

CHAPTER 5 PROCUREMENT AND TRANSFER OF RADIOACTIVE MATERIALS

1.0 PROCUREMENT POLICY

The University policy is that all orders for radioactive materials must be placed through the Procurement Office. Direct purchases from suppliers are prohibited, regardless of the amount to be expended. Athens campus radioisotope deliveries must be made to Radiation Safety, unless a written exception is granted by the Radiation Safety Committee. Authorized Users at outlying facilities, including the Tifton and Griffin experiment stations, will generally be granted approval for direct delivery.

2.0 PRECAUTIONS / PREREQUISITES

- Prior to ordering radioactive materials, Authorized Users must be approved by the RSC for the type and quantity of radioactive materials desired.
- Individuals performing transportation, shipment, or receipt of radioactive materials must have training in the requirements of this procedure and in the proper performance of radiological surveys. Advanced Radiation Worker training and DOT Basic Awareness training or an RSO approved equivalent is considered appropriate.
- Personnel opening radioactive material packages or working with radioactive materials shall wear personnel protective equipment (PPE) and dosimetry as required by this manual.

3.0 ORDERING PROCEDURE

To place an order for radioactive materials, Authorized Users must first be granted access to an electronic database system. This database is maintained by the Radiation Safety staff. After an AU has been approved for radioactive materials use by the RSC, his permit information is set-up in the database system by the Radiation Safety staff. The isotope and quantity limits that have been approved by the RSC are entered in the database. This database serves to control access and to track radioactive materials inventory. In the event of a malfunction of the electronic database system, the RSO may approve the use of an alternate system of inventory verification and tracking.

The following steps may be used to place an order for radioactive materials via the electronic database system.

- 1) The Authorized User or designee will log onto the database and input information in support of the radioactive materials order. If the isotope and quantity requested are within the prescribed limits for the Authorized User, the information is accepted into the system and an authorization tracking number (referred to as a "B number") is issued for the order. An authorization tracking number is a unique identifier for an individual order and is not reusable.
- 2) The Authorized User should prepare and route a purchase request form in accordance with the instructions of the Administrative Policies and Procedures Manual. The authorization number (B number) must be typed as part of the item description on the purchase request form. The "Deliver To" space of the purchase request form should be completed as provided in the Administrative Policies and Procedures Manual, with the Authorized Users desired final delivery point. Also, the words "**Deliver to UGA Radiation Safety Laboratory, 110 Riverbend Road Room 120, Athens, GA 30602**" should be typed in the comments area of the purchase request. The Procurement Office will then request that the vendor route the delivery to the Radiation Safety Laboratory where the package will be received and in-processed by Radiation Safety personnel as described in section 4.0 of this procedure.

- 3) The exception to this is when isotopes are ordered by an AU approved for direct delivery. In this case the AU should place a statement on the face of the purchase request to the effect that delivery is to go directly to the authorized use location. In such instances, the delivery information described above should not be typed in the comments area. In order for these purchase orders to be processed, the procurement office must be notified that the RSC has approved the Authorized User for direct delivery. This notification will be provided by the RSO.
- 4) The Procurement Office will issue a Field Purchase Order to the supplier and copies of the purchase order will be distributed to UGA personnel in accordance with standard operating procedures.

4.0 RECEIPT AND INVENTORY TRACKING OF RADIOACTIVE MATERIALS

Radiation Safety will receive and in-process all shipments of radioactive materials directed to them and will re-deliver the shipments to the final delivery point designated on the purchase request form. The Central Receiving Section will not be involved with such deliveries and, therefore, will not perform any automatic follow-up function on outstanding isotope orders. The Authorized User or their designee will be responsible for routine follow-ups. If a significant problem with a given shipment or continued problems with a supplier is encountered in follow-up activity, the Procurement Office should be notified.

Note: Radiological surveys of the exterior surfaces of radioactive material shipments shall be performed as soon as practicable after receipt of the package, but not later than three hours after the package is received if receipt occurs during normal working hours. Packages that are not received during normal working hours are required to be surveyed within three hours of the next normal workday following receipt.

4.1 Inspection and Redelivery

- 1) For deliveries directed to Radiation Safety, Radiation Safety will perform a receipt inspection of each package and evaluate compliance with the requirements of this procedure. If no discrepancies are noted, re-delivery will be made by the Radiation Safety staff to the Authorized User, usually on the same day. An *Inventory of Radioisotopes* form will be prepared and delivered with each shipment. The *Inventory of Radioisotopes* form must be returned to Radiation Safety when the radioactive material has been used up and disposed of.
- 2) Any shipment of radioactive material with more than 200 dpm/100cm² of removable contamination on either the outside package or the inside container will not be delivered to the Authorized User. The vendor should be contacted and arrangements made for a replacement shipment. The shipment may be returned to the vendor or disposed of as waste. The Authorized User will be notified that the shipment has arrived, that it is contaminated and that a replacement should be ordered. Vendor notification for replacement shipments is the responsibility of the Authorized User. The Procurement Department should be made aware of this notification.
- 3) In the case of an AU approved for direct delivery, an individual trained in the requirements of this procedure will be responsible for performing the receipt inspection.
 - A *Package Receipt Record* documenting the shipment receipt and radiological survey data must be completed by the individual performing the receipt inspection and forwarded to Radiation Safety.
 - Laboratory personnel will log in the shipment on an *Inventory of Radioisotopes* form upon arrival. A copy of the *Inventory of Radioisotopes* form must be returned to Radiation Safety

when the shipment has been used up or disposed of as waste. The radioactive materials inventory database will be updated (radioisotope removed from AU's inventory) when the *Inventory of Radioisotopes* form is returned to Radiation Safety.

4.2 Receipt Inspection Procedure

- 1) Precautions/prerequisites:
 - Individuals performing receipt inspections of radioactive materials must be trained to the level of Advanced Radiation Worker, or an RSO approved equivalent.
 - Personnel opening radioactive material packages shall wear a minimum PPE of gloves to prevent hand contamination.
 - Wear personnel dosimetry in accordance with the requirements of this manual when working with radioactive materials.
- 2) Visually inspect the package for any signs of damage, including crushed or punctured containers or signs of leakage. If any signs of damage are noted, store the package within a secondary containment and notify the RSO. Also, request that the person responsible for delivery of the package remain in the area until they can be monitored for contamination. If removable contamination on the outside of the package is confirmed to be in excess of the limits specified below, request that the delivery vehicle remain in place until released by the RSO.
- 3) Check the packing slip for a description of the contents and verify that the isotope and activity of the shipment does not exceed license (or permit) limits.
- 4) Survey the exterior of the package for radiation dose rates. Measure and record the maximum reading at contact on the package and the reading at 1 meter from the package. Compare the results to table 4.2 of this chapter. If the dose rate values are not in compliance with the labeling of the package, notify the RSO or designee. Do not proceed with opening the package.
- 5) Survey the exterior of the package for transferable contamination by performing a wipe test of an area of approximately 300 cm². Count the wipe in an appropriate counting instrument. Results should not exceed 200 dpm/100cm² and shall not exceed 1000 dpm/100cm². If results exceed 1000 dpm/100cm² notify the RSO or designee. Do not proceed with opening the package.
- 6) If no external contamination is indicated, open the package and carefully remove the packing material until the final source container is reached. Again, check for any obvious signs of leakage and take appropriate precautions.
- 7) Packages that contain volatile radioactive materials (I-125/131, S-35, H-3, etc.) in quantities greater than limited quantity shipments should be opened in a fume hood, if available. When appropriate, use shielding to reduce personnel exposure.
- 8) Perform a wipe test of the exterior of the inner-most radioactive materials container. Results shall not exceed 1000 dpm/100cm². If results exceed 1000 dpm/100cm² notify the RSO or designee. Do not proceed with use or delivery of the package unless approved by the RSO.
- 9) Verify that the inner container labeling is correct with the packing slip. Again, this should be done to confirm that the isotope and activity of the shipment does not exceed license (or permit) limits.
- 10) Re-package the inner container into the original shipping package for delivery to the final destination.

Table 4.2
Shipping Label Requirements and Dose Rate Limits

Label Category	Maximum External Contact Dose Rate	Transport Index (TI)*
Limited Quantity	≤0.5 mrem/hr	0
White I**	≤0.5 mrem/hr	0
Yellow II	>0.5 to 50 mrem/hr	0 to 1
Yellow III	>50 to 200 mrem/hr	1 to 10

*The TI is determined by the dose rate at 1 meter (3.3 feet) from the external surface of the package. TI values should be rounded up to the next tenth. The TI value is considered to be zero if the 1-meter dose rate is <0.05 mrem/hr.

**The White I category differs from the Limited Quantity category in that the Curie content exceeds the criteria for a limited quantity of material. Limited quantity values are shown in Table 6.4 of this procedure.

4.3 Inventory Record Keeping

- The Authorized User has the responsibility to keep accurate and up-to-date records of all radioactive materials in their possession. The first step in this process is to use the *Inventory of Radioisotopes* form. It is strongly recommended that copies of this form be kept in a dedicated location, preferably in some type of binder, for easy access and organization.
- The second inventory control tool is the *Radioactive Material Inventory Summary* form. If desired, an electronic equivalent of this form may be maintained. If kept electronically, printed copies may be requested by Radiation Safety for inventory verification purposes.
- The University's radioactive materials license with the state of Georgia requires the performance of a physical verification of radioactive material inventory every six months. Records in support of this inventory verification will be requested by Radiation Safety on a biannual basis.

4.4 Removal of Radioactive Materials from the Inventory of Authorized Users

- When all of the radioactive material assigned to an authorization tracking number (B number) has been used up or disposed of as waste, the *Inventory of Radioisotopes* form (or approved equivalent) must be completed and returned to Radiation Safety. The radioactive materials tracked by the B number on the returned *Inventory of Radioisotopes* form will be removed from the inventory of the respective AU in the database system by the Radiation Safety staff.
- *Inventory of Radioisotopes* forms must be returned promptly in order for the inventory database to be accurate. Additional radioactive materials orders will not be processed (B numbers will not be issued) if the inventory database indicates that a requested order would result in the AU's radioactive material inventory exceeding their possession limit.
- Authorized Users should be aware that radioactive materials are not removed from the inventory database as a result of radioactive decay. Inventory paperwork must be processed as described in this chapter in order for the database to be accurate.
- In the event that a B number is obtained for an order and the order is not completed (not purchased), Radiation Safety should be contacted. After verification that the order has not been procured, the radioactive materials tracked by that B number will be removed from the Authorized

Users inventory.

- AU's are encouraged to dispose of radioisotopes that have exceeded a reasonable shelf life as recommended by the manufacturer. Ionization due to radioactivity can cause the production of free radicals, resulting in accelerated chemical decomposition and increasing the possibility of ruined experiments.

4.5 Receipt of Devices Possessed Under a General License

Individuals who are already in possession of items received under a general license must inform Radiation Safety of the radioactive materials in their possession when they begin working at UGA. Individuals planning to acquire these items should contact Radiation Safety to arrange a transfer. These items must be tracked and controlled in accordance with the University's broad scope radioactive materials license. Some examples of items typically controlled under a general license include the Nickel-63 sources in electron capture detectors as found in certain gas chromatographs and the calibration sources in some liquid scintillation counters. Gas chromatographs and similar measuring and gauging devices that contain sealed radioactive sources may be procured and used by personnel other than Authorized Users if appropriate controls are met. Procurement, transfer, monitoring, training, and registration for these devices must be coordinated with Radiation Safety.

5.0 TRANSFER OF RADIOACTIVE MATERIALS

5.1 External Transfers

Licensed radioactive materials shall not be transferred from one institution to another without the approval of the RSO. The RSO of the institution desiring to make the transfer must contact the RSO of the receiving institution prior to making the transfer. Any individual wishing to initiate or receive an external transfer must notify the RSO well in advance of the transfer. The requirements for labeling, shipping, and receiving of radioactive materials as described in this manual and 49 CFR 173 must be complied with.

5.2 Internal Transfers

Radioactive materials may be transferred from one Authorized User to another by the internal transfer process. These transfers must be coordinated through the Radiation Safety Office and approved before the transfer takes place. The inventory records for both AU's will have to be updated by the Radiation Safety staff. The AU receiving the radioactive materials must be approved for the quantity and type of materials to be transferred and the transfer must not cause their possession limits to be exceeded. The *Internal Transfer of Radioactive Materials* form must be completed and signed by both AU's involved in the transfer. In addition, the requirements of section 6.0 of this procedure must be complied with.

5.3 Gifts and Donations

Gifts and donations of radioactive materials must be controlled in the same manner as for internal and external transfers.

5.4 General Transfer Requirements

- Radioactive materials may only be transferred from an Authorized User's approved location or from one AU to another after receiving approval from Radiation Safety.

- A University researcher who desires to use radioactive materials off campus must contact Radiation Safety well in advance of the proposed time of use.
 - (1) If the proposed site is a University-affiliated experiment station which is licensed to use the isotope in question, a few days' notice should be sufficient.
 - (2) If the proposed site is another institution, not affiliated with the University of Georgia, but licensed to use the isotope in question, approximately two weeks should be allowed for arrangements to be made. The name and phone number of the RSO (or equivalent) at the other institution should be provided to UGA Radiation Safety to facilitate this process.
 - (3) If no license exists for use of radioactive materials at the desired site, then a license amendment must be obtained from the Georgia Department of Natural Resources. A minimum of one month and possibly longer may be required. If the site is out-of-state, requiring coordination with other state regulatory agencies, the required time may be even longer.

6.0 TRANSPORTING RADIOACTIVE MATERIALS

- Transport of radioactive materials in private vehicles is not permitted. The use of University vehicles or common carriers is required, except as noted below.
- An exception to the prohibition regarding transporting radioactive materials in private vehicles is radioactive materials in exempt quantities or concentrations.
- Isotopes destined for common carrier must be checked by Radiation Safety before shipment to assure that they are properly packaged and all shipping papers are completed.
- Other materials exempt from the shipping requirements of this procedure include any radioactive materials in concentrations less than the amounts specified in 10 CFR 20 Appendix B, Table 2, any quantity or concentration of a radioisotope less than the exempt quantities or concentrations specified in 49 CFR 173.436, or any package containing radioactive material having a specific activity not greater than 0.002 micro curies/gram.

6.1 Transportation on University Property

If transportation of radioactive materials is to occur exclusively on University property and no public highways are to be traveled, the following method may be used.

- Ensure that Radiation Safety has approved the transfer.
- Individuals packaging and transporting the radioactive materials should be trained to the level of Advanced Radiation Worker, or an RSO approved equivalent.
- Package the radioactive materials in a secure container with adequate resistance to breakage. A secondary container should be used for liquids to prevent leakage.
- Label the radioactive materials with the isotope, quantity, and date.
- Ensure that contamination on the exterior of the outermost container does not exceed 200 dpm/100cm².
- Survey the exterior of the container for radiation dose rates. If the dose rates exceed 2 mrem/hr at 30 cm or 0.2 mrem/hr at 1 meter, contact the Radiation Safety staff for assistance prior to transporting the material.

- During transport it is considered a good practice to avoid high traffic areas and eating, drinking, and smoking areas. Otherwise, the most practical and direct route should be taken.
- The radioactive materials must be under continuous control of a trained Radiation Worker during transport.

6.2 Transportation by Common Carrier

Radioactive material shipments that are to be shipped by common carrier (Fed-Ex, UPS, etc.) must be approved by the Radiation Safety staff. The packaging and labeling information of this chapter must be followed, except as otherwise directed by the Radiation Safety staff.

6.3 Transportation on Public Roadways

- Radioactive materials must be properly packaged and labeled prior to transport on public highways. This requirement applies to all public highway transportation regardless of whether it is on or off campus.
- Any individual responsible for transporting or packaging radioactive materials for transport over public highways must be trained to the level of Advanced Radiation Worker, or an RSO approved equivalent.
- A "Letter of Intent" must be carried in the vehicle at all times when radioactive material, other than limited quantity, is being transported. Copies of this letter may be obtained from the Radiation Safety Office.
- Whenever practical, the original shipping containers that radioactive materials are received in should be reused. These containers should meet or exceed DOT requirements for packaging of radioactive materials.

6.4 Limited Quantity Shipments of Radioactive Materials

Radioactive material packages in quantities that do not exceed the values shown in Table 6.4 may be shipped as a limited quantity if the dose rate at contact on the exterior of the shipping container does not exceed 0.5 mrem/hr.

In the case of individual packages that contain multiple radioisotopes, the sum of the ratios of the quantity of each isotope in the package to the limit value for that isotope must be <1 to be in compliance with the quantity limits.

Table 6.4
Limited Quantity Values for Typically Used Radioisotopes

Isotope	Limited Quantity Value for Liquids	Limited Quantity Value for Solids
³ H	110 mCi	1100 mCi
¹⁴ C	8.1 mCi	81 mCi
³⁵ S	8.1 mCi	81 mCi
³² P	1.4 mCi	14 mCi
³³ P	2.7 mCi	27 mCi
¹²⁵ I	8.1 mCi	81 mCi
¹²⁹ I	unlimited	unlimited
¹³¹ I	1.9 mCi	19 mCi
¹³³ Ba	8.1 mCi	81 mCi
⁶⁷ Ga	8.1 mCi	81 mCi
⁶³ Ni	81 mCi	810 mCi
⁴⁵ Ca	2.7 mCi	27 mCi
²¹⁰ Po	0.054 mCi	0.54 mCi
¹³⁷ Cs	1.6 mCi	16 mCi
⁵⁷ Co	27 mCi	270 mCi
⁶⁰ Co	1.1 mCi	11 mCi
^{99m} Tc	11 mCi	110 mCi
²⁰³ Hg	2.7 mCi	27 mCi

Instructions for Packaging Limited Quantities of Radioactive Materials

- 1) Package the materials in a suitable container with enough packing material or a secondary containment to contain any spillage in case of breakage. This is the inside container.
- 2) The inside container of radioactive materials must be labeled “Caution, Radioactive Materials” and should describe the isotope, quantity, and assay date.
- 3) Place the inside container in a strong tight outer container. Add packing materials suitable to keep the inside container from moving within the outer container.
- 4) Survey the exterior surface of the package (outer container) with a portable instrument. If the dose rate exceeds 0.5 mrem/hr, repackage the container to reduce the dose rate. If this is not practical contact the Radiation Safety staff for assistance.
- 5) Survey the exterior of the package for transferable contamination by performing a wipe test covering an area of approximately 300 cm². Count the wipe in an appropriate counting instrument. Results should not exceed 200 dpm/100cm² and shall not exceed 1000 dpm/100cm².
- 6) Document the shipment survey on the *Limited Quantity Shipment Form*. Alternatively, a Radiological Survey Form (RSF) or equivalent may be used to document the survey if approved by the RSO or designee.
- 7) The designation “UN 2910” must be marked on at least one side or one end of the outside of the package in a manner that it is durable, legible, and readily visible.
- 8) The following statement must appear on a label placed on the outside of the package or on a packing slip, or equivalent, located inside the package:

“This package conforms to the conditions and limitations specified in 49 CFR 173.421 for

radioactive material, excepted package-limited quantity of material, UN 2910.”

- 9) Do not place any other radioactive material labels on the exterior of the shipping container.
- 10) All outgoing shipments must be approved by the Radiation Safety staff prior to transport.

6.5 Limited Quantity Shipments of Instruments and Articles

A commercially manufactured instrument or article that contains radioactive material may be shipped as a Limited Quantity if the following conditions are met:

- 1) The quantity of radioactive material must not exceed 10 times the value for solids shown in Table 6.4.
- 2) The radiation level at 10 cm from any point on the external surface of the unpackaged item must not exceed 10 mrem/hr.
- 3) The radiation level on the exterior surface of the shipping container must not exceed 0.5 mrem/hr.
- 4) The transferable contamination levels on the exterior surface must be in compliance with item 5 of section 6.4.
- 5) Radiological surveys of the item should be documented on a RSF or an RSO approved equivalent. .
- 6) The designation “UN 2911” must be marked on at least one side or one end of the outside of the shipping container in a manner that it is durable, legible, and readily visible.
- 7) The following statement must appear on a label placed on the outside of the package or on a packing slip, or equivalent, located inside the package:
“This package conforms to the conditions and limitations specified in 49 CFR 173.424 for radioactive material, excepted package-instruments or articles, UN 2911.”
- 8) All outgoing shipments must be approved by the Radiation Safety staff prior to transport.

6.6 Shipments of Radioactive Material in Quantities Exceeding Limited Quantities

Packages of radioactive materials which exceed the criteria described in section 6.4 or 6.5 for limited quantity shipments must be inspected, surveyed, and have shipping papers completed by the Radiation Safety staff prior to transport by either University vehicle or common carrier.

7.0 EXEMPT ITEMS

The items described below are exempt from the procurement and transfer requirements of this procedure. However, a manufactured product containing radioactive materials must not be used in any manner that is not approved by the manufacturer. These items should not be disassembled, altered, modified, or repaired; unless the items are returned to the manufacturer or their authorized representative, except as approved by the RSO. Naturally occurring radioactive materials shall not be used in any manner which could cause the concentration, extraction, or dispersal of the radioactive materials. The Radiation Safety Office must also be contacted regarding proper disposal of such items.

Items that are exempt from the procurement and transfer requirements of this procedure include the following:

- Industrial products that contain exempt quantities or concentrations of radioactive materials, including; smoke detectors, self-illuminated signs, etc.
- Manufactured products, radioactive standards, or sealed sources containing exempt radioactive materials as defined by the Georgia Department of Natural Resources in Rule 391-3-17.02, *Licensing of Radioactive Material* and by the Nuclear Regulatory Commission in 10 CFR 30.
- Naturally occurring radioactive material (NORM) in exempt quantities or concentrations.
- X-ray, imaging devices, and radioactive materials controlled under medical (human) use protocols or that are controlled in accordance with Chapter 290-5-22, *Rules and Regulations for X-Rays*.
- Any radioactive materials in quantities less than the amounts specified in 10 CFR 20 Appendix B, Table 2.

8.0 ATTACHMENTS

Package Receipt Record (example)

Inventory of Radioisotopes (example)

Radioactive Material Inventory Summary (example)

Internal Transfer of Radioactive Materials (example)

Limited Quantity Shipment Form (example)