

# ***Employee Training Waste Disposal***

Waste disposal by decay-in storage, generator return, and licensed material returned are governed by the following federal regulations Subpart K to 10 CFR Part 20, 10 CFR 20.1101, and 10 CFR 35.92:

- Subpart K 10 CFR Part 20 – ***Waste Disposal***
- 10 CFR 35.92 – ***Decay-in-storage***
- 10 CFR 35.2092 – ***Records of decay-in-storage***
- NUREG 1556 Vol. 9 Rev. 2 – ***Model Procedures for Waste Disposal***
- 10 CFR 20.1101 – ***Radiation Protection Program***

## **Subpart K 10 CFR Part 20 – *Waste Disposal***

### **10 CFR 20.2001 Waste Disposal states:**

(a) A licensee shall dispose of licensed material only-

- (1) By transfer to an authorized recipient as provided in 20.2006 or in regulations in parts 30, 40, 60, 61, 63, 70, and 72 of this charter;
- (2) By decay in storage; or
- (3) By release in effluents within the limits in 20.1301; or
- (4) As authorized under 20.2002, 20.2003, 20.2004, or 20.2005

(b) A person must be specifically licensed to receive waste containing licensed material from other persons for:

- (1) Treatment prior to disposal; or
- (2) Treatment or disposal by incineration; or
- (3) Decay in storage; or
- (4) Disposal at a land disposal facility licensed under part 61 of this charter; or
- (5) Disposal at a geologic repository under part 60 or part 63 of this charter.

### **10 CFR 20.2002 Method for obtaining approval of proposed disposal procedures states in part:**

A licensee or applicant for a license may apply to the commission for approval of proposed procedures, not otherwise authorized in the regulations in this chapter, to dispose of license material generated in the licensee's activities.

### **10 CFR 20.2003 Disposal by release into sanitary sewerage states:**

(a) A licensee may discharge licensed material into sanitary sewerage if each of the following condition is satisfied:

- (1) The material is readily soluble (or is readily dispersible biological material) in water, and
- (2) The quantity of licensee or other material that the licensee releases into the sewer in 1 month divided by the average monthly volume of water release into the sewer by the licensee does not exceed the concentration listed in table 3 of appendix B to part 20; and

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(3) If more than radionuclide is released, the following conditions must also be satisfied:

(i) The licensee shall determine the fraction of the limit in table 3 of appendix B to part 20 represented by discharges into sanitary sewerage by dividing the actual monthly average concentration of each radionuclide released by the licensee into the sewer by the concentration of that radionuclide listed in table 3 of appendix B to part 20; and

(ii) The sum of the fraction for each radionuclide required by paragraph (a)(3)(i) of this section does not exceed unity ; and

(4) The total quantity of licensed and other radioactive material and other radioactive material that the licensee releases into the sanitary system in a year does not exceed 5 curies (185 GBq) of hydrogen-3, 1 curie (37 GBq) of carbon-14, and 1 curie (37 GBq) of all other radioactive material combined.

(b) Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limits contained in paragraph.

**10 CFR 20.2004 Treatment or disposal by incineration.**

Not routinely used in Nuclear Medicine.

**10 CFR 20.2005 Disposal of specific wastes.**

Not routinely used in Nuclear Medicine.

**10 CFR 20.2006 Transfer for disposal and manifests.**

(a) The requirements of this section and appendix G to 10 CFR Part 20 are designed to:

(1) Control transfer of low-level radioactive waste by any waste generator, waste collector, or waste processor licensee, as defined in this part, who ships low-level waste either directly, or indirectly through a waste collector, or waste processor, to a licensed low-level waste, to a licensed low-level waste land disposal facility (as defined in Part 61 of the charter);

(2) Establish a manifest tracking system; and

(3) Supplement existing requirements concerning transfers and recordkeeping for those wastes.

(b) Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility must document the information required on NRC's Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee in accordance with appendix G to 10 CFR 20.

(c) Each shipment manifest must include a certification by the waste generator as specified in section II of appendix G to 10 CFR 20.

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(d) Each person involved in the transfer for disposal and disposal of waste, including the waste generator, waste collector, waste processor, and disposal facility operator, shall comply with the requirements specified in section III of appendix G to 10 CFR 20.

**10 CFR 20.2007 Compliance with environmental and Health protection regulation.**

Nothing in this subpart relieves the licensee from complying with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of material that may be disposed of this subpart.

**10 CFR 35.92 Decay-in-storage states:**

(a) A license may hold byproduct material with a physical half-life of less than 120 days for decay-in-storage before disposal without regard to its radioactivity if it –

- (1) Monitors byproduct material at the surface before disposal and determines that its radioactivity cannot be distinguished from background radiation level with an appropriate radiation detection survey meter set on its most sensitive scale and with no interposed shielding; and
- (2) Removes or obliterates all radiation labels, except for radiation labels on material that are within containers and that will be managed as biomedical waste after they have been released from the licensee.

(b) A licensee shall retain a record of each disposal permitted under paragraph (a) of this section in accordance with 35.2092.

**10 CFR 35.92 Records of decay-in-storage states:**

A licensee shall maintain records of the disposal of licensed materials, as required by 35.92 for 3 years. The record must include the date of disposal, the survey instrument used, the background radiation level, the radiation level measured at the surface of each waste container, and the name of the individual who performed the survey.

## NUREG 1556 Vol. 9 Rev. 2 – *Model Procedures for Waste Disposal*

### **Model Procedure for Waste Disposal by Decay-In-Storage, Generator Return, and Licensed Material Return**

With the implementation of the 2005 EPA Act, NRC now has regulatory authority over accelerator-produced radioactive materials and discrete sources of radium-226. Therefore, the procedures for waste disposal by decay-in-storage, generator return, and licensed material return also apply to the medical accelerator-produced radioactive materials and discrete sources of radium-226 after NRC's waiver of August 31, 2005, is terminated for medical use facilities. NRC's waiver for Government and Federally recognized Indian tribe medical use facilities was terminated on TBD (60 days after the effective date of the rule). NRC regional offices should be contacted to confirm the waiver termination date for other medical use facilities.

This model provides acceptable procedures for waste disposal. As a result of the EPA Act, licensed materials now include accelerator-produced radioactive materials and discrete sources of radium-226. Also, note that some short half-life radionuclide products (e.g., Tc-99m/Mo-99 generator columns and some Y-90 microspheres) contain long half-life contaminants that may preclude disposal by decay-in-storage.

Applicants may either adopt these model procedures or develop alternative procedures to meet the requirements of Subpart K to 10 CFR Part 20, 10 CFR 20.1101, and 10 CFR 35.92.

### **Model Procedure for Decay-In-Storage (this now includes decay-in-storage of accelerator produced radioactive materials)**

10 CFR 35.92 describes the requirements for decay-in-storage. Storage should be designed to allow for segregation of wastes with different half-lives (e.g., multiple shielded containers). Containers should have shielded covers to maintain occupational exposure at ALARA levels. Storage areas must be in a secure location.

- If possible, use separate containers for different types of waste (e.g., needles and syringes in one container, other injection paraphernalia such as swabs and gauze in another, and unused dosages in a third container). Because the waste will be surveyed with all shielding removed, the containers in which the waste will be placed must not provide any radiation shielding for the material.
- When the container is full, seal it and attach an identification tag that includes the date sealed and the longest-lived radionuclide in the container. The container may then be transferred to the decay-in-storage area.

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- Prior to disposal as in-house waste, monitor and record the results of monitoring of each container as follows:
  - Use a survey instrument that is appropriate for the type and energy of the radiation being measured;
  - Check the radiation detection survey meter for proper operation and current calibration status;
  - Monitor in a low-level radiation (<0.05 millirem per hour) area away from all sources of radioactive material, if possible;
  - Remove any shielding from around the container or generator column;
  - Monitor, at contact, all surfaces of each individual container;
  - Remove or deface any radioactive material labels (unless the containers will be managed as biomedical waste after they have been released from the licensee as described in 10 CFR 35.92);
  - Discard as in-house waste only those containers that cannot be distinguished from background radiation. Containers may include trash bags full of waste, generator columns, and biohazard (needle) boxes. Record the disposal date, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal; and
  - Containers that can be distinguished from background radiation levels must be returned to the storage area for further decay or transferred to an authorized byproduct material recipient.

**Model Procedure for Returning Generators to the Manufacturer (this now includes generators containing accelerator-produced radioactive materials)**

Used Mo/Tc-99m or Sr-82/Ru-82 generators may be returned to the manufacturer. This permission does not relieve licensees from the requirement to comply with 10 CFR Part 71 and DOT regulations. Perform the following actions when returning generators:

- Retain the records needed to demonstrate that the package qualifies as a DOT Specification 7A container;
- Assemble the package in accordance with the manufacturer's instructions;
- Perform the dose rate and removable contamination measurements;
- Label the package and complete the shipping papers in accordance with the manufacturer's instructions; and
- Retain records of receipts and transfers in accordance with 10 CFR 30.51.

## **Model Procedure for Return of Licensed Material to Authorized Recipients (this now includes return of accelerator-produced radioactive materials or discrete sources of radium-226)**

**Note:** Licensees authorized to produce and noncommercially transfer PET radioactive drugs to consortium members are not authorized to receive unused dosages or empty syringes or vials from consortium members.

Perform the following steps when returning licensed material (which now also includes accelerator produced radioactive materials and discrete sources of radium-226) to authorized recipients:

- In accordance with 10 CFR 30.41(a)(5), confirm that persons are authorized to receive byproduct material prior to transfer (e.g., obtain a copy of the transferee's NRC license or Agreement State license that authorizes the byproduct material);
- Retain the records needed to demonstrate that the package qualifies as a DOT Specification 7A container;
- Assemble the package in accordance with the manufacturer's instructions;
- Perform the dose rate and removable contamination measurements;
- Label the package and complete the shipping papers in accordance with the manufacturer's instructions; and
- Retain records of receipts and transfers in accordance with 10 CFR 30.51.

## **Radiation Protection Program**

### **Liquids and Gases (10 CFR 20.2003)**

Liquids may be disposed of by release to the sanitary sewer release to the atmosphere.

1. Disposal to the sanitary sewer system will be made in accordance with 10 CFR 20.2003. A record will be kept of the following: date, radionuclide, estimated activity released, and place where material was released.
2. Permissible concentrations in effluents will be kept within the limits enumerated in 10 CFR 20. A record will be kept of the date, radionuclide, estimated activity released, estimated concentration, and vent site at which the material was released.

### **Decay in Storage (10 CFR 35.92)**

1. Only material with a physical half-life of less than 120 days may be decayed in storage at the facility.
2. Each container will be tagged to include:
  - a. the date sealed or set into storage
  - b. the longest-lived isotope in the container

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3. Material will be decayed until its radioactivity cannot be distinguished from the background radiation level.
4. Prior to disposal as in-house waste, each container will be monitored as follows:
  - a. Low-range GM survey meter will be checked for proper operation on the most sensitive scale.
  - b. Waste will be monitored in a low level area.
  - c. Any shielding around the container will be removed.
  - d. All surfaces of each individual container will be monitored.
  - e. Only those containers, which cannot be distinguished from background levels will be disposed of after all radioactive labels, have been defaced.
5. Mo-99/Tc-99m generators will be held for at least 60 days before being dismantled. When dismantling generators, a low-range GM survey meter will be kept at the work area. The oldest generator will be dismantled first, working forward chronological I. Each individual column will be held in contact with a low-level survey instrument in a low background (less than 0.05 mR/hr) area. The generator date and disposal date will be logged in the disposal records. Radiation labels will be removed or defaced on the generator shield. Generators may also be returned to the manufacturer for disposal. Manufacturer's instructions will be followed.
6. Records of decay-in-storage disposal shall be maintained for three (3) years and must contain the following information (**10 CFR 35.92**):
  1. Date of disposal will be recorded
  2. Survey instrument used
  3. Background radiation level
  4. Radiation level measured at the surface of the container
  5. The name of the individual that performed the survey

## Unit Dose Waste

If a unit dose pharmacy is used, the materials supplied by them (e.g., syringes, needles, etc.) may be returned to the unit dose pharmacy in the original shipping container.

If combinations of radionuclides are shipped together in the same package, the total activity for the package must not exceed the lowest activity limit noted below for the radionuclides to be shipped.

**Limited Quantity vs. Normal Form Shipments**

The difference between these two types of radioactive shipments is purely based on activity. The Limited Quantity limits as of 10/1/05 are noted below. Any activity above these limits is considered a Normal Form Shipment. ***These limits are important because you should always send containers back to the Nuclear Pharmacy as Limited Quantity packages.***

If combinations of radionuclides are shipped together in the same package, the total activity for the package must not exceed the lowest activity limit noted below for the radionuclides to be shipped. Sealed/solid sources noted below have been multiplied by ten.

Radionuclide	mCi Max Activity	MBq Activity	Max
F-18	1.6	59.2	
P-32	1.4	51.8	
Co-57 sources	270	9990	
Ga-67	8.1	300	
Sr-89	1.6	59.2	
Y-90	0.81	30	
Mo-99 generators	20	790	
Tc-99m	11.0	407	
Pd-103 seeds	1100	4074	
In-111	8.1	300	
I-123	8.1	300	
I-125 seeds	81	3000	
I-131	1.89	70	
Xe-133 gas	270	10000	
Ho-166	1.1	40.8	
Tl-201	11.0	407	