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Nuclear and PET Scanner Radioactive Material Guidelines

EXCERPT FROM: Field Service EHS Design Requirements: A Guidance Document for project leaders and service engineers that outlines Equipment, Procedure, and Contract Requirements for Field Service.

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a) **Purpose**

i) The Nuclear and PET Scanner Radioactive Material Guidelines exist to assist GEHC employees in understanding radioactive material responsibilities for GEHC employees, customers, and vendors. This chapter was derived from a collection of policies from GEHC Radiation Safety Officer (RSO), the Nuclear and PET modality, modality training, and established service procedures. The information in this chapter provides a brief overview of GEHC position in regards to Nuclear and PET radioactive material handling. It does not list all GEHC policies or federal and state regulations.

b) **Scope**

i) This chapter covers the handling of non-exempt radioactive material pin sources for servicing Nuclear and PET equipment under the conditions of installation, replacement and service where sources are removed/replaced. It does not address servicing cyclotron equipment, flood sources or customer calibration sources (i.e., liquid sources, Tc-99m sources and phantoms).

ii) Licenses for equipment operation, FDA approval, and patient or equipment user qualifications are not addressed in this section.

c) **Definitions**

i) Radioactive materials mean any solid, liquid, or gas that undergoes the process of spontaneous transformation of the nucleus, generally with the emission of alpha or beta particles, often accompanied by gamma rays.

ii) Sealed source means any radioactive material that is permanently encased in a capsule designed to prevent leakage or escape of the radioactive material. These include the PET pin sources (^{68}Ge) and attenuation correction sources (^{153}Gd).

iii) Exempt quantity means radioactive materials in individual quantities below applicable limits of the NRC or state regulations that require a license.

d) **Working with radioactive material**

i) GEHC Field Service Engineers are prohibited from ordering, receiving, transporting, disposing or shipping non-exempt radioactive material.

ii) GEHC policy prohibits GEHC employees from ordering non-exempt radioactive material under the customer's license.

iii) The customers site RSO can authorize GEHC Field Service Engineers to remove and replace radioactive pin sources from their hot lab or system.

iv) The replacement or handling of radioactive material for the use in GE products will be handled under the direction of the customers site RSO.

v) GEHC Field Service Engineers are responsible for understanding and following the sites radioactive material handling procedures. Field Service Engineers can obtain the information from the site RSO.

vi) GEHC Field Service Engineers may be called upon to assist in replacement of radioactive pin sources for system PM and providing system configuration file updates as needed.

vii) GEHC Field Service Engineers may be called upon to assist in handling of radioactive pin sources for system calibration, or repair to the system.

viii) Radioactive pin sources should be handled or transferred using the approved source handling tools. Time, distance and shielding are all factors with radiation exposure. Distance is the most critical factor. Even if transferring the radioactive pin source occurs faster with a hand, a person would be exposed to more radiation because of the decreased distance from the source of radiation.

ix) GEHC Field Service Engineers should not fix or attempt to fix bent radioactive pin sources. The customer should return bent pins to the supplier. A dummy pin should be inserted until the damaged pin is replaced.

Note: If a GEHC Field Service Engineer notices that a pin source is bent, the Field Services Radiation Safety Officer should be contacted.

x) GEHC Field Service Engineers shall not physically prepare mix or transport (drive) liquid radioactive materials. Field Service Engineers are allowed to transport shielded pin sources (not PET phantoms) within the facility under the site's radioactive material handling guidelines.

xi) Field Service Engineers can only handle radioactive PET phantoms within the PET scanner room, under the supervision of the site RSO or trained technician following the site's radioactive material handling guidelines.

Note: Always use the concepts of ALARA (time and distance), which means planning ahead to eliminate unnecessary time spent around the source and using remote handling tools. Never handle a source directly!

xii) If the customer does not have a proper container to temporarily store radioactive pin sources, service should not be performed.

xiii) If a radioactive pin source needs to be removed from the source shield and temporarily stored while service is being performed it shall only be stored in an approved container.

xiv) In the event of any Radioactive Materials Emergency:

(1) Notify the customer site RSO and immediately follow the site's emergency procedures.

(2) Contact your EHS Specialist or Field Service RSO who will assist with incident investigation, customer site follow-up, corrective actions, and determine additional reporting requirements.

e) **Understanding Customer Procedures**

i) Customers cannot ask GEHC employees to violate regulatory requirements.

ii) Customers hold the NRC or state license to order, receive, possess, transport and ship (i.e. FedEx) non-exempt radioactive materials. GEHC Service does not hold any licenses to perform these activities.

iii) Ensure customer authorized personnel are onsite to physically prepare, mix, handle, or transport liquid radioactive materials. Inform the customer that GEHC Field Service Engineers are not authorized to prepare samples and that the service will have to be performed by the customers technologist.

iv) It is understood that in the field service environment, many of our customers expect service after hours, on weekends, or during holidays when a technologist may not be present. If a technologist is not on site or has to leave the site, the Field Service Engineers must have the technologists phone number or pager so that they can be contacted.

v) GEHC employees are allowed to remove and return shielded radioactive pin sources from the customer's hot lab or system.

vi) Do not attempt disposal of the customers decayed or spent radioactive materials under any circumstances. Place decayed or spent radioactive pin sources in the properly shielded storage location designated by the customer.

vii) The customer will physically prepare, mix and handle liquid radioactive materials.

viii) The customer should deliver prepared PET phantoms to the PET scanner.

ix) The customer is responsible for contamination surveys (wipe and leak test) per the site, state or NRC license.

x) The customer shall provide proper radioactive pin source storage containers. Service shall not be performed if the storage container for source material is not available.

xi) The customer is responsible for the source material storage.

f) **Formal Product and On-The-Job Training (OJT)**

i) Only employees formally trained in the following are authorized by the GEHC Radiation Safety Officer to use radioactive materials to service nuclear or PET equipment.

- GE-EHS-575, Radiation Safety (this includes FI506 as Tier 4)
- GEMS-TECH-FI506-online, Radioactive Source Safety for Service Engineers (now a part of 575)
- GEMS-EHS-RADSURVEY, Radiation Survey Meter Training

ii) Employees formally trained in radioactive material handling and who attended the Discovery ST course at Learning Solutions will be authorized to use radioactive materials to service the Discovery ST systems only.

iii) Employees formally trained in radioactive material handling and who attended the PET Advance courses (which include training on the DLS) at Learning Solutions will be authorized to use radioactive materials to service Discovery LS and PET Advance systems.

Note: Product Specific Technical Training courses can be found at http://gein.med.ge.com/ps_intranet/technical/stech_index.html

iv) Only employees formally trained in radioactive material handling and who attended the PET Advance course at Learning Solutions will be authorized to use radioactive materials to service PET scanners.

v) Nuclear and PET systems should only be assigned to formally trained individuals.

vi) NRC and state regulations require that all training be documented.

vii) Formal training shall be documented in Mylearning system.

viii) OJT documentation must identify the skill or experience received. Document via a service dispatch record.

ix) Training centers must make radioactive material handling a required competency.

x) General radiation safety training is required for all Field Service Engineers.

g) **Radiation Monitoring**

i) Follow GEHC ALARA (As Low As Reasonably Achievable) practices.

ii) A quarterly radiation dosimeter wear period has been established for PET and Nuclear service.

iii) The radiation dosimeter shall be worn on shirt collar during all work related activities.

iv) Never wear a lead apron, gloves or any other type of shield. .

v) Post "radiation service" signs (PN: 2282043) when conducting service or initiating calibration scans.

vi) Always wear the required personal protective equipment while working at the customer site.

vii) Never eat, drink, smoke or put fingers in mouth while working with radioactive materials.

viii) Always monitor hands, feet and clothing for contamination after handling radioactive materials and wash your hands thoroughly.

viv) Report to your EHS Specialist or Field Service RSO any instances of personal contamination and be prepared to provide information (radiation source type, activity, survey meter results , area of skin contaminated). The Field Service RSO will assist with follow up of personal contamination events with the customer RSO to investigate, assess potential skin dose, and initiate any needed corrective actions.'

(1) The RSO will determine additional reporting requirements per review of state regulation, license or reciprocity agreement requirements and will make GEHC internal notifications in accordance with the GEHC EHS Significant Incident, Accident & Event Communication Policy.

A 'spill' or contamination containing radioactive material can originate from the following: a damaged or leaking sealed source, liquid sources or phantoms prepared by customer, other radioactive materials on the customer premises not related to GEHC. Follow the procedure before should skin contamination occur.

h) **Skin Contamination**

i) If contamination event to the skin occurs, immediately flush the contaminated area with water.

ii) Gently clean the skin with soap and warm water.

iii) If some contamination remains, clean the skin with mild abrasive soap. Use a soft brush or towel if necessary and flush with water.

iv) **Never** scrub the skin to the point where irritation occurs.

v) **Never** use chemicals or caustic cleaning agents on skin.

vi) If after repeated washing the contamination persists, begin the survey and recordkeeping as detailed below. Notify the site Radiation Safety Officer (RSO) and/or your RSO.

vii) Initial Survey: **In a low radiation level background area,** survey the contaminated area by placing the detector directly above the area of skin contamination to achieve the highest reading.

viii) Use your Ludlum Model 2401-EW Survey Meter or a customer owned contamination-monitoring meter with display preferably in counts per minute (cpm). If you are unsure, ask the customer's Radiation Safety Officer.

ix) If after immediate, repeated washing the contamination persists, begin the survey and recordkeeping as detailed below.

x) Survey and Recordkeeping: Record all of the following:

(1) Site, building, and/or room where the contamination occurred.

(2) Date that the skin contamination occurred.

(3) Estimated time of day that the initial skin contamination occurred.

(4) Details to identify the location and area of the contaminated skin. Use a small volume detector such as your Ludlum Model 2401-EW Survey Meter to "pinpoint" contamination to estimate the area in cm^2 of contiguous contamination. If more than one area of contamination is detected, record all areas.

(5) The radionuclide (e.g. F-18, Tc-99m, I-131, etc.) causing the contamination.

(6) Manufacturer, model and serial number of the calibrated meter (i.e., meter calibrated in cpm).

(7) Results of the survey meter readings. **In a low radiation level background area,** survey the contained area by placing the detector directly above the area of skin contamination to achieve the highest reading. Record the meter reading, units, date, and time.

(8) Perform repeated measurements over time at frequent intervals (~ 1hour) as activity is removed through radioactive decay (for short-lived nuclides)

and/or skin exfoliation. Record the time interval between consecutive surveys, as necessary.

(9) Provide all information to the GEHC Field Services RSO to complete the dose assessment.

i) **Attenuation Correction Box Options**

i) Never handle Gadolinium or Germanium sources, used for attenuation correction without formal documented training for this type of material and activity.

ii) GEHC employees CAN NOT service or activate as part of servicing, the source assembly on OEM equipment (such as ADAC, Siemens, etc).

j) **U.S. State Notification of Service**

i) GEHC Services is required to notify the state regulatory agency of source handling activities at least 3 days PRIOR to any source service event (i.e., installation, replacement and service where sources are removed/replaced)

ii) See Field Service Radiation Program - State Notification Procedure:
http://supportcentral.ge.com/products/sup_products.asp?prod_id=18657

k) **Radiation Survey / Meters**

i) A radiation survey by a GEHC Field Engineer is required following the handling of PET pin sources (^{68}Ge) and attenuation correction sources (^{153}Gd).

ii) A survey with a calibrated survey meter needs to be completed whenever you handle a PET Pin source or ATC option sources. This includes:

(1) An initial installation,

(2) Source changes,

(3) Pm or service calls where sources are removed/replaced.

iii) GEHC will provide all Authorized Field service Engineers with a Radiation Survey Meter.

(1) Use of a customer meter is permitted if GE meter is not available or not functioning properly.

iv) Survey meter/equipment must be calibrated and in working order.

(1) See Radiation Survey Meter Training for more information: http://data.supportcentral.ge.com/upload/18657/doc_266215.ppt

v) GEHC Field Service Engineers have one week to submit the required survey information to the RSO via the Radiation Survey Report Form (which is a part of the State Notification process).

(1) See Radiation Survey Meter Training for more information: http://data.supportcentral.ge.com/upload/18657/doc_266215.ppt