of the container. One container for each type of radioisotope should be used and the container clearly labeled with a tag which displays the standard radiation sign and identifies the radioisotope contained. No radiation labels should be put inside the container.

g) Any liquid radioactive waste must be poured into a suitable container (e.g. glass or solvent-resistant plastic bottle) and labeled with a tag which displays the standard radiation sign and identifies the radioisotope contained.

h) All disposable lab vessels and receptacles which contain radioactive liquid, including scintillation vials with cocktail, must be emptied into a liquid waste container before placing them into the solid waste container.

i) Any reusable receptacle which contains radioactive liquid, after being emptied into the liquid waste container, may be thoroughly washed out in the lab sink prior to being reused.

j) Traces of "non-pourable" liquid radioactive waste may be classified as solid waste and placed into the solid waste container.

k) All radiation labels must be removed from receptacles before placing them into the solid waste container. Do not leave radiation labels or radiation indications of any kind inside the bag.

l) Each authorized user must make an estimate of the amount in millicuries of radioisotope deposited in the lab waste containers. These estimates are essential for documenting transportation of radioactive wastes requiring indefinite storage. The amount of radioactive nuclide recorded for transport on all transport forms (FORM 010) must equal the amount recorded as dispensed from the original stock on the corresponding inventory form (RSC FORM 013).

m) All containers for transport from the lab of origin to the transient storage facility must be tightly sealed, appropriately labeled on the outside with the radiation label and radioisotope and must carry all information completed on RSC FORM 010.

n) No radioactive waste which also contains biologically hazardous material (orange biological hazard container) may be transported for radioisotope storage unless it has been treated in such a way as to render it no longer a biological hazard (e.g. by autoclaving). In this case it must be repackaged in a labeled radioisotope waste container. No orange biological hazard containers may be transported for storage.

o) No radioactive waste which contains material considered toxic to animals or humans may be transported for radioisotope storage. Such waste must be treated in such a way as to render it no longer a toxic hazard to the environment before it can be transported for storage.

p) Each container with radioactive waste will be escorted by the RSO or designee and transported to the transient storage facility where it will remain until the RSO determines its final disposal.

III. THE TRANSIENT STORAGE FACILITY

a) Transient storage consists of 1) storing short half-life (half-life < 90d) solid radioactive material for decay, 2) storing both short half-life and long half-life (half-life > 90 days) liquid radioactive waste until the waste can be disposed of through the general sewage and 3) storing long half-life (half-life > 90 days) solid radioactive waste until the amount collected will justify outshipment by a commercial radioactive waste disposal firm.

b) Upon receipt in the transient storage facility, the RSO or designee will examine each radioactive waste container and enter the container into a permanent log record along with the date and the contact reading and/or radioactivity level if appropriate.

c) The RSO or designee is the ONLY person authorized to remove any item which has been stored in the transient storage facility. The RSO will monitor the contents of the waste storage facility periodically.

d) Solid waste containing only short half-life radionuclides (half-life < 90d) may be held in transient storage for ten half-lives. This may be followed by disposal in the ordinary trash provided 1) surveyed radioactivity is reduced to background levels and 2) all radiation labels are removed or obliterated. Bags which read a background contact reading (i.e. less than 0.05 mrem/hr) may be disposed of as regular trash. Note: Do not leave radiation labels or radiation indications of any kind on the bag.

e) Any bag which yields a contact reading greater than background should be tied at the top with masking tape and a tag which displays the standard radiation sign should be tied around the top.

f) Solid waste containing long half-life radionuclides (half-life > 90d) must be held in transient storage until the amount collected will justify outshipment by a commercial radioactive waste disposal firm.

g) Low-level liquid radioactive waste is eligible for immediate disposal in the general sewerage under the direct supervision of the RSO. Immediate sewage disposal consists of flushing the waste down a designated sink along with a pre-determined adequate flow of tap water. As a general rule, low level liquid radioactive waste exists when calculations indicate that less than 10 gallons of water are necessary to take the waste to concentrations below the Maximum Permissible Concentrations specified in Appendix B-10-CFR-Part 20. The total amount of liquid radioactive material released into the municipal sewage system by all UCC radiation workers will not exceed 5 curies per year for H-1 and 1 curie per year for C-14 (10 CFR 20.2003(4)). In addition, certain other conditions on quantity and type of material govern any discharge into the environment (10 CFR 20 App. B.). To ensure compliance with these conditions no persons may discharge any liquid radioactive waste into the sewage system without specific approval of the RSO.

IV. PROCEDURES AND PRECAUTIONS FOR USE AND STORAGE OF RADIOACTIVE MATERIALS IN ANIMALS

a) Animal housing: small animals that are used in experiments involving radioisotopes must be transported to and maintained in a lab that is approved for use of the specific radioisotope(s) for the duration of the experiments.

b) Handling of animals, animal waste and carcasses

1) Cages containing radioactive animals are clearly marked with distinctive yellow magenta radiation label tape indicating radioactivity.

2) Disposable plastic gloves are worn whenever handling radioactive animals or when cleaning cages.

3) Radioactive cage bedding, animal waste and animal carcasses are put into plastic bags, labeled as to the isotope and approximate amount of radioactivity and stored temporarily in a freezer.

4) Do not smoke or eat in the area where radioactive animals are handled or stored.

c) Cleaning of cages

1) Radioactive cages should be maintained separately and cleaned separately.

2) Plastic gloves and aprons should be worn when cleaning the cages.

3) The cages should be washed with soap or Radiowash (or comparable product) and flushed with a large volume of water.

4) The cages should be wipe-tested and documented to be free of radioactive contamination before returning the cages to the animal care facility or storage facility.

d) Rooms where radioactive animals are housed must be locked during nonworking hours.

e) Instructions for transport & storage of radioactive animals

1) Disposable gloves should be worn.

2) A heavy gauge polyethylene bag should be prepared to place the animal inside.

3) The bag should be folded back in a double cuff, fold outwards, to protect surface to be sealed off from contamination.

4) The animal carcass should be placed on a disposable plastic sheet big enough so that no part of the animal projects outside the sheet.

5) The feet of the carcass should be bound with adhesive tape to avoid the risk of the bag being punctured by the claws of the animal.

6) The carcass should be split ventrally along the midline.

7) If the carcass is soiled with tissue fluid or blood, it should be powdered with vermiculite or commercial expanded mica.

8) The carcass should then be put into the bag along with the plastic sheet.

9) Gloves should be removed and also placed in the bag.

10) New gloves should be used to continue the procedure.

11) Mark on the outside of the bag the date, isotope and activity of the isotope.

12) The bag may be temporarily stored in a freezer which is approved and properly labeled for radioisotope storage.

13) The RSO is to be contacted so that arrangements can be made for the transport of all contaminated animal carcasses and associated solid waste to the designated freezer that is located in the Radioisotope Storage Room for long-term storage.

V. DISPOSAL OF ANIMAL CARCASSES CONTAINING LONG HALF-LIFE SOLID RADIOACTIVE WASTE

1. 3H and l4C are anticipated to be the main long half-life radioisotope contaminants of animal carcasses, body parts, animal bedding and liquid scintillation counting waste that will be generated at UCC.

2. Research programs at the UCC are approved for in vitro testing and tracer studies in animals. Amounts of radionuclides are expected not to exceed the standard specific activity of 0.05mCi/g.

3. All long half-life solid radioactive waste, including animal carcasses, body parts & bedding, will be properly packaged for outshipment to a licensed radioactive waste storage depot.

APPENDIX

RADIATION SAFETY PROGRAM FORMS

INDEX OF FORMS

RSC FORM 001 **APPLICATION TO BE AN AUTHORIZED USER OF RADIOSIOTOPES**

RSC FORM 002 **APPLICATION FOR RADIOISOTOPE USE & PROCUREMENT**

RSC FORM 003 **RADIATION SAFETY LAB SURVEY**

RSC FORM 004 **RADIATION SAFETY COMMITTEE EVALUATION SHEET**

RSC FORM 005 **RADIOACTIVE SHIPMENT RECEIPT REPORT**

RSC FORM 009A **SAFETY INSTRUCTIONS FOR MAINTENANCE PERSONNEL**

RSC FORM 009B **SAFETY INSTRUCTIONS FOR SECURITY PERSONNEL**

RSC FORM 010 **RADIOACTIVE WASTE TRANSFER FORM**

RSC FORM 011 **RADIOSIOTOPE SAFETY EDUCATION PROGRAM CERTIFICATION**

RSC FORM 012 **RADIOSIOTOPE SAFETY INDIVIDUAL TRAINING CERTIFICATION**

RSC FORM 013 **RADIOSIOTOPE LAB STOCK INVENTORY SHEET**

RSC FORM 014 **RADIATION SAFETY COMMITTEE INCIDENT REPORT**

RSC FORM 001

PERMIT NUMBER _____
(For RSC use)

RADIATION SAFETY COMMITTEE/RADIATION SAFETY OFFICER
UNIVERSIDAD CENTRAL DEL CARIBE BAYAMON, PUERTO RICO

APPLICATION TO BE AN AUTHORIZED USER OF RADIOISOTOPES FOR RADIOISOTOPE USE AND PROCUREMENT

Please submit the completed and signed form to the Chairman of the UCC Radiation Safety Committee (RSC).

1. Applicant name: _____

   Department: _____ Lab or office number: _____ Telephone extension: _____

2. Provide a brief description of applicant's prior training and experience in the use of radioisotopes (attach additional pages if necessary):

3. Radioisotope to be used: _____

4. Physical/chemical form(s) to be purchased or otherwise obtained:

5. Estimated maximum radioisotope amounts

a. to be used in a typical single experiment: _____ mCi

b. to be ordered per shipment: _____ mCi

c. to be ordered per year: _____ mCi

(continued)

RSC FORM 001 (continued)

6. Please describe proposed procedures which will utilize the radioisotope in this application. Include any special hazards or necessary precautions needed to achieve ALARA. Please consult the UCC Radiation Safety Manual as needed. (Attach additional page if necessary.)

7. Please list the locations (Department & Room Number) where this radioisotope will be utilized or stored.

8. Please list the name and radioisotope experience (if any) of each current personnel who will work with the radioisotope under the applicant's direct supervision. Please indicate if the individual is a student.

9. Name and address of planned radioisotope supplier:

10. Signature of applicant: _____ Date: _____
(This signature affirms that the applicant is familiar with authorized user responsibilities as specified in the UCC *Radiation Safety Manual* Section A.IV.)

11. Signature of approval by the Radiation Safety Committee:

Name: _____ Signature: _____ Date: _____

Note: First-time applicant approval to be an authorized user of radioisotopes is subject to final approval by the U.S. Nuclear Regulatory Commission as an amendment to the UCC Materials License. (Attach evidence of NRC approval.)

This authorization is valid only for the authorized user and for the designated radioisotope as specified in this application. A separate application (RSC FORM 002) must be filled out for each additional radioisotope. The authorized user must notify the RSC in the event of a significant change in experimental procedures, use or storage location, maximal radioisotope quantity or personnel.

RSC FORM 002

PERMIT NUMBER _____
(For RSC use)

RADIATION SAFETY COMMITTEE/RADIATION SAFETY OFFICER

UNIVERSIDAD CENTRAL DEL CARIBE BAYAMON, PUERTO RICO

APPLICATION FOR RADIOISOTOPE USE AND PROCUREMENT BY AN AUTHORIZED USER OF RADIOISOTOPES OR UNDER THE DIRECT SUPERVISION OF AN AUTHORIZED USER

Please submit the completed and signed form to the Chairman of the UCC Radiation Safety Committee (RSC).

1. Applicant name: _____

   Department: _____ Lab or office number: _____ Telephone extension: _____

   If the applicant is not an authorized user of radioisotopes:

   Name of Authorized User who will supervise all work with radioisotopes: _____

   Authorized User Department: _____ Radioisotope Permit Number: _____

2. Provide a brief description of applicant's prior training and experience in the use of radioisotopes (attach additional pages if necessary):

3. Radioisotope to be used: _____

4. Physical/chemical form(s) to be purchased or otherwise obtained:

5. Estimated maximum radioisotope amounts

a. to be used in a typical single experiment: _____ mCi
b. to be ordered per shipment: _____ mCi
c. to be ordered per year: _____ mCi

(continued)

RSC FORM 002 (continued)

6. Please describe proposed procedures which will utilize the radioisotope in this application. Include any special hazards or necessary precautions needed to achieve ALARA. Please consult the UCC Radiation Safety Manual as needed. (Attach additional page if necessary.)

7. Please list the locations (Department & Room Number) where this radioisotope will be utilized or stored.

8. Please list the name and radioisotope experience (if any) of each current personnel who will work with the radioisotope under the applicant's direct supervision. Please indicate if the individual is a student.

9. Name and address of planned radioisotope supplier:

10. Signature of applicant: _____ Date: _____
(This signature affirms that the applicant is familiar with responsibilities of radioisotope use as specified in the UCC *Radiation Safety Manual*)

11. Signature of approval by the supervising Authorized User if applicant is not an Authorized User of radioisotopes:

    Name: _____ Signature: _____ Date: _____

12. Signature of approval by the Radiation Safety Committee:

    Name: _____ Signature: _____ Date: _____

Each authorization is valid only for the use of the designated radioisotope as specified in this application. A separate application must be filled out for each radioisotope. The authorized user must notify the RSC in the event of a significant change in experimental procedures, use or storage location, maximal radioisotope quantity or personnel.

RSC FORM 003

UNIVERSIDAD CENTRAL DEL CARIBE
RADIATION SAFETY COMMITTEE

RADIATION SAFETY LAB SURVEY

DEPARTMENT: _____ LAB NO: _____ SURVEY DATE: _____
AUTHORIZED USERS: _____ SURVEYOR: _____
RADIOISOTOPES APPROVED FOR USE: _____
DIAGRAM OF AREAS TO BE SURVEYED:

INSERT LAB FLOOR PLAN HERE

WHAT RADIOISOTOPES WERE USED IN THIS LAB DURING THE PREVIOUS MONTH? _____ OR NONE _____
[IF RADIOISOTOPES WERE USED, ALL NUMBERED AREAS MUST BE SURVEYED]
WHAT RADIOISOTOPES WERE STORED IN THIS LAB DURING THE PREVIOUS MONTH? _____ OR NONE _____
[IF RADIOSIOTOPES WERE STORED IN THIS LAB, INDICATE & SURVEY STORAGE AREA ONLY]
WHO IS THE SOURCE OF THIS INFORMATION? _____
DETERMINATION OF EXTERNAL RADIATION LEVELS:
MAKE: Ludlum GM MODEL: 14C SER. NO. 37716
BACKGROUND _____ OR AS INDICATED: _____
DETERMINATION OF REMOVABLE SURFACE CONTAMINATION:
MAKE: Beckman-Coulter MODEL: LS6500 SER. NO. 7071214
NONE FOUND (< 2200 dpm/ 100cm^2) _____ OR AS INDICATED _____

RSO QUARTERLY INSPECTION: (OK = IN COMPLIANCE; NO = NON-COMPLIANCE; NA = NOT APPLICABLE)

_____ ROOM CORRECTLY SIGNED	_____ RADIATION SAFETY MANUAL IN LAB
_____ NOTICE TO EMPLOYEES POSTED	_____ DOSIMETRY WORN
_____ STORAGE AREA(S) LABELED	_____ INVENTORY RECORDS POSTED
_____ WORK AREA(S) PREPARED	_____ LAB RECORDS & SURVEYS UP TO DATE
_____ WASTE AREA(S) LABELED	_____ FOOD USED OR STORED IN LAB

COMMENTS**:**

RSC FORM 004

RADIATION SAFETY COMMITTEE EVALUATION SHEET

APPLICATION FOR RADIOISOTOPE USE AND PROCUREMENT

APPLICANT NAME: _____

RADIOISOTOPE: _____

I have reviewed this application and my opinion is that this application should be:

[ ] APPROVED WITHOUT MODIFICATIONS

[ ] APPROVED WITH THE FOLLOWING MODIFICATION(S):

_____

_____

_____

_____

_____

[ ] NOT APPROVED FOR THE FOLLOWING REASON(S):

_____

_____

_____

_____

_____

REVIEWER NAME (PLEASE PRINT): _____

REVIEWER SIGNATURE: _____

DATE: _____

Please return this completed and signed form to:

Dr. Richard Hann
Radiation Safety Committee Chairman
Department of Biochemistry
Universidad Central del Caribe
PO Box 60-327
Bayamón, PR 00960

RSC FORM 005

RADIATION SAFETY COMMITTEE/RADIATION SAFETY OFFICER
UNIVERSIDAD CENTRAL DEL CARIBE BAYAMON, PUERTO RICO

RADIOACTIVE SHIPMENT RECEIPT REPORT

1. UCC PO# _____ Survey Date: _____ Time: _____

   Radioisotope: _____ Ordered by: _____

2. CONDITION OF PACKAGE:

   _____ Undamaged _____ Punctured _____ Wet _____ Crushed

   _____ Other(describe)_____

3. RADIATION UNITS OF LABLE: _____ Units (mR/hr)

4. MEASURED RADIATION LEVELS:

   a. Package surface: _____ mR/hr

   b. 3 feet/ 1 meter from surface: _____ mR/hr

5. DO PACKING SLIP AND SOURCE CONTAINER LABLE AGREE?

   a. Radionuclide: ____ Yes ____ No Difference: _____

   b. Amount: ____ Yes ____ No Difference: _____

   c. Chemical form: ____ Yes ____ No Difference: _____

6. WIPE RESULTS:

   a. From outside _____ cpm _____ dpm (Eff: _____)

   b. From source container _____ cpm _____ dpm (Eff: _____)

7. SURVEY RESULTS FROM PACKING MATERIAL AND CARTONS: _____ mR/hr

8. DISPOSITION OF PACKAGE AFTER INSPECTION: _____

9. IF NRC OR CARRIER NOTIFICATION IS REQUIRED GIVE DATE, TIME AND NAME OF PERSONS NOTIFIED.

   Name of Surveyor: _____

   Signature: _____ Date: _____

Please complete this form, attach a copy of the invoice and submit to the Chairman of the Radiation Safety Committee. Keep a copy for your records.

RSC FORM 009A

UCC RADIATION SAFETY COMMITTEE

SAFETY INSTRUCTIONS FOR MAINTENANCE PERSONNEL

INTRODUCTION: Radioactive materials are found in a few specific labs & rooms on the UCC campus. These rooms are always labeled on the entrance doors with a standard yellow & purple sign that reads "Caution: Radioactive Material". Any radioactive material within the lab will be inside containers labeled as "Radioactive Material". In general, the radioactive material is of low energy and does not represent a health hazard as long as a few basic guidelines are followed.

INSTRUCTIONS FOR MAINTENANCE IN LABS OR ROOMS LABELED "RADIOACTIVE MATERIAL"

1. You may enter the room unless a specific sign says "Do Not Enter".

2. Do not smoke, eat, drink or apply cosmetics in these rooms.

3. Do not touch or handle containers or equipment that are labeled with "Radioactive Material" labels.

4. The regular trash containers may be emptied the same as in any lab because the regular trash containers will never contain radioactive material.

5. The floor can be swept & mopped as in any lab. Any floor contamination will have been detected and cleaned by lab or radiation safety personnel.

6. If any container labeled "Radioactive Material" is found broken, crushed or leaking, you should notify the lab personnel. If lab personnel are not available or cannot be located, then you should contact Dr. Richard Hann or Mr. David Rhoe. Current contact information is posted in every room where radioactive materials are used or stored.

7. If you are to perform special maintenance in a room labeled "Radioactive Material", you should first find someone who works in the room and explain the work that needs to be done. If department personnel are not available or cannot be located, then you should contact Dr. Richard Hann or Mr. David Rhoe. Current contact information is posted in every room where radioactive materials are used or stored.

8. If there is a question about contamination of an area or of a piece of equipment requiring special maintenance, ask the Radiation Safety Technician to perform a survey to check for contamination. If contamination is detected, the Radiation Safety Technician will supervise decontamination procedures before work can be done. The Radiation Safety Technician can be contacted through the Department of Biochemistry office.

9. Once work is completed, the door should be locked upon leaving the room if there is no one in the room.

Important: Contact Dr. Richard Hann or Mr. David Rhoe at any time if you are in doubt about any procedures for handling anything marked "Radioactive Material". Current contact information is posted in every room where radioactive materials are used or stored.

THESE GUIDELINES MUST BE POSTED ON THE OUTSIDE OF THE ENTRANCE DOOR TO EVERY ROOM OR LAB THAT MAY CONTAIN RADIOACTIVE MATERIAL.

RSC FORM 009B

UCC RADIATION SAFETY COMMITTEE

SAFETY INSTRUCTIONS FOR SECURITY PERSONNEL

INTRODUCTION: Radioactive materials are found in a few specific labs & rooms on the UCC campus. These rooms are always labeled on the entrance doors with a standard yellow & purple sign that reads "Caution: Radioactive Material". Any radioactive material within the lab will be inside containers labeled as "Radioactive Material". In general, the radioactive material is of low energy and does not represent a health hazard as long as a few basic guidelines are followed.

INSTRUCTIONS FOR LABS OR ROOMS LABELED "RADIOACTIVE MATERIAL"

1. You may enter the room unless a specific sign says "Do Not Enter".

2. Do not smoke, eat, drink or apply cosmetics in these rooms.

3. Do not touch or handle containers or equipment that are labeled with "Radioactive Material" labels.

4. If any container labeled "Radioactive Material" is found broken, crushed or leaking, you should notify the lab personnel. If lab personnel are not available or cannot be located, then you should contact Dr. Richard Hann or Mr. David Rhoe. Current contact information is posted in every room where radioactive materials are used or stored.

5. If there is a question about contamination of an area or of a piece of equipment, ask the Radiation Safety Technician to perform a survey to check for contamination. If contamination is detected, the Radiation Safety Technician will supervise decontamination procedures before work can be done. The Radiation Safety Technician can be contacted through the Department of Biochemistry office. If the Radiation Safety Technician is not available or cannot be located, then you should contact Dr. Richard Hann or Mr. David Rhoe. Current contact information is posted in every room where radioactive materials are used or stored.

6. The door should be locked upon leaving the room if there is no one in the room.

Important: Contact Dr. Richard Hann or Mr. David Rhoe at any time if you are in doubt about any procedures for handling anything marked "Radioactive Material". Current contact information is posted in every room where radioactive materials are used or stored.

THESE GUIDELINES MUST BE POSTED ON THE OUTSIDE OF THE ENTRANCE DOOR TO EVERY ROOM OR LAB THAT MAY CONTAIN RADIOACTIVE MATERIAL.

RSC FORM 010

RADIOACTIVE WASTE TRANSFER FORM

Name of authorized user _____

User permit number _____

Radioisotope _____ Half-life _____

(DO NOT MIX RADIOISOTOPES!)

Original chemical form of radioisotope _____

Physical state of waste: Liquid _____ Dry Solid _____

Waste container description _____

Date of waste container storage _____

Total radioactivity at storage (mCi or μCi)_____

FILL OUT BOTH PARTS OF THIS FORM. ATTACH ONE HALF SECURELY TO THE CONTAINER. GIVE THE OTHER HALF TO THE RADIATION SAFETY TECHNICIAN. (SEE THE UCC RADIATION SAFETY MANUAL FOR ADDITIONAL INSTRUCTIONS.)

RSC FORM 010

RADIOACTIVE WASTE TRANSFER FORM

Name of authorized user _____

User permit number _____

Radioisotope _____ Half-life _____

(DO NOT MIX RADIOISOTOPES!)

Original chemical form of radioisotope _____

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Total radioactivity at storage (mCi or μCi)_____

FILL OUT BOTH PARTS OF THIS FORM. ATTACH ONE HALF SECURELY TO THE CONTAINER. GIVE THE OTHER HALF TO THE RADIATION SAFETY TECHNICIAN. (SEE THE UCC RADIATION SAFETY MANUAL FOR ADDITIONAL INSTRUCTIONS.)

RSC FORM 011

RADIOISOTOPE SAFETY EDUCATION PROGRAM

UCC RADIATI0N SAFETY COMMITTEE

*****CERTIFICATION*****

THE RADIATION SAFETY COMMITTEE HEREBY CERTIFIES THAT:

_____

PARTICIPATED IN A RADIATION TRAINING SEMINAR ENTITLED:

_____

GIVEN BY MR. DAVID RHOE, RADIATION SAFETY OFFICER

ON: _____

AT UNIVERSIDAD CENTRAL DEL CARIBE, BAYAMON, PUERTO RICO, AS PART OF THE REQUIREMENTS OF THE INSTITUTIONAL NUCLEAR MATERIALS LICENSE AWARDED BY THE UNITED STATES NUCLEAR REGULATORY COMMISSION.

SIGNED

_____

RADIATION SAFETY COMMITTEE CHAIRMAN

RSC FORM 012

RADIOISOTOPE SAFETY INDIVIDUAL TRAINING PROGRAM

UCC RADIATION SAFETY COMMITTEE

The following materials were given to_____ on _____
(Name of employee or student) (Date)
as part of his/her training in the use of radioisotopes. Instructions were to read the material and then come to his/her supervisor with any questions.

1. UCC *RADIATION SAFETY MANUAL* (Maintained in Lab # _____)
   In particular, read the requirement to notify the supervisor and the RSO in the event that a female employee or student becomes pregnant (p. 18, Para e.)

2. The U.S. Nuclear Regulatory Commission *Notice to Employees* (Posted in Lab # _____)

3. UCC *MANUAL ON RADIOISOTOPE BASICS* (Available from the Radiation Safety Committee on request.)

4. Additional material (please describe in detail if any):

_____
Signature of Authorized User or Supervisor

I received and read the above material and I understand it.

_____
Signature of Employee or Student

_____
Date

Note to the Authorized User: Please forward a signed copy of this document to the Chairman of the Radiation Safety Committee and retain the signed original in your files.

Rev: 11-30-01

RSC FORM 013

RADIOISOTOPE ORIGINAL LAB STOCK INVENTORY SHEET

[THIS FORM MUST BE COMPLETED FOR EACH ORIGINAL SOURCE STOCK CONTAINER RECEIVED. ATTACH THE FORM TO THE FRONT OF THE CABINET, REFRIGERATOR OR FREEZER WHERE THE ORIGINAL SOURCE STOCK CONTAINER IS STORED.]

RADIOISOTOPE: _____

CHEMICAL FORM: _____

DATE RECEIVED: _____

ORIGINAL AMOUNT: _____ **mCi**

ON DATE: _____ **(RECORD CALIBRATION DATE ONLY IF ISOTOPE IS SHORT HALF-LIFE)**

USAGE RECORD:

DATE:	**AMOUNT USED (mCi):**	**AMOUNT REMAINING (mCi):**

ONCE ALL OF THE CONTENTS OF A RADIOISOTOPE SOURCE STOCK CONTAINER HAVE BEEN REMOVED FOR USE AND/OR THE CONTAINER HAS BEEN TRANSPORTED TO THE RADIOISOTOPE STORAGE ROOM BY THE RADIATION SAFETY TECHNICIAN, THE CORRESPONDING RSC FORM 013 MUST BE REMOVED FROM THE COMPARTMENT.

RSC FORM 014

UCC RADIATION SAFETY COMMITTEE

INCIDENT REPORT

Date: _____

Location: _____

Authorized User: _____

Narrative:

_____ _____

Signed Date

cc: RSO
Authorized User
RSC File