

Western Michigan University Radiation Safety

Source Inventory and Control Program

Purpose

- A. To ensure all Western Michigan University licensed material and radiation producing machines are controlled and accounted for.
- B. To provide guidance on the proper handling and care of licensed material to maintain exposure As Low As Reasonably Achievable (ALARA).

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I. Responsibilities

A. Executive Manager

1. Support the RSO and AUs in complying with the requirements of this program.

B. Radiation Safety Officer (RSO)

1. Order the needed radioactive material.
2. Receive the radioactive material ordered.
3. Maintain the Campus RAM inventory.
4. Leak test sealed non-gaseous sources.
5. Perform the semi-annual source inventory.
6. Investigate discrepancies between the Campus RAM inventory and the AU semi-annual inventories.
7. Review radiation producing machine registration requests.
8. Complete and submit radiation producing machine registrations to the appropriate State Agencies.
9. Perform initial run surveys for radiation producing machines.
10. Provide storage for the documentation required by this program.

C. Authorized User (AUs)

1. Maintain their RAM Activity Log (inventory).
2. Submit a semi-annual source inventory to the RSO.
3. Complete or verify complete RAM order requests prior to submitting them to the RSO.
4. Notify the RSO of the need to transfer RAM accountability from one AU to another.
5. Move or direct the movement of RAM to and from the storage area and their lab.

D. Radiation Producing Machine Supervisors

1. Complete the registration requests before the machine is purchased or brought on campus.
2. Develop the operating procedures for the safe operation of the machines.
3. Run the machines in accordance with approved procedures.

II. Definitions

Contact Reading	Dose rate readings taken within 1/4 -1/2 inch from the surface of an object.
Leak test	A wipe survey performed on non-gaseous sealed sources to ensure that there is no leakage of radioactive material. Devices containing only Kr-85 or H-3 are exempt from leak testing. Also, devices that contain $\leq 100 \mu\text{Ci}$ of β or γ emitting material are exempt.
License	Official authorization to possess and use radioactive material. The license also stipulates additional parameters by which we must abide while using radioactive material.
Package	The packaging together with its radioactive contents as presented for transport.

Packaging	The container or receptacle that makes up the containment system for radioactive transport. This includes any absorbent materials, shielding, etc.
Radioactive / Licensed Material (RAM)	Source material, special nuclear material, or by-product material received, possessed, used, transferred, or disposed of under a license issued by the NRC.

III. Requirements for NRC Licensed Material and State Registered Machines

A. Permissible quantities [10CFR33.17 and 100 / License]

1. Maximum quantity of licensed material on campus is directed by our license.
2. Each AU is authorized by the RSO a maximum quantity per isotope allowed to be in use, storage, and in waste in their lab.

B. Security [10CFR20.1801 and 1802 / 10CFR30.34]

1. Unattended sources and radiation-producing machines OR the rooms containing them will be locked.
2. While working with material, the user is responsible for its security with a good work practice being to maintain the material within 'line of sight.'
3. Transporting nuclear gauges require additional precautions and measures and will be conducted in accordance with the Transportation of Radioactive Material/Waste Program.

C. Inventory [10CFR33.17 / NUREG 1556 Vol 7]

1. A semi-annual inventory of all sealed and unsealed sources will be conducted.
2. The semi-annual inventory will include:
 - a. An area by area accounting
 - b. For each isotope:
 1. Calibration date
 2. Lot number
 3. Estimate of activity remaining in vial or incorporated into another medium awaiting further research activities
 4. Estimated activity in area's liquid waste container(s)
 5. Estimated activity in area's dry waste container(s)
 6. Estimated volume sent to the storage area.

D. Leak test of sealed non-gaseous sources [10CFR30.32 / NUREG 1556 Vol 7 / License]

1. Tests are required semi-annually (every 6 months) unless specified more frequently on the Sealed Source Device Registration Certificate issued by the Nuclear Regulatory Commission.
2. The RSO or designee will conduct the leak test.
3. The leak test will be performed in accordance with Appendix F to Radiological Controls Program procedure or a source specific procedure.

NOTE: NUREG-1556 Vol. 11 "Program Specific Guidance about Licenses of Broad Scope" states that the NRC has found centralized purchasing and receipt to be effective in controlling licensed material entering the institution through normal commercial channels, particularly for larger institutions.

E. Procurement of sealed and unsealed sources [10CFR33.14 / NUREG 1556 Vol 7]

1. Orders are submitted to the RSO or designee via the AU.
2. The RSO or designee places the orders with the vendors.
3. The RSO or designee will receive all orders from the vendors.

F. Procurement of radiation producing machines [R333.5037 and 5293]

1. Should not be brought on campus before it is registered.
2. The user will develop and submit operating procedures for each machine.
3. Users provide registration requests to the RSO.
4. The RSO submits registration applications to the State of Michigan.
5. A survey will be done during the initial run of a new machine or machine that had maintenance performed on it.

G. Transfer responsibilities of RAM/devices/machines between WMU AUs/supervisors or locations.

1. Handled the same as an order to a vendor.
2. Requests are submitted to the RSO or designee.
3. The RSO or designee documents the transfer.
4. The RSO or designee submits registration applications to the State of Michigan for radiation producing machines.
5. A survey will be done during the initial run of a new machine/device or a machine that had maintenance performed on it.

IV. Requirements for General Licensed (GL) Devices

NOTE: These requirements are for devices such as Gas Chromatograph - Electron Capture Detector (GC-ECD) and does NOT pertain to items such as smoke detectors which are also under a GL.

A. Inventory [10CFR71 / 10CFR33.17]

1. The RSO will keep a record of GL items, including:
 - a. Name of person responsible of the equipment,
 - b. Isotope, quantity and type,
 - c. Location
 - d. GL reference number
 - e. Frequency of required leak tests

B. Leak test [10CFR30.32 / NUREG 1556 Vol 7 / License]

1. The frequency specified under the terms of the GL or semi-annually for items that do not have a specified frequency.
2. The RSO or designee performs leak tests.
3. The leak test will be performed in accordance with Appendix F to Radiological Controls Program procedure or a source specific procedure.

C. Procurement, receipt, and transfer of ownership with another WMU user. [10CFR33.14 / NUREG 1556 Vol 7]

1. The user must notify the RSO of the intent to purchase a GL device.
2. The user will develop and submit operating procedures for each device.
3. A survey must be conducted when it arrives.
4. A record of all transfers will be maintained by the RSO.
5. The RSO will update the GL inventory and maintain all records in accordance with the Administrative Controls Program.

D. Transfer of a device to an off-campus location.

1. The user must notify the RSO of the intent to transfer a GL device.
2. Permission must be obtained from the Vendor holding the GL before the item can be moved.
3. The Transportation of Radioactive Material/Waste Program governs the transportation requirements.
3. A record of all transfers will be maintained by the RSO.

V. Final Conditions

- A. All licensed and registered material is accounted for.
- B. All records are maintained in accordance with the Administrative Controls Program.

Appendix A Procurement, Receipt, and Transfer of Responsibility for RAM

I. Procurement

- A. The following steps will be performed by the AU or Radiation Worker (RW) needing RAM:
1. Determine the isotope and quantity needed.
 2. Complete the Radionuclide Order Form.
 3. Obtain authorization from the responsible AU.
 4. Submit the completed form to the RSO or designee.
- B. The following steps will be performed by the RSO or designee:
1. Review the order form.
 - a. AU is authorized for the type, quantity, and use.
 - b. Quantity will not exceed user's inventory.
 - c. Quantity will not exceed the campus' inventory.
 - d. The form is complete and information is valid.
 2. Place the order with the vendor.
 - a. Direct the vendor to clearly mark the package:
"Atten: Radiation Safety Officer"
 - b. Direct the location and time for the delivery.

II. Receipt of RAM

- A. The following steps will be performed by the RSO or designee:
1. Receive the package from the vendor, shipper, or WMU's Shipping and Receiving personnel.

NOTE: Licensed material must have its receipt survey conducted within three (3) hours of receipt for packages labeled Radioactive White I, Yellow II, or Yellow III or packages that are damaged or degraded.

2. Inspect the shipping packaging.
3. Initiate the Radioactive Shipment Receipt Report.
4. Perform a radiation and contamination survey of the exterior of the package.
 - a. Notify the vendor, the final carrier, Department of Transportation, and Nuclear Regulatory Commission, if:
 1. > 200 mR/hr contact
 2. > 10 mR/hr at 1 meter
 3. ≥ 2200 dpm/100 cm² β - γ and/or ≥ 220 dpm/100 cm² α
5. Document the results of the surveys and package inspection.
6. Open the package.
7. Perform a radiation and contamination survey of the package contents.
8. Verify the shipping documentation and the contents agree.
9. Complete the Radioactive Shipment Receipt Report.

10. Transfer and place the material in the proper storage location.
11. Notify the AU/RW of the receipt of their ordered material.
12. Update the Campus' RAM Inventory list.
13. File the completed Radioactive Shipment Receipt Report.

- B. The following steps will be performed by the AU/RW
1. Verify the material received is the material they ordered.
 2. Properly store the material.
 3. Update their RAM Activity Log.

III. Transfer of responsibility for RAM between WMU AUs

- A. The following steps will be performed by the AU or Radiation Worker needing RAM:
1. Determine the isotope and quantity needed.
 2. Complete the Radionuclide Order Form, specifying a material transfer.
 3. Obtain authorization from the responsible AU.
 4. Submit the completed form to the RSO or designee.
- B. The following steps will be performed by the RSO or designee:
1. Review the order form.
 - a. AU is authorized for the type, quantity, and use.
 - b. Quantity will not exceed user's inventory.
 - c. Quantity will not exceed the campus' inventory.
 - d. The form is complete and information is valid.
 2. Submit a change to the State of Michigan registration, if necessary.
 3. Notify the receiving AU of approval or disapproval.
 4. Transfer and place the material in the proper storage location.
 5. Update the Campus' RAM Inventory list.
- C. The following steps will be performed by the new AU/RW
1. Verify the material received is the material they requested.
 2. Properly store the material.
 3. Update their RAM Activity Log.

Appendix B

Movement of Unsealed RAM on Campus

NOTE: This section refers to movements within the same building **ONLY**. Movement of radioactive material over public roadways is addressed in the Transportation Program.

NOTE: This section refers to usable material. The movement of radioactive waste is addressed in the Radioactive Waste and Transportation Programs.

I. Movement of unsealed radioactive material within the same building.

A. The following steps will be performed by the AU or RW using the RAM:

1. Wipe test the outside of the source vial and decontaminate as necessary to < 1,000 dpm/wipe.
2. Place the sample vial into its shipping container.
3. Wipe test the outside of the shipping container and decontaminate as necessary to < 1,000 dpm/wipe.
4. Transfer the material using the predetermined transfer path.
 - a. Notify the RSO if the predetermined transfer path is unavailable.
 - b. Transfer the material using an approved alternate path.
5. Notify the RSO of any problems with the movement.

Appendix C

Procurement, Receipt, or Transfer of State Registered Machines

I. Procurement

A. The following steps will be performed by the Supervisor or Radiation Worker (RW) needing the machine:

1. Identify the machine needed.
2. Complete the Radiation Machine Registration Request Form.

NOTE: The Vendor's manual or instructions may be used in lieu of developing a WMU operating procedure.

3. Develop the operating procedures for the machine, including:
 - a. Precautions, limitations, and steps for safe operation of the machine.
 - b. Radiation protection guidelines; the Radiation Safety Officer can assist.
 - c. Any pertinent technical information from the vendor's manual.
4. Submit the completed form and a copy of the operating procedure(s) to the RSO.

B. The following steps will be performed by the RSO:

1. Transcribe information from the request form to the State of Michigan's registration application or draft a letter stating the desired change to an existing registration.
2. Submit the application or letter and necessary fees to the State of Michigan.
3. Notify the applicant of the application status.
4. Order the machine when the registration certificate and tag has arrived.

II. Receipt of a Radiation Producing Machine

A. The following steps will be performed by the Supervisor or RW needing the machine:

1. Notify the RSO when the machine arrives, is in place, and ready for operation.
2. Post the required documents in the room.

NOTE: The RSO must be present to verify radiation levels during the initial operations of a radiation producing machine.

3. Run the machine in accordance with the approved operating procedures.

B. The following steps will be performed by the RSO:

1. Perform a radiation survey during the initial run, include as a minimum:
 - a. Contact; all sides, top and bottom if accessible.
 - b. General Area.
 - c. Adjacent areas, if contact readings or general area levels cannot be obtained.
2. Determine if the room needs additional posting or shielding.
3. Provide a copy of the initial survey to the area supervisor for future comparison.
4. File the survey, application, and registration.

5. Update the records as necessary.

III. Transfer of responsibility for the machine between WMU supervisors or a change in the machine's location.

- A. The following steps will be performed by the Supervisor or RW needing the machine:
 1. Identify the machine needed.
 2. Complete the Radiation Machine Registration Request Form.

NOTE: The Vendor's manual or instructions may be used in lieu of developing a WMU operating procedure.

3. Verify the operating procedures are acceptable or develop new operating procedures for the machine, including:

- a. Precautions, limitations, and steps for safe operation of the machine.
- b. Radiation protection guidelines; the Radiation Safety Officer can assist.
- c. Any pertinent technical information from the vendor's manual.

4. Submit the completed form and a copy of the operating procedure(s) to the RSO.

- B. The following steps will be performed by the RSO:

1. Transcribe information from the request form to the State of Michigan's registration application or draft a letter stating the desired change to an existing registration.
2. Submit the application or letter and necessary fees to the State of Michigan.
3. Notify the applicant of the application status.
4. Authorize the machine movement when the registration certificate and tag has arrived.

- C. The following steps will be performed by the Supervisor or RW needing the machine:

1. Notify the RSO when the machine is in its new place and ready for operation.
2. Post the required documents in the room.

NOTE: The RSO must be present to verify radiation levels during the initial operations of a radiation producing machine.

3. Run the machine in accordance with the approved operating procedures.

- B. The following steps will be performed by the RSO:

1. Perform a radiation survey during the initial run, include as a minimum:
 - a. Contact; all sides, top and bottom if accessible.
 - b. General Area.
 - c. Adjacent areas, if contact readings or general area levels cannot be obtained.
2. Determine if the room needs additional posting or shielding.
3. Provide a copy of the initial survey to the area supervisor for future comparison.
4. File the survey, application, and registration.
5. Update the records as necessary.

Appendix D

Procurement, Receipt, or Transfer of General Licensed Devices

I. Procurement

- A. The following steps will be performed by the Supervisor or Radiation Worker (RW) needing the device:
1. Identify the device needed.
 2. Notify the RSO of intent to purchase/obtain.
 3. Obtain a copy of the General License (GL) from the vendor.

NOTE: The Vendor's manual or instructions may be used in lieu of developing a WMU operating procedure.

4. Develop the operating procedures for the device, including:
 - a. Precautions, limitations, and steps for safe operation of the machine.
 - b. Radiation protection guidelines; the Radiation Safety Officer can assist.
 - c. Any pertinent technical information from the vendor's manual.
5. Submit a copy of the GL and operating procedure(s) to the RSO.

- B. The following steps will be performed by the RSO:
1. Order the device.
 2. Notify the supervisor or RW of the order status.

II. Receipt of a GL device

- A. The following steps will be performed by the Supervisor or RW:
1. Notify the RSO when the device arrives, is in place, and ready for operation.
 2. Post the required documents in the room.
 3. Run the device in accordance with the approved operating procedures.
- B. The following steps will be performed by the RSO:
1. Perform a leak test during the initial run.
 2. Determine the frequency of leak tests.
 3. Update the records as necessary.

NOTE: If the device is being transferred/moved off campus follow the Transportation Program.

III. Transfer of responsibility of a GL device between WMU supervisors or a change in the device's on campus location.

- A. The following steps will be performed by the Supervisor or RW needing the device:
1. Identify the device needed.
 2. Notify the RSO of intent to transfer or move the device.

NOTE: The Vendor's manual or instructions may be used in lieu of developing a WMU operating procedure.

3. Verify the operating procedures are acceptable or develop new operating procedures for the machine, including:
 - a. Precautions, limitations, and steps for safe operation of the machine.
 - b. Radiation protection guidelines; the Radiation Safety Officer can assist.
 - c. Any pertinent technical information from the vendor's manual.
 4. Submit a copy of the operating procedure(s) to the RSO.
- B. The following steps will be performed by the RSO:
1. Conduct a leak test.
 2. Notify the current and new user of the results.
 3. Authorize the device movement.
- C. The following steps will be performed by the Supervisor or RW:
1. Move the device to its new location.
 2. Notify the RSO when the device arrives, is in place, and ready for operation.
 3. Post the required documents in the room.
 4. Run the device in accordance with the approved operating procedures.
- D. The following steps will be performed by the RSO:
1. Perform a leak test during the initial run.
 2. Update the records as necessary.