

ENPROTECH CORPORATION
RADIATION PROTECTION PROGRAM

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ENPROTECH CORPORATION
RADIATION PROTECTION PROGRAM

I. Introduction

A. Purpose

It is the policy of Enprotech Corp. to provide the necessary training, facilities, equipment, and personnel to maintain levels of radiation exposure to its employees and to the general public and environment as low as reasonably achievable (ALARA). Enprotech Corp. is committed to ensuring that radioactive materials are possessed, used, transported, and disposed in accordance with the conditions of its license along with applicable regulations of the U.S. Nuclear Regulatory Commission, the Department of Transportation, the Commonwealth of Massachusetts, and any other applicable federal or state regulations.

Careful observance of laboratory rules and procedures is essential and carelessness or lack of respect for the radionuclides to be handled will not be tolerated. The Enprotech Radiation Protection Officer will be responsible for the safe handling and use of radioactive materials at these facilities and will be Chairman of the Enprotech Radiation Protection Committee.

B. Radiation Protection Officer's Responsibilities

The Radiation Protection Officer (RPO) is responsible for the following:

- (1) The establishment and continuing review of the Enprotech Radiation Protection Program.
- (2) Compliance with radiation protection rules and regulations promulgated by governmental agencies and compliance with the NRC license conditions of approval.
- (3) Serving as Chairman of the Enprotech Radiation Protection Committee.
- (4) Providing new and current employees with proper training and information regarding radiation health and safety.
- (5) Maintaining up-to-date copies of Title 10 and Title 49 of the Code of Federal Regulation.

(6) Reviewing reports of infractions of any rules or regulations and implementing corrective actions.

(7) Maintaining all records as required by the Enprotech Radiation Protection Program.

(8) Supplying reports, if necessary, to the Nuclear Regulatory Commission or to employees as required by 10 CFR 19 and 20.

(9) Supervising any radiation emergencies or special decontamination procedures.

(10) Maintaining a current copy of all NRC and/or Agreement State licenses of persons purchasing radiolabelled compounds from Enprotech.

C. Radiation Protection Committee

The Enprotech Radiation Protection Committee will be comprised of the Radiation Protection Officer, who will act as Chairman, the person responsible for receipt and shipment of radioactive samples, the administrative person responsible for maintaining current licenses of customers, and one or two scientist from the research and development laboratory. The committee will meet four times per year to review matters relevant to the safe handling of radioactive materials at the Enprotech facilities, discuss changes in regulations and how compliance will be affected, make changes in the Enprotech program as necessary to maintain compliance, and discuss any and all matters involving radioactive materials at the Enprotech facilities. Minutes of all committee meetings will be maintained by the Radiation Protection Officer.

II. Radiation Protection Program

A. Registration and Instruction of Radiation Workers

Prior to working with radioactive materials, all radiation workers are:

(1) Given a lecture and hand-out material on the mechanics of radioactivity and radiation protection practices. Our consultants, Bolton & Galanek, Inc., will assist the Radiation Protection Officer in the training of radiation workers (see the attached outline of the subject material to covered). Periodic retraining seminars will be held as needed.

(2) Provided with a copy of the Enprotech Radiation Protection Program as accepted by the Nuclear Regulatory Commission (NRC). Employees are urged to become familiar with the contents of this program.

(3) Instructed that all laboratory rules and safety procedures outlined in this program must be complied with and that failure to do so may result in disciplinary action.

(4) Informed of the relevant portions of NRC regulations in 10 CFR 19 and 20. Copies of these regulations will be maintained by the RPO for review by interested workers.

(5) Required to sign the following statement confirming that the above information has been conveyed to them and they have been afforded an opportunity to ask any questions.

ENPROTECH CORPORATION

Statement of Training in Radiation Protection

" I have been provided with a copy of the Enprotech Corp. Radiation Protection Program as well as any additional material and information necessary to understand the radiation protection practices that are outlined in the program. I have been afforded the opportunity to ask questions concerning radiation safety and the safe use of radioactive material. I am aware of the NRC regulations in 10 CFR 19 & 20 pertaining to radiation safety and I understand my responsibility to comply with applicable regulations and license conditions of approval."

Signature _____
Date _____

(6) Training will also be provided for ancillary personnel (custodians, security, etc.).

B. Control of Radiation Exposures

(1) External and internal exposures to ionizing radiation shall be kept as low as reasonably achievable (ALARA).

(2) Occupational external and internal exposures from radioactive material shall be controlled such that no individual can receive a radiation dose in excess of the values listed in Table 1.

Table 1.
OCCUPATIONAL DOSE VALUES

(a) Maximum permissible exposures for occupational external radiation

	<u>Rems per calendar quarter</u>	<u>Rems per year</u>
Whole body; head and trunk; active blood forming organs; lens of eye; gonads	1.25	5.0
Skin of whole body	7.50	30.0
Hands and forearms; feet and ankles	18.75	75.0

(b) Maximum permissible dose for minors and non-radiation workers:

500mrem per year.

(c) Maximum permissible dose to pregnant women: The Radiation Safety Officer instructs all pregnant women to follow the NRC guidelines established in Regulatory Guide 8.13.

C. Personnel Monitoring of Internal and External Exposures

Internal Dose Assessment:

Urinanalysis:

Persons routinely handling 10 millicuries or greater of unsealed tritium will be required to submit urine specimens to the RPO for tritium analysis. Action levels along with corrective actions taken will be those outlined in NRC Draft Regulatory Guide Task OP 713-4, "Applications of Bioassay for Tritium".

Additional bioassays may be performed on designated individuals at the discretion of the RPO or as might be required in an accident or emergency situation. As is required by 10 CFR 20.401, records of bioassay results for all employees will be maintained.

External Dose Assesment:

(1) Whole body dosimeters:

Radiation workers who handle radioisotopes or are routinely present in the areas where the radioisotopes are stored and used will be required to wear a whole body film badge.

(2) Extremity dosimeters:

Persons who routinely handle millicurie quantities of radiosotopes that can result in hand exposures (i.e. phosphorus-32 users) will be required to wear wrist badges and/or finger ring dosimeters in conjunction with their whole body badges.

Dosimeters will be supplied by R.S. Landauer and will have a monthly exchange frequency. Records of personnel exposures will be maintained by the Radiation Protection Officer.

D. Radiation Surveys of Radioisotope Laboratories

(1) All laboratories in which greater than 100 microcuries of radioactivity is handled on a routine basis will be surveyed weekly. These surveys will consist of radiation dose rate measurements at specified locations accompanied by wipe testing for removable contamination.

(2) All other laboratories will be surveyed on a monthly basis.

(3) Wipe tests will consist of rubbing a 1 inch dry filter disc over an area of approximately 100cm^2 . The wipes will be analysed by liquid scintillation counting or by holding them approximately 1 centimeter from the end of an end window GM detector. Results of the wipe tests will be recorded in disintegrations per minute per 100cm^2 . Any results greater than 200 dpm/ 100cm^2 for all licensed radioisotopes will be investigated, decontaminated, if necessary, and resurveyed.

(5) Daily 'close-down' procedures will be established in all areas in which radioactive materials are stored or used. These procedures will ensure that:

- (a) Radiation sources are properly labeled, stored, and secured.
- (b) Survey meter measurements have established that radiation and radioactive contamination levels are within permissible limits and as low as reasonably achievable.
- (c) The facilities are secured against unauthorized access.
- (d) Workers survey themselves to prevent leaving the facilities with contaminated clothing.

E. Procurement, Receipt, and Monitoring of Radioactive Packages

- (1) The person ordering the radioactive material must forward a purchase order requisition to the radiation protection officer for approval. The radioisotope and amount must appear on the requisition, not just the catalog number.
- (2) The Radiation Protection Officer will sign the requisition after verifying that the material to be ordered is covered by the NRC license and that possession limits for the laboratory are not exceeded.
- (3) Incoming shipments of radioactive material are delivered to the receiving room and then forwarded to the Radiation Protection Officer or her/his designate. The package will then be logged in and surveyed for radiation dose rates and external contamination.
- (4) Check in procedures will include radiation dose rate measurements at the surface of the package and at one meter. If dose rates are greater than 200 mr/hr at the surface or 10 mr/hr at one meter, the package will be isolated and the RPO contacted immediately. The outside surface of the package will be wipe tested to check for removable contamination. If removable contamination is found in excess of the limits set forth in 20.205 (22,000 dpm/100cm²), the package will be immediately isolated and the RPO notified.
- (5) Radioactive shipments will only be received during normal working hours. These are 8:00am to 5:00pm, no weekends.

F. Procedures for Opening Radioactive Material Shipments

- (1) Packages of radioactive material are to be opened only in the designated radioisotope laboratory.
- (2) Wearing protective gloves, open the outer package. Remove the packing slip and inspect it to verify that the shipment is in agreement with what was ordered. If special instructions for opening the radioisotope container are enclosed, these instructions are to be followed.
- (3) Monitor the inner container with a GM survey instrument. Check the inner packing material for contamination.
- (4) Remove the inner container and place behind appropriate shielding, if necessary.
- (5) Open the inner container. Monitor and inspect the primary container for leakage (i.e. loss of volume, discoloration of the absorbing material, etc.). Monitor the plastic container or lead pig for any leakage from the primary container. If the package contains tritium, perform a wipe test of the primary container.

(6) Notify the Radiation Protection Officer if:

- (a) Contamination or leakage is detected.
- (b) If readings in excess of expected values are obtained with the survey meter.
- (c) There is a discrepancy between the material received and that ordered.

(7) Place radioisotopes in storage refrigerator/freezer and log in on inventory records.

G. Storage of Radioactive Material

(1) Radiolabeled compounds to be repackaged for distribution to licensees will be stored in a locked refrigerator/freezer in Lab 1. The refrigerator/freezer will be kept locked whenever the lab is vacant. A complete up-to-date inventory of radionuclides and amounts will be maintained at all times.

(2) Radiolabeled compounds used in quality control and research and development will be properly stored in the laboratory where the materials are used. An up-to-date inventory of these materials will be maintained in the laboratory.

H. Shipments of Radioactive Material

All radiolabeled compounds to be shipped from Emprotech will be packaged in accordance with all applicable NRC and DOT regulations. Packages will be prepared for shipment in a designated area of the Shipping/Receiving room. This area will be routinely monitored.

The shipper will be responsible for the following:

(1) Confirming that Emprotech has a current copy of the recipient's NRC or Agreement State license.

(2) Confirming that the recipient is licensed to possess the material requested.

(3) Packaging the radioactive material according to NRC and DOT requirements.

(4) Performing a wipe test of the inner container for removable contamination and confirming that the results of this test is within NRC and DOT guidelines.

(5) Performing dose rate measurements at the surface and at one meter from each shipment and confirming that these measurements are within NRC and DOT guidelines.

(6) Maintaining a record of all shipments of radioactive materials from the Enprotech facilities.

Records of all shipments will be reviewed by the RPO on a regular basis. The RPO will also audit the packaging and shipment program on a regular basis.

I. Calibration of Radiation Survey Instruments

All radiation survey instruments will be calibrated by our consultants on a six month basis. If instruments are repaired, they will be recalibrated after such work is complete. The following are the procedures used by our consultants, Bolton & Galanek, Inc.:

Radiation survey instruments are calibrated as described in the application for NRC license # 20-13302-01. Calibrations are performed by either Murray M. Bolton or Mitchell S. Galanek. All instruments are checked with an electronic pulser to determine that the instrument is functioning properly. Geiger Mueller (GM) and ionization detectors are calibrated with an N.B.S. certified Radium standard. The source is 46.3 milligrams of ^{226}Ra - N.B.S. No. 25729 - Test No. 1194552. The standard is certified by N.B.S. with an uncertainty value of less than 0.7 %. The source is raised and lowered via remote electrical controls. The instruments are calibrated at 2 points on each scale using a variable distance technique. The 2 points on each scale are separated by 35 to 50 % of full scale. The low energy gamma scintillation detector used for detection of ^{125}I is calibrated with an N.B.S. traceable ^{125}I standard (N.B.S. 4407L-D). The detector efficiency is determined at a fixed distance from the source. Also the detector efficiency for thyroid monitoring is determined with the probe in contact with a thyroid phantom loaded with the ^{125}I standard.

A calibration record with applicable information is attached to each calibrated instrument. Calibration certificates will be maintained by the RPO.

J. Radioactive Waste Disposal

(1) All solids contaminated with radioactive material with a half life of less than 100 days will be put in the waste containers provided in the laboratory. A record of the radioisotope and amount being disposed will be maintained. When these containers are full, the waste will be transferred to storage drums and stored for radioactive decay. No liquids are to be put in the solid waste containers.

(2) All other solids contaminated with radioactive material (half lives greater than 100 days) will be disposed of as low level radioactive waste through a licensed disposal company. These wastes will be put in separate containers from those in (1) above. A record of the radioisotope and amount being disposed will be maintained. When these containers are full, the waste will be transferred to storage drums that become the shipping container for final disposal as low level radioactive waste. This waste stream is disposed of through a licensed waste disposal company.

(3) Liquid radioactive waste will be disposed of via the sanitary sewage system in accordance with 10 CFR 20.303 and the applicable concentrations in Appendix B Table II. Any liquids that cannot meet these requirements will be absorbed and disposed of as low level radioactive waste through a licensed waste disposal company.

(4) Whenever possible, radioactive material will be stored for radioactive decay and subsequent disposal as non-radioactive waste. All such material will be held for a minimum of 10 half lives and will be surveyed completely before disposal. Survey results must be background before any material is disposed of as normal trash.

(5) Liquid scintillation vial waste will be disposed of through a licensed disposal company.

(6) Records of all radioactive waste disposed of will be maintained by the radiation protection officer.

K. Radiation Emergencies

In the event of a spill or accident involving radioactive material, the following procedures should be used:

(1) The area is quarantined immediately.

- (2) If volatile material is involved, activate the hood if necessary and evacuate personnel from the immediate work area.
- (3) Survey persons involved in accident. If clothing is contaminated, remove and place in a plastic bag.
- (4) If skin is contaminated, begin decontamination procedures and continue until levels are as close to background as possible.
- (5) Decontaminate the work area. Continue with decontamination and resurvey procedures until removable contamination and dose rates are within permissible limits.
- (6) Notify the Radiation Protection Officer

Responsibility for any decontamination procedures rests with the Radiation Protection Officer and the laboratory supervisor. Under no circumstances are these procedures to be performed by members of the maintenance or housekeeping staff. The Radiation Protection Officer will perform a thorough survey of the affected areas to determine if additional action is necessary. The RPO will establish and maintain a log of radiation accident reports and corrective actions taken. Our consultants will be used as needed by the Radiation Protection Officer. The home phone number of the RPO will be posted in the radiation laboratories.

In the event that the accident occurs after hours or on a weekend, the following steps are to be taken:

- (1) Do not attempt to clean up the spill. Quarantine the area as much as possible.
- (2) Notify the Radiation Protection Officer or the Facility Supervisor for specific instructions as to the course of action to be followed.
- (3) Survey yourself for radioactive contamination. Begin decontamination procedures and await help from the RPO.

As above, responsibility for any decontamination procedures rests with the Radiation Protection Officer and the laboratory supervisor. Under no circumstances are these procedures to be performed by members of the maintenance or housekeeping staff. The Radiation Protection Officer will perform a thorough survey of the affected areas to determine if additional action is necessary. The RPO will establish and maintain a log of radiation accident reports and corrective actions taken. Our consultants will be used as needed by the Radiation Protection Officer. The home phone number of the RPO will be posted in all radiation laboratories.

L. General Laboratory Rules

- (1) Lab coats or other designated protective clothing must be worn at all times when working with radioactive materials.
- (2) Mouth pipetting of radioactive material is prohibited.
- (3) There will be no eating, drinking, smoking, storage of food, or application of cosmetics in areas where radioactive materials are stored or used.
- (4) Personnel will wear protective gloves when handling unsealed quantities of radioactive material. Gloves are to be removed and disposed of before leaving the work area.
- (5) Dosimeters (film badges), as assigned by the Radiation Protection Officer, must be worn when in the areas where radioactive materials are stored or used.
- (6) After hour or weekend work must have the specific approval of the Radiation Protection Officer.
- (7) All equipment and instrumentation containing radioactive material must be properly labeled.
- (8) All radioactive materials not in use will be stored in a safe and approved manner.
- (9) All areas where radioactive materials are stored or used must be properly posted.
- (10) Work performed on an open bench must be done in a manner such that any spills are contained and spread of contamination is controlled.
- (11) At the end of each work day, work areas must be thoroughly surveyed and cleaned if necessary.
- (12) Any radiation survey instruments found to be defective or suspected to be malfunctioning will be brought to the attention of the Radiation Protection Officer immediately.
- (13) All persons who work with radioactive materials will wash their hands after work is completed and will thoroughly survey their hands and clothing for contamination before leaving the laboratory.

N. Specific rules for Phosphorus-32:

(a) Persons handling millicurie quantities will use low density shielding (i.e. plexiglass) to minimize bremsstrahlung radiation production.

(b) Wear safety glasses or similar protective devices when handling millicurie quantities of P-32

(c) Thoroughly survey the work area after each use of P-32.

(d) Perform a dry run prior to any new procedures to preclude unexpected complications.

(e) Wear wrist or ring badge dosimeters when handling millicurie quantities.

(f) Use the GM detector when surveying for P-32 contamination.

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: _____
STATUS CODE: 3
FEE CATEGORY: _____
EXP. DATE: 0
FEE COMMENTS: _____

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: ENPROTECH CORPORATION
RECEIVED DATE: 880224
DOCKET NO: 3030451
CONTROL NO.: 108462
LICENSE NO.:
ACTION TYPE: NEW LICENSEE

2. FEE ATTACHED \$1,200
AMOUNT:
CHECK NO.: 323

3. COMMENTS

SIGNED
DATE

[Signature]
3/3/88

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED 1-5)

1. FEE CATEGORY AND AMOUNT: 3A \$1,200

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
AMENDMENT _____
RENEWAL _____
LICENSE / _____

3. OTHER _____

SIGNED
DATE

[Signature]
3/8/88