

NEW YORK STATE DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL RADIATION PROTECTION
RADIATION GUIDE 10.2, REV. 1
GUIDE FOR THE PREPARATION OF APPLICATIONS FOR
ACADEMIC PROGRAMS OF LIMITED SCOPE

PURPOSE OF GUIDE

This guide describes the type of information that should be submitted in applications for specific licenses of limited scope for the possession and use of radioactive material by academic institutions. It does not apply to applications for specific licenses of broad scope, licenses for source or special nuclear materials, or licenses for kilocurie irradiation sources. It includes the general principles that will be considered in evaluating an applicant's proposed radiation safety measures. This type of license is provided for under Section 16.100, New York State Sanitary Code (10 NYCRR 16).

The New York State Department of Health will normally issue a single license to cover the academic institution's entire radioisotope program. Separate licenses are not normally issued to different departments of an academic institution, nor are they issued to individuals associated with the institution.

The applicant should carefully study the regulations and this guide, and should submit all information requested. The Department will request additional information when necessary to provide reasonable assurance that the applicant has established an adequate radiation safety program. Such requests will delay final action on the application.

Three general principles that will be considered in evaluating proposed radiation safety measures are recognition by the institution of:

- 1) The management's* responsibility for the safety of employees and the public;
- 2) Its responsibility for maintaining off-site releases as low as is reasonably achievable (ALARA) and avoiding significant increases in environmental radioactivity; and
- 3) Its responsibility for minimizing exposures to employees, students, and visitors.

* Management is defined as those persons authorized by the charter of the academic institution to make its policies and direct its activities.

PURPOSE OF APPENDICES TO GUIDE

The regulations require that the licensee develop and implement procedures that will ensure compliance with the regulations. Appendices A through L to this guide describe model radiation safety procedures. Each applicant should carefully read the applicable regulations and model procedures and adopt them as written whenever possible. If you are unable to adopt a particular procedure as written submit a copy of the procedure in the guide with your changes indicated in red ink. You must keep copies of these procedures with the license document when it is issued since they will be made a part of the license at that time.

APPLICABLE REGULATIONS

All regulations pertaining to this type of license are found in Title 10, Chapter 1, Part 16, of the New York Code of Rules and Regulations (10 NYCRR 16). Chapter 1 is entitled the "State Sanitary Code" and Part 16 is entitled, "Ionizing Radiation." The statutory authority for the rules and regulations is found in the New York State Public Health Law, Section 225.

AS LOW AS IS REASONABLY ACHIEVABLE (ALARA)

Item (a) of 10 NYCRR 16.5 requires that persons who operate or permit the operation of radiation installations shall make every effort to maintain radiation exposures and releases of radioactive material as far below the limits of Part 16 as is reasonably achievable. License applicants should give consideration to the ALARA philosophy in the development of plans for work with radioactive materials.

TYPES OF RADIOACTIVE MATERIALS LICENSES

Specific Licenses - Limited Scope

Specific licenses of limited scope are issued to institutions which use radioactive materials in moderate or small quantities. Such licenses specify the radioisotopes, the use of the material, and the person who is the primary user of the materials.

Specific Licenses - Broad Scope

If the institution has an extensive radioisotope program with a need for a great variety of radionuclides for many uses, it may wish to apply for a specific license of broad scope. Such a license authorizes multiple quantities of many types of radioactive materials for unspecified uses. Such programs operate under the supervision of a radiation safety committee. Individual users are not named on the license. All uses and users are approved by the institution's radiation safety committee. This type of license is not appropriate for most institutions using radioactive materials. Further information on this type of license can be obtained from the New York State Department of Health.

FILING AN APPLICATION

A license application for specific licenses for academic use should be submitted on Form GEN 307B, "Application for Radioactive Materials License" and appropriate attachments. The applicant should complete all items on the application form in sufficient detail for the review staff to determine that the applicant's equipment, facilities, personnel training and qualifications, and radiation safety program are adequate to protect health and minimize danger to life and property.

For items 5 through 25, submit the required information on supplementary pages. You should identify and key each separate sheet or document submitted with the application to the item number on the application to which it refers. All typed pages, sketches, and, if possible, drawings should be on 8-1/2 x 11 inch paper to facilitate handling and review. If larger drawings are necessary, fold them to 8-1/2 x 11 inches.

One copy of the application, with all attachments, should be retained by the applicant, since the license will require as a condition that the licensee follow the statements and representations set forth in the application and any supplement to it. The original and one copy should be mailed to the Bureau of Environmental Radiation Protection, New York State Department of Health, 2 University Place, Room 325, Albany, New York 12203.

CONTENTS OF AN APPLICATION

The following paragraphs explain the information requested on Form GEN 307B.

- Item 1a Enter the name and corporate address of the academic institution and the telephone number of administration.
- Item 1b List all addresses and locations where radioactive material will be used or stored if other than that in Item 1a, e.g., university-owned farm, second campus, research station. A post office box number should not be stated as the address for a place of use. These addresses and locations will become part of the license conditions, if the license application is approved, and the addresses or locations at which radioactive materials or radioactive wastes are located or stored may not be changed without obtaining a license amendment.
- Item 2 Enter the name and telephone number (including area code) of the individual who knows your proposed radioactive materials program and can answer questions about the application. This should be a staff member and not a consultant.
- Item 3 Indicate whether the application is for a new license, an amendment to an existing license, or a renewal of an existing license.
- Item 4 State the name and title of the person designated by, and responsible to, the institution's management for the coordination of the institution's radiation safety program. If the radiation safety officer is assisted by a consultant or part-time

Item 4, cont.

employee, state the consultant's name and describe his/her duties, responsibilities, and the amount of time to be devoted to the radiation safety program.

Item 5 List all individuals who will use or directly supervise the use of radioactive material. Give the title or position of each person.

Item 6a List each radionuclide to be used, and specify the particular nuclides to be licensed for use by each individual named in item 5.

Item 6b List the chemical and physical form and maximum quantity (in millicuries) of each radionuclide to be possessed at any one time. State separate possession limits for each chemical and physical form requested, e.g., iodine-131 as iodide and labeled proteins. List the manufacturer, model number, and quantity for all sealed sources. The possession limit for each radionuclide should include material held as radioactive wastes.

Item 7 Describe the intended use for each radionuclide and form listed in items 6a and 6b. Any use of radioactive material in animals should be indicated. (Human use applications should be filed separately.)

Item 8a Radiation Safety Officer - Section 16.5, New York State Sanitary Code (10 NYCRR 16) requires that a Radiation Safety Officer be appointed. The Radiation Safety Officer is responsible for the day-to-day operation of the radiation safety program within the institution. A description of his/her training and experience in radiation protection and the use of radioactive material should be provided, along with a curriculum vitae.

The Radiation Safety Officer should have, as minimum qualifications, a bachelors degree in science, formal training in radiological health (e.g., college level or its equivalent) and should have specific experience in radiation protection with the types, quantities and uses of the radioactive material requested in the application. Submit an outline of the candidate's training and experience in radiological health and the use of radioactive materials. Include on-the-job and formal training, where it was obtained, dates and durations and the topics covered. Also include experience with the use of materials; the radionuclides used, the quantities handled and the type of process. Experience in the specific functions the Radiation Safety Officer will perform (e.g. wipe-testing, leak-testing, thyroid bioassay, waste handling, meter calibration) should be individually listed.

A statement must be included delineating the Radiation Safety Officer's duties, responsibilities and authority for carrying out the radiation safety program. The extent of the Radiation Safety Officer's responsibility and authority will depend on the scope of the proposed program; however, the following should be considered for inclusion in your statement:

Item 8a, cont.

- (1) General surveillance over all activities involving radioactive material, including routine monitoring and special surveys of all areas in which radioactive material is used.
- (2) Determining compliance with rules and regulations, license conditions, and the conditions of project approval specified by the radiation safety committee.
- (3) Monitoring and maintaining absolute and other special filter systems associated with the use, storage or disposal of radioactive material.
- (4) Furnishing consulting services on all aspects of radiation safety to personnel at all levels of responsibility.
- (5) Receiving, delivering and opening all shipments of radioactive material arriving at the institution and receiving, packaging and shipping all radioactive material leaving the institution.
- (6) Distributing and processing personnel monitoring equipment, determining the need for bioassays, keeping personnel exposure and bioassay records, and notifying individuals and their supervisors of exposures approaching maximum permissible amounts and recommending appropriate remedial action.
- (7) Conducting training programs and otherwise instructing personnel in the proper procedures for the use of radioactive material prior to use, at periodic intervals (refresher training), and as required by changes in procedures, equipment, regulations, etc.
- (8) Supervising and coordinating the radioactive waste disposal program, including keeping waste storage and disposal records, and monitoring effluents.
- (9) Storing all radioactive materials not in current use, including wastes.
- (10) Performing leak tests on all sealed sources.
- (11) Maintaining an inventory of all radioisotopes at the institution and limiting the quantity of radionuclides at the institution to the amounts authorized by the license. The inventory should include the name of the person responsible for each quantity of radioisotope, where it will be used or stored, and the date the quantity was delivered to that person. Items are removed from the inventory by showing how and when the radioisotope was disposed of.

Item 8a, cont.

- (12) The authority to terminate immediately a project that is found to be a threat to health or property.
- (13) Maintaining other records not specifically designated above (e.g., receipt, transfer and survey records as required by Section 16.14 of 10 NYCRR 16).

Item 8b

Radiation Safety Committee - The New York State Department of Health requires that the applicant for an institutional license, which names more than one person as individual users, appoint a radiation safety committee. The committee should include the radiation safety officer, a person representing management, an authorized user from each department using radioactive materials, and other persons whose fields of expertise complement the functions of the committee (e.g., persons knowledgeable in radiobiology, radiochemistry, radiation physics). One of the main functions of the radiation safety committee is to administer the institution's radioactive materials program. The committee should have the authority and responsibility for approval and disapproval of all proposals for radionuclide use prior to purchase of the materials.

The following information concerning the committee must be submitted:

- (1) A list of members of the committee. The committee members who have an essential radiation safety function, such as the chairman and the radiation safety officer, should be listed by name. Members with a less important safety function, e.g., student representative, administration representative, etc., may be listed by title and minimum qualifications.
- (2) A description of each member's training and experience with radiation and radioactive material.

Appendix A to this Guide contains a model procedure. Submit a statement that you will follow the model procedure, or submit a copy of the Appendix with your changes indicated in red ink.

Item 9a

Training and Experience - Submit the curriculum vitae and a description of experience with radioactive materials for each individual listed in item 5. Include the radionuclides used, the quantities handled and the type of process.

Item 9b

Personnel Training Program - You must provide a training program for individuals who work with or in the vicinity of radioactive material. Appendix B to this Guide contains a model program. Submit a statement that you will adopt the model program, or submit a copy of the Appendix with your changes indicated in red ink.

Item 10a

Instruments - Submit a list of all radiation detection instrumentation available. Appendix C to this guide contains a form that may be used to describe the instruments. Complete this form and return with application.

- Item 10b (1) Calibration of Instruments - If survey meter calibrations are performed at your facility, then submit your procedures. Appendix D to this Guide contains a model procedure. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.

If your survey meters are sent out for calibration, submit a statement that calibrations will be performed by persons licensed to perform this service by the U.S. Nuclear Regulatory Commission or an Agreement State and that a copy of this license will be kept on file with the calibration certificates.

- (2) Quantitative Measuring Instruments - Instruments that will be used for quantitative measurements to determine compliance with Department regulations (e.g., leak-test measurements, effluent monitoring) should be calibrated at six-month intervals. A description of the procedure for calibration of such instruments should be submitted and should include:

- (a) the manufacturer and model number of the source(s);
- (b) the nuclide and quantity of radioactive material in the source(s);
- (c) the accuracy of the source(s);
- (d) the step-by-step procedures for calibration, including associated radiation procedures; and
- (e) the name(s) and pertinent experience of person(s) who will perform the calibrations.

- Item 11 Facilities and Equipment - Describe the facilities and equipment (e.g., remote handling equipment, storage containers, shielding, fume hoods) to be made available at each location where radioactive material will be used. Include a description of the area(s) assigned for the receipt, storage (including waste), preparation and measurement of radioactive materials. A diagram should be submitted showing the locations of shielding, the proximity of radiation sources to unrestricted areas, and other items related to radiation safety.

When applicable to facilities where radioactive materials may become airborne, the diagram should also include schematic descriptions of the ventilation system, with pertinent airflow rates, pressures, filtration equipment, and monitoring instruments. Diagrams should be drawn to a specified scale, or dimensions should be indicated. The locations of the facilities and equipment should be specified with respect to the addresses and locations given in item 1b.

- Item 12 Procedures for Ordering and Receiving Radioactive Material - Appendix E to this Guide contains a model procedure. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.
- Item 13 Procedures for Package Opening - Appendix F to this Guide contains a model procedure. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.
- Item 14 General Rules for the Safe Use of Radioactive Material - Describe your rules for the safe use of radioactive material. Appendix G to this Guide contains a model procedure. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.
- Item 15 Spill Procedures - Appendix H to this Guide contains a model procedure. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.
- Item 16 Area Survey Procedures - Appendix I to this Guide contains a model procedure. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.
- Item 17 Waste Disposal - Appendix J to this Guide contains general guidance and model procedures for waste disposal. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.
- Item 18 Not Applicable
- Item 19 Not Applicable
- Item 20 Not Applicable
- Item 21 Procedures and Precautions for Use of Radioactive Materials in Animals - Submit the procedures to be followed if radioisotopes will be used in animals, including: (a) a description of the animal housing facilities; (b) a copy of instructions provided to animal caretakers for the handling of animals, animal waste, and animal carcasses; (c) instructions for cleaning and decontaminating animal cages; and (d) procedures for ensuring that animal rooms will be locked or otherwise secured unless attended by authorized users of radioactive material. Instructions to animal caretakers should reflect the types of studies done at the institution.

Item 22 Other Procedures and Precautions for Use of Radioactive Materials Specified in item 6b - Clearly state any additional radiation safety procedures to be followed while individuals are using the materials listed in item 6b, e.g., air sampling,* other special surveys, bioassays, leak-testing sealed sources, including radiation safety procedures.

Bioassays may be required when individuals work with millicurie quantities of hydrogen-3, iodine-125, or iodine-131 (depending on the chemical and physical form, the procedures followed, and the equipment used). Guidance on bioassay programs for iodine-131 and iodine-125 including the levels and types of handling for which bioassays are indicated, are provided in U.S. Nuclear Regulatory Commission Guide 8.20, "Applications of Bioassays for I-125 and I-131" and Guide 8.32, "Criteria for Establishing a Tritium Bioassay Program." Copies of these guides are attached. If you propose to use bioassays less conservatively than is recommended in the guides discussed above, you should state your rationale. Submit your bioassay policy.

Leak-Testing of Sealed Sources - Describe your procedure for leak-testing sealed sources as required by Section 16.10 (a) (4), New York State Sanitary Code, (10 NYCRR 16). Appendix K to this Guide contains a model procedure. Submit a statement that you will adopt this particular Appendix, or submit a copy of the model procedure with your changes indicated in red ink. If an outside service analyzes leak-test samples submit a statement that the service will be performed by persons licensed to do so by the U.S. Nuclear Regulatory Commission or an Agreement State and that a copy of this license will be kept on file with the leak-test reports.

Item 23 Personnel Monitoring Program - Appendix L to this Guide contains a model procedure. State that you will follow the model procedure or submit a copy of the Appendix with your changes indicated in red ink.

Item 24 Not Applicable

Item 25 Not Applicable

Item 26 Certificate - The application should be signed by the President, or Chief Executive Officer. Identify the title of the office held by the individual who signs the application.

*NOTE: Releases to the environment are regulated by the New York State Department of Environmental Conservation in 6 NYCRR Part 380. For further information contact: New York State Department of Environmental Conservation, Division of Hazardous Substance Regulation, Bureau of Radiation, 50 Wolf Road, Albany, New York 12233-0001

AMENDMENTS TO LICENSES

Licensees are required to conduct their programs in accordance with statements, representations and procedures contained in the license application and supporting documents. The license must therefore be amended if the licensee plans to make any changes in the facilities, equipment (including type of monitoring and survey instruments), procedures, authorized users or radiation safety officer, or radioactive material to be used.

Applications for license amendments may be filed either on the application form or in letter form. The application should identify the license by number and should clearly describe the exact nature of the changes, additions, or deletions. References to previously submitted information and documents should be clear and specific, and should identify the pertinent information by date, page and paragraph.

RENEWAL OF A LICENSE

An application for renewal of a license should be filed at least 30 days prior to the expiration date. This will ensure that the license does not expire until action on the application has been taken by the New York State Department of Health, as provided for in Section 16.105, New York State Sanitary Code (10 NYCRR 16).

Renewal applications should be filed on Form GEN 307B, appropriately supplemented, should contain complete and up-to-date information about the applicant's current program, should meet all licensing and regulatory requirements in effect at the time of renewal, and should be signed and dated by a representative of the licensee's administrative management. Renewal applications should also include the users' training and experience or make a clear and specific reference to previous applications on which individual users received approval.

In order to facilitate the review process, the application for renewal should be submitted without reference to previously submitted documents and information (except for previously approved users).

Prepare an original and two copies of the application. Retain one copy of the application, with all attachments, because the license will require, as a condition that the institution follow the statements and representations set forth in the application and any supplement to it. Mail the original and one copy to the New York State Department of Health, Bureau of Environmental Radiation Protection, 2 University Place, Room 325, Albany, New York 12203.

LICENSE TERMINATION REQUESTS

Submit a signed Form GEN 322 indicating the disposition of the radioactive material. Form GEN 322 is available from the New York State Department of Health, Bureau of Environmental Radiation Protection, Empire State Plaza, 2 University Place, Room 325, Albany, New York 12203.

Submit a survey showing that all previously occupied areas are free of contamination and all sources of radioactive material have been removed in accordance with Section 16.10, New York State Sanitary Code (10 NYCRR 16). A decontamination guide is available from the New York State Department of Health, Bureau of Environmental Radiation Protection, 2 University Place, Room 325, Albany, New York 12203.

Such submissions must be made at least 30 days prior to relinquishing possession or control of premises where radioactive material is or has been stored or used.

LIST OF APPENDICES

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D	Model Procedure for Calibrating Survey Instruments
E	Model Procedure for Ordering and Receiving Radioactive Material
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APPENDIX A

RADIATION SAFETY COMMITTEE

MODEL PROCEDURE FOR ESTABLISHING RADIATION SAFETY COMMITTEE

Responsibility

The Committee is responsible for:

1. Ensuring that all individuals who work with or in the vicinity of radioactive material have sufficient training and experience to enable them to perform their duties safely and in accordance with Department regulations and the conditions of this license.
2. Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with Department regulations and the conditions of the license.

Duties

The Committee shall:

1. Be familiar with all pertinent New York State Health Department regulations, the terms of the license, and information submitted in support of the request for the license and its amendments.
2. Review the training and experience of all individuals who use radioactive material and determine that their qualifications are sufficient to enable them to perform their duties safely and in accordance with New York State Health Department regulations and the conditions of the license.
3. Be responsible for monitoring the institution's program to maintain individual and collective doses as low as reasonably achievable.
4. Review semi-annually, with the assistance of the Radiation Safety Officer, occupational radiation exposure records of all personnel working with radioactive materials.
5. Establish a table of investigational levels for occupational radiation exposure, which when exceeded, will initiate an investigation and consideration of action by the Radiation Safety Officer.
6. Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material (e.g., security and housekeeping personnel) are properly instructed as required by Section 16.13, New York State Sanitary Code (10 NYCRR 16).

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7. Review and approve all requests for use of radioactive material within the institution.
8. Prescribe special conditions that will be required during a proposed use of radioactive material such as requirements for bioassays, physical examinations of users, and special monitoring procedures.
9. Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with New York State Health Department regulations and the conditions of the license. The review shall include an examination of all records, reports from the Radiation Safety Officer, results of New York State Health Department inspection, written safety procedures, and the adequacy of the institution's management control system.
10. Recommend remedial action to correct any deficiencies identified in the radiation safety program.
11. Maintain written records of all Committee meetings, actions, recommendations, and decisions.
12. Ensure that the radioactive materials license is amended, when necessary, prior to any changes in facilities, equipment, policies, procedures, radioactive material, possession limits, and personnel, as specified in the license.

Meetings

1. The Radiation Safety Committee shall meet as often as necessary to conduct its business, but not less than once in each calendar quarter.
2. A quorum shall consist of at least one-half of the Committee's membership, including the Radiation Safety Officer and the management representative.

APPENDIX B

MODEL PERSONNEL TRAINING PROGRAM

It may not be assumed that safety instruction has been adequately covered by prior training at other institutions, even experienced professionals will need instruction in your institution's procedures and the conditions of your license. Ancillary personnel (e.g., clerical, housekeeping, security) whose duties may require them to work in the vicinity of radioactive material (whether escorted or not) need to be informed about radiation hazards and appropriate precautions. A training program that provides necessary instruction should be written and implemented.

Model Program

Personnel will be instructed:

1. Before assuming duties with, or in the vicinity of, radioactive materials.
2. During annual refresher training.
3. Whenever there is a significant change in duties, regulations, or the terms of the license.

Instruction for individuals in attendance will include the following subjects:

1. Applicable regulations and license conditions.
2. Areas where radioactive material is used or stored.
3. Potential hazards associated with radioactive material in each area where the employees will work.
4. Appropriate radiation safety procedures.
5. Licensee's in-house work rules.
6. Each individual's obligation to report unsafe conditions to the Radiation Safety Officer.
7. Appropriate response to emergencies or unsafe conditions.
8. Worker's right to be informed of occupational radiation exposure and bioassay results.
9. Locations where the licensee has posted or made available notices, copies of pertinent regulations, and copies of pertinent licenses and license conditions (including applications and applicable correspondence), as required by Section 16.13, New York State Sanitary Code (10 NYCRR 16).

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Records that Document Training:

Records of initial and refresher training will be maintained for five years and will include:

1. the name of the individual who conducted the training;
2. the names of the individuals who received the training;
3. the dates and duration of the training session; and
4. a list of the topics covered.

APPENDIX C

INSTRUMENTATION

1. Survey meters

a. Manufacturer's name _____

Manufacturer's model number _____

Number of instruments available _____

Minimum range _____ mR/hr to _____ mR/hr

Maximum range _____ mR/hr to _____ mR/hr

b. Manufacturer's name _____

Manufacturer's model number _____

Number of instruments available _____

Minimum range _____ mR/hr to _____ mR/hr

Maximum range _____ mR/hr to _____ mR/hr

2. Other instruments used for quantitative measurement procedures (e.g., liquid scintillation counter, well counter, velometer)

Type of Instrument

Manufacturer's Name

Model No.

APPENDIX D

MODEL PROCEDURE FOR CALIBRATING SURVEY INSTRUMENTS

Radiation survey meters should be calibrated with a radioactive source. Electronic calibrations are not acceptable. Survey meters must be calibrated at least annually and after servicing. (Battery changes are not considered "servicing.")

Model Procedure

1. The source must be approximately a point source.
2. Either the apparent source activity or the exposure rate at a given distance must be traceable by documented measurements to a standard certified within 5 percent accuracy by the National Bureau of Standards.
3. A source that has the same photon energy as the environment in which the calibrated device will be employed should be used for the calibration.
4. The source should be of sufficient strength to give an exposure rate of about 30 mR/hr at 100 cm. Minimum activities of typical sources are 85 millicuries of cesium-137, 21 millicuries of cobalt-60, and 34 millicuries of radium-226.
5. The inverse square law and the radioactive decay law must be used to correct for change in exposure rate due to changes in distance or source decay.
6. A record must be made of each survey meter calibration.
7. A single point on a survey meter scale may be considered satisfactorily calibrated if the indicated exposure rate differs from the calculated exposure rate by less than 10 percent.
8. The following three kinds of scales are frequently used on survey meters:
 - a. Meter on which the user selects a linear scale must be calibrated at no less than two points on each scale. The points should be at approximately $1/3$ and $2/3$ of full scale.
 - b. Meters that have a multi-decade logarithmic scale must be calibrated at no less than one point on each decade and no less than two points on one of the decades. Those points should be at approximately $1/3$ and $2/3$ of scale.
 - c. Meters that have an automatically ranging digital display device for indicating rates must be calibrated at no less than one point on each decade and at no less than two points on one of the decades. Those points should be approximately $1/3$ and $2/3$ of the decade.

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9. Readings above 1,000 mR/hr need not be calibrated. However, such scales should be checked for operation and approximately correct response.
10. At the time of calibration, the apparent exposure rate from a built-in or owner-supplied check source must be determined and recorded.
11. The report of a survey meter calibration should indicate the procedure used and the data obtained. The description of the calibration will include:
 - a. The owner or user of the equipment.
 - b. A description of the instrument that includes manufacturer, model number, serial number, and type of detector.
 - c. A description of the calibration source, including exposure rate at a specified distance on a specified date.
 - d. For each calibration point, the calculated exposure rate, the indicated exposure rate, the deduced correction factor (the calculated exposure rate divided by the indicated exposure rate), and the scale selected on the instrument.
 - e. The reading indicated with the instrument in the "battery check" mode (if available on the instrument).
 - f. The angle between the radiation flux field and detector (for external cylindrical GM or ionization-type detectors, this will usually be "parallel" or "perpendicular" indicating photons traveling either parallel with or perpendicular to the central axis of the detector. For instruments with internal detectors, this should be the angle between the flux field and a specified surface of the instrument.
 - g. For detectors with removable shielding, an indication of whether the shielding was in place or removed during the calibration procedure.
 - h. The apparent exposure rate from the check source.
 - i. The name of the person who performed the calibration and the date on which the calibration was performed.
12. The following information will be attached to the instrument as a calibration sticker or tag:
 - a. The source that was used to calibrate the instrument.
 - b. The proper deflection in the battery check mode (unless this is clearly indicated on the instrument).

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- c. For each scale or decade, one of the following as appropriate:
 - 1) the average correction factor;
 - 2) a graph or graphs from which the correction factor for each scale or decade may be deduced; or
 - 3) an indication that the scale was checked for function but not calibrated, or an indication that the scale was inoperative.
- d. The angle between the radiation flux and the detector during the calibration.
- e. The apparent exposure rate from the check source.

NOTE: One-word reminders or symbols that are explained on the Survey Meter Calibration report may be used on the calibration sticker.

On the following page is a form you may want to use.

APPENDIX E

MODEL PROCEDURE FOR ORDERING AND ACCEPTING DELIVERY OF RADIOACTIVE MATERIAL

Model Procedure

1. The Radiation Safety Officer will place all orders for radioactive materials and will ensure that the requested materials and quantities are authorized by the license and that possession limits are not exceeded.

The standard purchase order, or purchase request, used at this institution will have a box that must be checked indicating that the requested item is, or is not, radioactive material. The purchasing agent will not process any order where radioactive material is indicated unless it is countersigned by the Radiation Safety Officer.

2. A system for ordering and receiving radioactive materials will be established and maintained. The system will consist minimally of the following:
 - a. Written records will be used that identify the isotope, compound, activity levels, and supplier.
 - b. The written records will be referenced when opening or storing radioactive shipments.
 - c. It is essential that written records be maintained for all ordering and receipt procedures.
3. During normal working hours, carriers will be instructed to deliver radioactive materials directly to _____.*
4. During off-duty hours security personnel or other designated individuals will accept delivery of radioactive packages in accordance with the procedures outlined in the sample memorandum.

*The appropriate information for your facility should be supplied in this space.

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Sample Memorandum*

MEMORANDUM TO: Security Personnel
FROM: John Jones, Administrator
SUBJECT: Receipt of Packages Containing Radioactive Material

Any packages containing radioactive material that arrive between 4:30 PM and 7:00 AM, or on Sundays, shall be signed for by the Security Guard on duty and taken immediately to the Radiation Safety Office. Unlock the door, place the package on top of the counter immediately to the right of the door, and re-lock the door.

If the package is wet or appears to be damaged, immediately contact the Radiation Safety Officer. Ask the carrier to remain at the institution until it can be determined that neither he, nor the delivery vehicle, are contaminated.

RADIATION SAFETY OFFICER _____

OFFICE TELEPHONE _____ HOME TELEPHONE _____

*Submit a copy of your own institution's memorandum.

APPENDIX F

MODEL PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL

Model Procedure

1. Special requirements will be followed for packages containing quantities of radioactive material in excess of the A quantities specified in 49 CFR 173.435. They will be monitored for surface contamination and external radiation levels within 3 hours after receipt if received during working hours or within 18 hours if received after working hours, in accordance with the requirements of Section 16.16 (a) and (e), New York State Sanitary Code (10 NYCRR 16). The Department will be notified in accordance with the regulations if removable contamination exceeds 0.01 uCi/100 square centimeters (22,000 dpm) or if external radiation levels exceed 200 mR/hr at the package surface or 10 mR/hr at 3 feet (or 1 m).
2. For all packages, the following procedures for opening packages will be carried out:
 - a. Put on gloves to prevent hand contamination.
 - b. Visually inspect package for any sign of damage (i.e., wetness, crushed). If damage is noted, stop procedure and notify Radiation Safety Officer.
 - c. Measure exposure rate at 3 feet (or 1 m) from package surface and record. If it is higher than usual, stop and notify the Radiation Safety Officer.
 - d. Open the package with the following precautionary steps:
 - (1) Open the outer package (following manufacturer's directions, if supplied) and remove packing slip.
 - (2) Open inner package and verify that contents agree with those on packing slip. Compare requisition, packing slip and label on container.
 - (3) Check integrity of final source container (i.e., inspect for breakage of seals or vials, loss of liquid, or discoloration of packaging material).
 - e. If there is any reason to suspect contamination, wipe external surface of final source container and remove wipe to low background area. Assay the wipe and record amount of removable radioactivity (i.e., dpm/100 square centimeters, etc.). Check wipes with a thin-end window GM survey meter, and take precautions against the spread of contamination as necessary.

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Model Procedure Cont.

2. f. Monitor the packing material and packages for contamination before discarding.
 - (1) If contaminated, treat as radioactive waste.
 - (2) If not contaminated, obliterate radiation labels before discarding in regular trash.
3. Maintain records of the results of checking each package, using "Radioactive Shipment Receipt Record" (see next page), or a form containing the same information.

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Radioactive Shipment Receipt Record

1. P.O. No. _____ Survey Date _____ Time _____
Surveyor _____
2. Condition of the Package:
____ OK
____ Other (explain) _____
3. Radiation Units of Label: _____ units (mR/hr)
4. Measured Radiation Levels:
 - a. Package Surface _____ mR/hr
 - b. 3 feet or 1 meter from Surface _____ mR/hr
5. Do Packing Slip and Vial Contents Agree?
 - a. Radionuclide ____ Yes ____ No Difference _____
 - b. Amount ____ Yes ____ No Difference _____
 - c. Chemical Form ____ Yes ____ No Difference _____
6. Wipe Results From:
 - a. Outer _____ CPM - _____ (efficiency) = _____ DPM
 - b. Final Source Container _____ CPM - _____ (efficiency) = _____ DPM
7. Survey Results of Packing Material and Cartons _____ mR/hr, CPM
8. Disposition of Package After Inspection _____
9. If Department/Carrier Notification Required, Give Time, Date, and Persons Notified

Signature

Date

APPENDIX G

MODEL RULES FOR SAFE USE OF RADIOACTIVE MATERIAL

These rules must be posted as required by Section 16.13 (b), New York State Sanitary Code (10 NYCRR 16).

Model Rules

1. Prior to performing operations with quantities of radioactive material which may produce significant external or internal exposure, attention shall be given by the user to precautionary measures including the use of remote handling devices, hoods, shielding, etc. The Radiation Safety Officer must be consulted before beginning any new use of radioactive material.
2. There shall be no eating, drinking, applying cosmetics or preparation of food in any location where unsealed sources of radioactive materials are used or stored.
3. Smoking is prohibited in locations where unsealed sources of radioactive materials are used or stored.
4. Do not store food, drink, or personal effects with radioactive material.
5. Pipetting of radioactive solutions by mouth is prohibited.
6. Segregate pipetting devices used with radioactive materials from those used with non-radioactive solutions.
7. Lab coats and disposable gloves shall be worn during operations involving the handling of unsealed sources of radioactive material. The lab coat and gloves should be removed before leaving the laboratory. Care must be taken such that other items (e.g., pens, pencils, notebooks, door knobs, telephones, etc.) are not handled with gloves used during work with radioactive materials.
8. Work which may result in contamination of work surfaces shall be done over plastic-backed absorbent paper. Trays made of impervious materials (i.e., stainless steel, porcelain-coated, etc.) and lined with absorbent paper provide excellent work arrangements to help prevent the spread of contamination.
9. Work surfaces and personnel should be monitored after working with radioactive materials.
10. Where there has been a spill of radioactive material (see posted Spill Procedures) which may have produced contamination of the person or clothing, both the person and the clothing shall be monitored. Personnel contamination shall be removed as soon as possible. Where

contamination above action levels is noted during a laboratory survey decontamination must be immediately initiated by the user.

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11. After working with unsealed sources of radioactive material, hands should be monitored and washed before leaving the laboratory.
12. Objects and equipment that may have been contaminated with radioactive material shall be surveyed and demonstrated to be free of contamination prior to their removal from a laboratory, or transferred to other laboratories, repair shops, surplus, etc. If found to be contaminated, such items must be decontaminated as soon as practical.
13. If personnel monitoring devices (whole-body or ring badge) have been issued to you for your work with radioactive material, they must be worn at all times when in areas where these materials are used or stored. These devices should be worn as prescribed by the Radiation Safety Officer. Personnel monitoring devices should be stored in a designated low background area when they are not being worn to monitor occupational exposures. They should not be left on your lab coat or shared by another individual.
14. Dispose of radioactive waste only in the manner designated by the Radiation Safety Officer and maintain records as instructed.
15. Store radioactive materials in covered containers plainly identified and labeled with name of compound, radionuclide, date, activity, and radiation level, if applicable.
16. Always transport radioactive material in shielded containers.

APPENDIX H

MODEL SPILL PROCEDURES

These procedures must be posted as required by Section 16.13 (b), New York State Sanitary Code (10 NYCRR 16).

Minor* Spills

1. NOTIFY: Notify persons in the area that a spill has occurred.
2. PREVENT THE SPREAD: Cover the spill with absorbent paper.
3. CLEAN UP: Use disposable gloves and remote handling tongs. Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Also insert into the plastic bag all other contaminated materials such as contaminated gloves.
4. SURVEY: With a low-range thin-window GM survey meter, check the area around the spill, hands, and clothing for contamination.
5. REPORT: Report incident to the Radiation Safety Officer.

Major* Spills

1. CLEAR THE AREA: Notify all persons not involved in the spill to vacate the room.
2. PREVENT THE SPREAD: Cover the spill with absorbent pads, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.
3. SHIELD THE SOURCE: If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.
4. CLOSE THE ROOM: Leave the room and lock the door(s) to prevent entry.
5. CALL FOR HELP: Notify the Radiation Safety Officer immediately.
6. PERSONNEL DECONTAMINATION: Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

***Define Minor and Major as they apply to your facility**

7. The Radiation Safety Officer will supervise the clean-up of the spill and will complete a report.

RADIATION SAFETY OFFICER: _____ **

OFFICE PHONE: _____ HOME PHONE: _____

ALTERNATE NAMES AND TELEPHONE NUMBERS DESIGNATED BY THE RADIATION SAFETY OFFICER:

****The appropriate information for your facility should be supplied in these blanks when posting these procedures or submitting them with the application.**

APPENDIX I

MODEL PROCEDURE FOR AREA SURVEYS

Model Procedure

1. Laboratory areas where only small quantities of radioactive material are used (less than 200 uCi) will be surveyed monthly.
2. Waste storage areas and all other laboratory areas will be surveyed weekly.
3. The weekly and monthly surveys will consist of:
 - a. A measurement of radiation levels with a survey meter sensitive enough to detect 0.1 mR/hr.
 - b. A series of wipe tests to measure contamination levels. The method for performing wipe tests will be sensitive enough to detect 1000 dpm per 100 square centimeters for the contaminant involved. Wipes made of "high background" areas will be removed to a low background area for measurement.
4. A permanent record will be kept of all survey results, including negative results. The record will include:
 - a. Location, date and identification of equipment used, including the serial number and pertinent counting efficiencies.
 - b. Name of person conducting the survey.
 - c. Drawing of area surveyed, identifying relevant features such as active storage areas, active waste areas, etc.
 - d. Measured exposure rates, keyed to a location on the drawing (point out rates that require corrective action).
 - e. Detected contamination levels, keyed to locations on drawing.
5. Area will be cleaned if the contamination level exceeds 2000 dpm/100 square centimeters.

APPENDIX J

WASTE DISPOSAL

Note: In view of the recent problems with shallow-land burial sites used by commercial waste disposal firms, New York State Department of Health is encouraging its licensees to reduce the volume of wastes sent to these facilities. Important steps in volume reduction are to segregate radioactive from nonradioactive waste, to hold short-lived radioactive waste for decay in storage, and to release certain materials in the sanitary sewer in accordance with Section 16.8, New York State Sanitary Code (10 NYCRR 16).

General Guidance

1. All radioactivity labels must be defaced or removed from containers and packages prior to disposal in in-house waste. If waste is compacted, all labels that are visible in the compacted mass must be defaced or removed.
2. Remind employees that nonradioactive waste such as leftover reagents, boxes, and packing material should not be mixed with radioactive waste.
3. Occasionally monitor all procedures to ensure that radioactive waste is not created unnecessarily. Review all new procedures to ensure that waste is handled in a manner consistent with established procedures.
4. In all cases, consider the entire impact of various available disposal routes. Consider occupational and public exposure to radiation, other hazards associated with the material and routes of disposal (e.g., toxicity, carcinogenicity, pathogenicity, flammability).
5. In New York State the Department of Environmental Conservation regulates releases to the environment and has enacted regulations on the transport of low-level radioactive waste in New York State (6 NYCRR Part 381). These regulations require that a properly executed manifest and a valid transport permit issued by Department of Environmental Conservation accompany all waste shipments. For further information contact:

New York State Department of Environmental Conservation
Division of Hazardous Substance Regulation
Bureau of Radiation
50 Wolf Road
Albany, New York 12233-0001

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MODEL PROCEDURE FOR DISPOSAL OF LIQUIDS AND GASES

Liquids may be disposed of by release to the sanitary sewer. This does not relieve licensees from complying with other regulations regarding toxic or hazardous properties of these materials.

1. Regulations for disposal in the sanitary sewer appear in 16.8(c), New York State Sanitary Code (10 NYCRR 16). Material must be readily soluble or dispersible in the water. There are daily and monthly limits based on the total sanitary sewerage release of your facility. (Excreta from patients undergoing medical diagnosis or therapy is exempt from all the above limitations) Make a record of the date, radionuclide, estimated activity that was released (in millicuries or microcuries), and of the sink or toilet at which the material was released.
2. Releases to the environment are regulated by the New York State Department of Environmental Conservation in 6NYCRR Part 380. You should be conversant with those regulations and possible permit requirements. For further information contact New York State Department of Environmental Conservation at the address given above.
3. Liquid scintillation-counting media containing 0.05 microcurie per gram of H-3 or C-14 may be disposed of without regard to its radioactivity. Make a record of the date, radionuclide, estimated activity (in millicuries or microcuries), calculated concentration in microcuries per gram, and how the material was disposed of.

MODEL PROCEDURE FOR DISPOSAL BY DECAY-IN-STORAGE (DIS)

Short-lived material (physical half-life less than 65 days) may be disposed of by DIS. If you use this procedure, keep material separated according to half-life.

1. Consider using separate containers for different types of waste, e.g., capped needles and syringes in one container, other injection paraphernalia such as swabs and gauze in another, and unused dosages in a third container. Smaller departments may find it easier to use just one container for all DIS waste. Because the waste will be surveyed with all shielding removed, the containers in which waste will be disposed of must not provide any radiation shielding for the material.
2. When the container is full, seal it with string or tape and attach an identification tag that includes the date sealed, the longest-lived radioisotope in the container, and the initials of the person sealing the container. The container may then be transferred to the DIS area.
3. Decay the material for at least 10 half-lives.

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4. Prior to disposal as in-house waste, monitor each container as follows:
 - a. Check your radiation detection survey meter for proper operation;
 - b. Plan to monitor in a low-level (less than 0.05 millirem per hour) area;
 - c. Remove any shielding from around the container;
 - d. Monitor all surfaces of each individual container;
 - e. Discard as in-house waste only those containers that cannot be distinguished from background. Record the date on which the container was sealed, the disposal date, and type of material (e.g., paraphernalia, unused dosages). Check to be sure no radiation labels are visible.
 - f. Containers that can be distinguished from background radiation levels must be returned to the storage area for further decay or transferred for burial.
5. If possible, Mo-99/Tc-99m generators should be held 60 days before being dismantled because of the occasional presence of a long-lived contaminant. When dismantling generators, keep a radiation detection survey meter (preferably with a speaker) at the work area. Dismantle the oldest generator first, then work forward chronologically. Hold each individual column in contact with the radiation detection survey meter in a low-background (less than 0.05 mR/hr) area. Log the generator date and disposal date for your waste disposal records. Remove or deface the radiation labels on the generator shield.

MODEL PROCEDURE FOR TRANSFER FOR BURIAL

Except for material suitable for DIS and some animal carcasses, solids must be transferred to a burial site. Follow the packaging instructions you received from the transfer agent and the burial site operator. For your record of disposal, keep the consignment sheet, or manifest, that the transfer agent gave you. You must also comply with regulations issued by the New York State Department of Environmental Conservation (6NYCRR Part 381) relating to waste manifests and transport permits.

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MODEL PROCEDURE FOR RETURNING GENERATORS TO THE MANUFACTURER

Used Mo-99/Tc-99m generators may be returned to the manufacturer. This permission does not relieve licensees from the requirement to comply with Department of Transportation (DOT) regulations.

1. Retain the records needed to demonstrate that the package qualifies as a DOT specification 7A container (see DOT regulations, paragraph 173.415(a) of 49 CFR Part 173).
2. Assemble the package in accordance with the manufacturer's instructions.
3. Perform the dose rate and removable contamination measurements required by paragraph 173-475(i) of 49 CFR Part 173.
4. Label the package and complete the shipping papers in accordance with the manufacturer's instructions.

*Be sure that waste storage areas were described in Item 11 and that they are surveyed periodically (Item 16).

APPENDIX K

MODEL PROCEDURE FOR LEAK-TESTING SEALED SOURCES

Model Procedure

1. Make a list of all sources to be tested. This should include at least the isotope, the activity on a specified date, and the physical form.
2. If you will be testing high-activity sources, set out a survey meter, preferably with a speaker, so you can monitor your exposure rate.
3. Prepare a separate wipe sample for each source. A cotton swab, injection prep pad, filter paper, or tissue paper is suitable. Number each wipe so you will know for which source it is to be used. Samples should be taken as follows:
 - a. For small sealed sources, it is easiest to wipe the entire accessible surface area. Pay particular attention to seams and joints. However, do not wipe the port of beta applicators.
 - b. For larger sealed sources and devices (survey meter calibrator, irradiators), take the wipe near the radiation port and on the activating mechanism.
 - c. If you are testing radium sources, they should also be checked for radon leakage. This can be done by submerging the source in a vial of fine-grained charcoal or cotton for a day. Then remove the source and analyze the adsorbent sample as described below. A survey should be done to be sure the sources are adequately shielded during the leak-test period.
4. The samples will be analyzed as follows:
 - a. Select a suitable detector that is sufficiently sensitive to detect 0.005 microcuries. For beta sources, a proportional flow counter, liquid scintillation counter, or thin-end-window GM survey meter may be appropriate. For gamma sources, a crystal with a ratemeter or scaler or a GM survey meter may be appropriate.
 - b. Assay a check source that has the same isotope as the sealed source and whose activity is certified by the supplier. If one is not available, it will be necessary to use a certified check source with a different isotope that has a similar spectrum in order to estimate the detection efficiency of the analyzer used to assay the wipe samples.
 - c. Assay the wipe sample. It must be in the same geometry relative to the detector as was the certified check source.
 - d. Calculate the estimated activity in microcuries on the wipe sample.

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- e. Continue same analysis procedure for all wipe samples.
- f. If the wipe sample activity is 0.005 microcuries or greater, notify the RSO. The source must be withdrawn from use to be repaired or disposed of and the Health Department must be notified.
- g. Record the wipe sample results on the list of sources, and sign and date the list.

APPENDIX L

MODEL PERSONNEL EXTERNAL EXPOSURE MONITORING PROGRAM

Personnel monitoring devices should be provided for individuals who are exposed to sources of whole-body radiation, or who handle millicurie quantities of energetic beta or gamma-emitting radionuclides.

Model Program

1. The Radiation Safety Officer will promptly review all exposure reports to look for workers or groups of workers whose exposure is unexpectedly high or low. This procedure does not apply to backup monitor records (e.g., pocket ionization chambers, when the monitor of record is a film or TLD).
2. All individuals who are occupationally exposed to radiation on a regular basis will be issued a film or TLD whole body monitor that will be processed by a contract service on a monthly basis. This service must be accredited under NVLAP (a voluntary program for determining that a dosimetry service meets ANSI standards).
3. All individuals who handle radioactive material on a regular basis will be issued a film or TLD finger monitor that will be processed by a contract service on a monthly basis.
4. All individuals who are occupationally exposed to radiation on an occasional basis will consult with the Radiation Safety Officer concerning personnel monitoring before using radioactive materials.
5. Other individuals who are exposed to radiation on an occasional basis, such as security personnel who deliver packages, will not normally be issued exposure monitors.

APPENDIX M

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