

Appendix D

SERVICE OFFICE MANUAL
STANDARDS AND PROCEDURES FOR THE USE
OF RADIOACTIVE MATERIAL

SIEMENS MEDICAL SYSTEMS, INC.

EMERGENCY PHONE NOS:
DES PLAINES OFFICE: 312/635-3396
NIGHT: 312/635-3100

REVISED: June 6, 1984

8512090174 841105
REG3 LIC30
12-00369-02 PDR

Control No. 77166

TABLE OF CONTENTS

I. INTRODUCTION	1
II. ADMINISTRATION OF RADIATION SAFETY PROGRAM	1
A. Corporate Radiation Safety Officer/ (Health Physicist)	1-2
B. Radiation Protection Officer	2
C. Authorized Users	2-3
III. REGULATIONS GOVERNING THE USE OF RADIOACTIVE MATERIALS	3
A. Federal Regulations	3
B. Agreement State Regulations	3
IV. RULES FOR THE SAFE HANDLING OR RADIOACTIVE MATERIALS	4
A. Posting of Areas: Caution Signs, Labels & Notice to Employees	4
B. Handling of Radioactive Materials	4-5
C. Storage of Radioactive Materials	5
D. Receipt of Radioactive Materials	5
E. Transport of Radioactive Materials	5-6
F. Disposal of Radioactive Materials	6
G. Shipping of Radioactive Materials	6-7
H. Accountability of Radioactive Materials	7
I. Leak Tests of Radioactive Materials	7
V. PERSONNEL MONITORING	8
A. Film Badges	8
B. Maximum Permissible Dose Limits	8-9
VI. RADIATION EMERGENCY PROCEDURES	9
A. Definition and Purpose	9
B. Loss or Theft of Source	9-10
C. Sealed Source Rupture	10
D. Fires Involving a Radioactive Source	10-11
E. Contamination of Personnel, Equipment or Facility	11
VII. CHANGES OF OFFICE LOCATIONS	11
A. Purpose for Notification of RSO	11
B. Close-out Survey	11-12

I. Introduction

The procedures contained in this manual are for the protection from unnecessary radiation exposure of field service personnel and the general public. If certain regulations seem restrictive, keep in mind that these requirements are dictated by various governmental agencies. This manual will also serve as a guide to maintaining required records for these various agencies.

If you have any questions call Health Physics Services, Siemens Gammasonics, Inc., 2000 Nuclear Drive, Des Plaines, Illinois 60018 at telephone number 312/635-3396. After hours, or in case of an emergency call 312/635-3100.

II. Administration of Radiation Safety Program

A. Corporate Radiation Safety Officer (Health Physicist)

The Radiation Safety Officer or RSO is responsible for radiation protection and licensing within the Siemens field offices. The responsibilities of the RSO are as follows:

1. Initiate programs to educate users in the safe handling of radioactive materials.
2. Implement any changes in governmental regulations.
3. Maintain all NRC licences and all agreement state licenses for all field service offices (except California).
4. Order, receive, process, store, dispense, and dispose of all radioactive materials and maintain records of such.
5. Report any emergencies or incidents involving radioactive materials to the appropriate authorities.
6. Provide health physics services to all field service offices including leak test kits, processing, and certificates.

7. Maintain inventory information on all sealed sources located throughout the various field offices.

B. Radiation Protection Officer

The district manager at each field office location is the Radiation Protection Officer (RPO). The RPO is responsible for the safe use of all radioactive materials in their district. The responsibilities of the RPO are as follows:

1. Possess a copy of the Field Service Manual for Use of Radioactive Material and have a thorough understanding of its contents.
2. Comply with all federal, state, and Siemens policies for the safe use of radioactive materials as described in the field service manual.
3. Notify the Radiation Safety Officer regarding any changes within the district, including office location changes and changes in the sealed sources in his/her possession.
4. Maintain current records as required by federal and/or state agencies, as described elsewhere in this manual.
5. Report any emergencies or accidents with radioactive materials to the RSO.
6. Insure all personnel are monitored for exposure to radiation.
7. Retain on file a copy of the federal or state license issued to the district office and have an understanding of its contents.

C. Authorized Users

Authorization to use radioactive materials will be granted to individuals who demonstrate the ability to work with radioactive materials in a safe manner. The following are requirements for the authorized user:

1. Have sufficient training in the use of radioactive materials.
2. Follow all federal, state, and Siemens policies dealing with the use of radioactive materials as stated in the field service manual.
3. Keep their exposure to radiation As Low As Reasonably Achievable (ALARA).
4. Wear the radiation monitoring device issued.
5. Report any accidents involving radioactive material immediately to the Radiation Protection Officer.
6. Read and understand this manual.

In addition, female personnel handling radioactive materials shall be informed of the instructions concerning prenatal radiation exposure. (NRC Regulatory Guide 8.13). An example of this guide is found at the back of this manual and must be read.

III. Regulations Governing the Use of Radioactive Materials

A. Federal Regulations

Byproduct material, special nuclear material, and source material may be used only under specific licenses issued by the U.S. Nuclear Regulatory Commission (NRC). All licensees are required to conform with standards for protection against radiation as established by the NRC. Certain natural occurring radioactive materials such as radium, and all accelerator produced radionuclides, such as Cobalt-57, are not regulated by the NRC. These are regulated by state agencies.

B. Agreement State Regulations

Agreement States are those states not governed by NRC regulations but are governed by the state itself. Specific licenses are issued by the state to radioactive material users. These licensees follow standards similar to those of NRC set forth by the state agency. The state must meet certain requirements as set by the NRC before being approved as an agreement state.

IV. Rules for the Safe Handling of Radioactive Materials

A. Posting of Areas: Caution Signs, Labels and Notice to Employees

Each area in which licensed radioactive material is used or stored shall be posted with a sign bearing a radiation caution symbol and the words: "Caution Radioactive Materials."

A sign bearing the radiation caution symbol and the words: "Caution Radiation Area" must be posted in any area in which an individual would receive a dose equivalent in excess of 2 millirem in any one hour or in excess of 100 millirem in any seven consecutive days.

Each container in which radioactive material is transported, stored, or used must have a durable, clearly visible label with the radiation symbol and the words: "Caution: Radioactive Material." When such containers are used for storage, another label which has the radionuclide, amount of activity, and the date must appear.

Federal regulations require that Form NRC-3, "Notice to Employees" be posted in every service office. Agreement states have similar forms which must be posted.

B. Handling of Radioactive Materials

The radioactive materials used at the field service locations are in the form of sealed sources. These sources must be handled as follows:

1. Do not take the source out of its shielding.
2. Only the authorized user is allowed to handle the source.
3. Do not leave the source unattended. Post the area with a sign bearing the radiation symbol and the words, "Caution - Radioactive Material", if the source is left unattended during testing.

4. Do not look directly into the bore hole of the source holder or cover it with any part of your body.
5. Do not smoke, eat, or drink while working with a source.
6. Do not keep sealed sources that are not going to be used.

C. Storage of Radioactive Materials

It is important that all sources be stored in a locked cabinet with a radiation caution sign posted on the outside. All sources must be stored with lead shielding covering the bore hole and labeled with the radionuclide quantity and serial number. Sources in the field must be stored in the service engineer's tool box with a radioactive material storage area label on the box and transferred in the locked trunk of the car.

D. Receipt of Radioactive Materials

All radioactive materials are ordered and received at the Des Plaines office. No exceptions. All information and leak test data are put into the inventory system at the time of receipt. The Des Plaines office then transfers the radioactive material to the service office. At the service office, records are kept logging the receipt date. The RPO will distribute the sealed source to the authorized user. Records for all receipts are to be kept on file for future inspections.

E. Transport of Radioactive Materials

The following precautions must be taken when transporting sealed sources:

1. Sources must be transported in the locked trunk of the car.
2. Lead shielding must cover the bore hole of the source.
3. A "Use Log" card must be maintained (showing the location, date, and name of user) for each sealed source transported to a temporary location. This

will provide a record of where the source is at all times and must be kept on file for future inspections.

F. Disposal of Radioactive Materials

All radioactive materials are disposed of by the Siemens Des Plaines office. The sealed source must be shipped with information including the radionuclide, serial number, activity and field service location. A log of the disposal date must be on file at the field office. After the sealed source is received by Health Physics, it is deleted from the field service inventory.

G. Shipping of Radioactive Materials

All sealed sources shipped must have a lead shield covering the bore hole. The source must be packaged in accordance with Department of Transportation (DOT) regulations. Packaging specifications are as follows:

1. Co-57 Sealed Sources

- Package cannot exceed 90 mCi.
- Exposure rate must be less than 0.5 mR/hr at the surface. This specification is met if the same shielding that came with the source is used.
- No labels are needed on the outside of the box if the two above specifications are met.
- Inside container must be labeled as radioactive.
- A notice including the name of the consignee and the following statement: "Packaged materials conform to all specifications, limited quantity, NOS UN2910." must accompany the packing slip inside the box.

2. Am-241 Sealed Sources

- Package cannot exceed 8 mCi.

- Exposure rate must be less than 0.5 mR/hr at the surface. This specification is met if the same shielding that came with the source is used.
- No labels are needed on the outside of the box if the two above specifications are met.
- Inside container must be labeled as radioactive.
- A notice including the name of the consignee and the following statement: "Packaged materials conform to all specifications, limited quantity, NOS UN2910." must accompany the packing slip inside the box.

All sealed sources must be shipped with information including the radionuclide, serial number, activity and field office location.

H. Accountability of Radioactive Materials

The Radiation Protection Officer is responsible for maintaining records of receipt, use, and disposal of all radioactive materials in their district. Inventory of all sealed sources is performed every six months in April and October. The RPO must provide an accurate account of all the sealed sources. This is to be kept on file for future inspections. A copy will also be on file at the Des Plaines office.

I. Leak Tests of Radioactive Materials

The Radiation Protection Officer will insure that all sealed sources are leak tested every six months in April and October. The Siemens Des Plaines office will send the leak test kits to the RPO for distribution. It is the RPO's responsibility to see that all tests are performed and returned to the Des Plaines office for analyses. A leak test certificate is issued to the field service office upon completion of analyses. All certificates for each sealed source must be on file for future inspections.

V. Personnel Monitoring

A. Film Badges

All personnel in Siemens field service locations are required to have a film badge radiation monitor. Instructions concerning film badges are as follows:

1. The RPO is responsible for issuing film badges to his/her field service personnel.
2. Film badges are to be worn when working with radioactive materials.
3. Film badges are to be worn on the torso; belt, lapel, or pocket.
4. Film badges should not be tampered with or abused. The film is sensitive to heat, light, and moisture. Do not tear the film packet.
5. A film badge must be worn only by the person to whom it is assigned.
6. Film badges are changed on a monthly basis. Expired film badges are returned to the Des Plaines office for processing by the RPO at the end of the monitoring period. The RPO is responsible for insuring that each badge is returned on time each month so that all exposure reports are up to date for inspection purposes.
7. Monthly film badge exposure reports must be reviewed and kept on file by the RPO. All reports are subject to inspection.
8. The RPO must investigate all incidents where radiation exposure is in excess of 300 mRem in any one calendar quarter. All findings must be reported to the RSO.

B. Maximum Permissible Dose Limits

The maximum permissible dose varies as to what part of the body is being monitored for radiation exposure. The extremities may receive more exposure than the whole body. The following are occupational radiation exposure limits that the body can receive:

Whole Body:	1250 millirem per quarter 5000 millirem per year
Skin:	7500 millirem per quarter
Pregnant Women:	500 millirem during entire gestation period
Hands, Forearms:	18,750 millirem per quarter
Ankles:	75,000 millirem per year

Although these above limits represent the maximum allowable exposure, you should keep your exposure as far below these limits as possible.

VI. Radiation Emergency Procedures

A. Definition and Purpose

An emergency is any incident resulting from the use of radioactive material which might cause or has caused an internal or external radiation hazard to personnel, the general public, equipment or facilities. Such incidents that may be considered an emergency are as follows:

1. Loss or theft of a radioactive source.
2. Sealed source rupture.
3. Fires involving a radioactive source.
4. Contamination of personnel, equipment or facility.

The RSO must be notified immediately of any emergency. It is the responsibility of the RSO to report any incident to the regulatory agency if necessary.

B. Loss or Theft of Source

All regulatory agencies require that a report be made as soon as it becomes known of the loss or theft of radioactive materials. It is the responsibility of the RPO to report immediately to the RSO if such an

incident occurs. Reports should include the following information:

1. Description of material, quantity, serial number, and make of sealed source.
2. Description of circumstances concerning the incident, including where and how it was lost.
3. Actions that have been taken to recover the source.

The RSO will notify the appropriate authority.

C. Sealed Source Rupture

The rupture of a sealed source is very unlikely. Extreme stress is needed to cause such an incident. If a sealed source is ruptured contact the RSO. If the RSO cannot be contacted immediately, notify the state authorities or NRC office for help. Extreme care should be taken, especially in the case of a ruptured Americium-241 source. Precautions are as follows:

1. Do not handle the source without the use of gloves. If tweezers are at hand, use these to handle the source.
2. If possible, place the source in a sealed container, i.e., sealed plastic bag, to prevent any contamination.
3. Once the above is done, get away from the source and post a warning to keep out.
4. If nothing can be done, evacuate the area.

D. Fires Involving a Radioactive Source

In the event a sealed source is involved in a fire, the RSO must be notified immediately. Fire fighting personnel should be warned that a sealed source is involved and details concerning the radionuclide and quantity given. Indicate that the sealed source is a small calibration source and is used for testing and repair of instruments. The area must be surveyed after the fire and attempts made to recover the source. Once the source is found the following

precautions must be taken:

1. Do not handle the source without gloves. The possibility of leakage remains.
2. Confine the sealed source in a container, i.e., sealed plastic bag, if possible to prevent contamination.

E. Contamination of Personnel, Equipment, or Facility

Contamination is the presence of radioactive material in any area where it is not desired, and particularly in places where it may be harmful. If contamination is detected, the following must be done:

1. Skin and Hands: Wash approximately two minutes with a mild soap in warm water covering the affected area thoroughly. Particular attention should be given to the nails and cuticles when the hands are contaminated. Repeat two or three times.
2. Surfaces and Materials: Initial decontamination should be by flushing with water. If unsuccessful, the next step is to scrub with soap and water or soaking with commercially available cleansing agents as Radiacwash, Count-Off, or Isoclean. Gloves are worn at all times when decontaminating.

If contamination is suspected, be aware of the possibilities of ingestion or inhalation. Do not put contaminated hands to your mouth, nose, or eyes. Once any radioactivity enters the body it remains longer and results in continual exposure to the body.

VII. Changes of Office Locations

A. Purpose for Notification of RSO

The RSO must be notified as soon as possible of any planned field office relocation. Notification must be made before the move and not afterwards. An amendment to the existing license, indicating such a move, has to be submitted to the regulatory agency.

B. Close-Out Survey

A close-out survey must be performed before the office is newly occupied. Such a survey involves a swipe test of the area to check for contamination and a check of all sealed sources so that none are forgotten. The swipe tests are analyzed by Health Physics Services at the Des Plaines office. The close-out survey must be on file for future inspections.

VIII. Definitions

- Absorbed Dose: Amount of radiation received by the soft tissue and can be correlated to the biological and chemical effects of radiation.
- Background: Levels of radiation due to natural occurring sources such as cosmic radiation from the sun, altitude, composition of soil and construction materials.
- Contamination: The presence of radioactivity in any area where it is not desired.
- Film Badge: A device that utilizes film as a means of detecting and measuring radiation.
- Leak Test: A test that checks for leakage of radiation from a sealed source by performing a swipe test.
- Rad: A unit that expresses absorbed doses of radiation.
- Rem: A unit that expresses the energy absorbed in biological tissue and can reflect the amount of biological damage.
- Roentgen: A unit that expresses the quantity of ionization produced by x-rays in air. Symbol used is R.

- Shielding: A covering that prevents the penetration of radiation from some radioactive source.
- Sealed Source: A radioactive source that is permanently fixed in a shielded container.
- Swipe Test: A test that checks for any removable contamination by wiping a piece of filter paper over a hundred square centimeters area.