# Sealed Sources Safety Manual

IOWA STATE UNIVERSITY

Environmental Health and Safety

2408 Wanda Daley Drive
Ames, Iowa 50011-3602
(515) 294-5359 |www.ehs.iastate.edu



Reviewed 2018

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

**Protecting the Safety, Health, and Environment of the Iowa State Community**

Iowa State University strives to be a model for safety, health, and environmental excellence in teaching, research, extension, and the management of its facilities. In pursuit of this goal, appropriate policies and procedures have been developed and must be followed to ensure the Iowa State community operates in an environment free from recognized hazards. Faculty, staff, and students are responsible for following established policies and are encouraged to adopt practices that ensure safety, protect health, and minimize the institution's impact on the environment.

As an institution of higher learning, Iowa State University

- fosters an understanding of and a responsibility for the environment,
- encourages individuals to be knowledgeable about safety, health and environmental issues that affect their discipline, and
- shares examples of superior safety, health and environmental performance with peer institutions, the State of Iowa and the local community.

As a responsible steward of facilities and the environment, Iowa State University

- strives to provide and maintain safe working environments that minimize the risk of injury or illness to faculty, staff, students, and the public,
- continuously improves operations, with the goal of meeting or exceeding safety, health and environmental regulations, rules, policies, or consensus standards, and
- employs innovative strategies of waste minimization and pollution prevention to reduce the use of toxic substances, promote reuse, and encourage the purchase of renewable, recyclable and recycled materials.

The intent of this statement is to promote environmental stewardship, protect health, and encourage safe work practices within the Iowa State University community. The cooperative efforts of the campus community will ensure that Iowa State University continues to be a great place to live, work, and learn.

Wendy Wintersteen
President

# Directory of Service and Emergency Providers

## Services

**Environmental Health and Safety**
2408 Wanda Daley Drive | (515) 294-5359

**Iowa State University Occupational Medicine Department**
G11 Technical and Administrative Services Facility (TASF), 2408 Pammel Drive | (515) 294-2056

**McFarland Clinic PC, Occupational Medicine**
1018 Duff Avenue | (515) 239-4496

**Thielen Student Health Center**
2647 Union Drive | (515) 294-5801

## Emergency

**Emergency - Ambulance, Fire, Police**
911

**Department of Public Safety/ Iowa State University Police**
Armory, 2519 Osborn Drive | (515) 294-4428

**Mary Greeley Medical Center**
1111 Duff Avenue | (515) 239-2011

## Table of Contents

# A. Introduction

A sealed source is radioactive material (RAM) that is permanently bonded or fixed in a capsule or matrix designed to prevent release of the RAM under normal working conditions. Iowa State University (ISU) has organized sealed sources into four categories: generally licensed materials, check sources, license specific sources, and nuclear gauges.

**Generally licensed materials** are items that containing a RAM source to illuminate, detect, measure, gauge, or control the composition of various items. Common devices containing generally licensed materials include: gas chromatographs, liquid scintillation detectors, lead analyzers, x-ray fluorescent analyzers, exit signs, and static eliminators. Generally licensed materials are registered with the Iowa Department of Public Health (IDPH) annually.

**Check sources** are small encapsulated or plated sources of RAM used for instrument verification, laboratory experiments, or class room demonstrations. Check sources are subject to the requirements listed in this manual.

**License-specific sources** are specifically listed on ISU's Broadscope Radioactive Materials License. These sources require a higher level of control. Medical therapy and large calibration sources are common types of license specific sources.

**Nuclear gauges** are instruments containing RAM used to measure the density, moisture content, or composition of materials. Gauges can be either fixed or portable and are license specific sources. Portable gauges require additional training, transport, and security controls.

The possession and use of sealed sources in Iowa is regulated. These rules are found in Chapter 136C of the Iowa Administrative Code (IAC) and are administered by the Bureau of Radiological Health of the Iowa Department of Public Health (IDPH). ISU holds a Broadscope Radioactive Materials License and a General Materials License through IDPH for the possession and use of sealed sources.

ISU has adopted policies that reduce the hazards of radiation and minimize radiation exposures. ISU has established a Radiation Safety Committee (RSC) to oversee the safe use of RAM on campus. The Radiation Safety Officer (RSO) is a permanent member of the RSC and is designated as the radiation safety expert who oversees the daily operation of ISU's Radiation Safety Program.

At ISU, the Department of Environmental Health and Safety (EH&S) has implemented the procedures contained in *ISU's Radioactive Materials Safety Manual, Sealed Source Safety Manual,* and

*Laboratory Safety Manual.* When used together these three manuals outline the minimum requirements for the use of sealed sources at ISU. While meeting the minimum requirements constitute compliance, safety performance within the laboratory should be the goal of everyone working with sealed sources.

# B. Process Planning

The use of sealed sources under Iowa State University's (ISU's) licenses requires the approval of the Radiation Safety Committee (RSC). New projects or changes to existing projects must be reviewed and approved by the RSC. Principal investigators (PIs) wanting to use sealed sources must apply for a Sealed Source Use Authorization. Authorizations may be revoked for non-compliance of procedures, deliberate misuse of sealed sources, or for failing to complete annual training.

## Authorization Process

### Application for Initial Use

The PI must submit a completed Sealed Source Use Application to Environmental Health and Safety (EH&S). Application forms are available from the Office of Responsible Research (ORR) website or the Radiation Safety section of the EH&S website. See the Appendix for application instructions.

### Review and Approval of Application

**Note**:

All new applications must be reviewed and approved by the RSC.

A PI will submit an application to the Radiation Safety Officer (RSO) for review. The RSO may request additional information before submitting the application to the RSC for approval. The RSC will render a decision for or against approval and inform the RSO. Special conditions may be specified on the authorization based on the reviews. An approved Sealed Source Use Authorization will be sent to the PI and an appointment will be made to set-up the laboratory.

### Laboratory Set–Up

Upon approval EH&S staff will contact the PI to schedule set up the lab and hang required postings.

### Authorization Amendments

**Note:**

All new protocols must be approved by the RSC.

PIs and lab personnel are only allowed to use sealed sources as outlined by their approved procedures. Modification to an existing procedure or the addition of a new procedure requires the approval of the RSC through an authorization amendment. To amend an authorization a written request must be submitted to the RSO for review. The amendment will be forwarded to the RSC for approval. Minor changes, such as adding personnel, increasing possession limits, or changing storage and use locations are reviewed and approved by the RSO. Extensive changes such as adding additional sources, or devices will be reviewed by the RSC.

**Note**:

Obtain an Approval in Concept when applying for a grant without a Sealed Source Authorization.

## Adding Personnel

Adding personnel to an authorization is completed through the training process. Once new personnel complete their sealed source safety training a signed Sealed Source Worker Application must be submitted to EH&S. Upon verification of training status and an assessment of dosimetry needs, EH&S will update the authorization and send a revised copy to the PI. Allowing untrained or unapproved personnel to use sealed sources, even under supervision, is not allowed.

## Approvals when Applying for Grants

Approval in Concept is a pre-approval issued by the RSC to allow researchers to apply for grants without having to secure a sealed source authorization. The Approval in Concept requires the PI to accept the requirements within the Sealed Source Safety Manual if the grant is funded. No research with sealed sources may be conducted under this pre-approval. Submission of a Sealed Source Use Authorization Application is required to obtain RSC approval prior to conducting research. See the Appendix for application instructions.

## Authorization Closure and Decommissioning

When sealed source projects are completed or no longer active, a request to close the authorization must be submitted to EH&S. EH&S will schedule a time to collect materials and remove postings from the laboratory. Anticipated future funding does not qualify as an active project.

## Research Centers

Research centers are units that provide research services to customers or that serve as a teaching laboratory. Operating as a Research center provides administrative relief to the PI by allowing the PI to manage personnel within the lab. Research centers are required to

- Provide EH&S with a procedure detailing how training records will be maintained (who is in charge, location of records, etc.).
- Maintain records of EH&S annual Sealed Source Safety training for all users.
- Maintain records of annual laboratory specific training.
- Ensure that only authorized people are allowed to use the sources or devices.
- Provide EH&S with copies of the Sealed Source Worker Applications and usage logs annually.
- Contact EH&S for approval prior to using a new research

protocol or change in current protocols.

- Be aware of other approvals that may be needed (IACUC, IRB, IBC, etc.).

Approval of the RSO is required before operating as a research center.

## Responsibilities

The Sealed Source Safety Manual covers the procedures required for the safe and proper use of sealed sources. Sealed Source Use Authorizations may be revoked for non-compliance. When handled in accordance with this manual, exposures to employees, students, and the general public will be As Low As Reasonably Achievable (ALARA).

### Responsibilities of Authorized Personnel

Authorized personnel named on a Sealed Source Use Authorization are responsible for the safe use of sealed sources. All personnel must:

- Minimize personal exposure.
- Maintain public exposure ALARA.
- Prevent unauthorized access to sealed sources.
- Complete all required training within the time period specified by the RSC.
- Wear assigned personnel monitoring devices.
- Comply with the Sealed Source Safety, Radioactive Materials Safety, and Laboratory Safety manuals.
- Know location of all sealed sources and minimize associated risks.
- Maintain postings, labels, and markings for sources and work areas.
- Maintain usage logs, if applicable, and inventories.
- Dispose of sealed sources properly.
- Notify EH&S immediately of all unusual events including: damaged sources, missing inventory, etc.

### Responsibilities of Principal Investigators

In addition to the responsibilities of authorized personnel, the PI is responsible for ensuring that

- All authorized personnel have completed EH&S and laboratory safety training requirements including annual Sealed Source Safety training.

- All rules, regulations, and procedures for the safe use of sealed sources are followed.
- An accurate inventory of sealed sources is maintained.
- EH&S is notified prior to any changes in the storage or use of sealed sources.
- All uses of sealed sources are maintained ALARA.
- All written SOPs for using sealed sources are current and accurate.
- EH&S is informed when authorized personnel are no longer associated with the laboratory.
- EH&S is informed prior to the PI leaving ISU or when sealed source projects are completed.

## Personnel Exposure and Monitoring

Radiation exposure limits are based on the Linear-No Threshold dose model that assumes all radiation exposures carry some risk. To minimize risk, workers are required to keep all exposures ALARA. Engineering and administrative controls and personnel protective equipment are utilized to achieve ALARA.

For additional information about the fundamentals of radioactivity and ionizing radiation, measurement of radiation, biological effects of radiation, or radiation safety for laboratory use.

### Occupational Dose Limits

Limits for occupational radiation exposure have been established to prevent acute biological effects, such as erythema or epilation, and minimize latent biological effects, such as cancer or genetic damage. These annual limits are listed in the following table.

### Personnel Monitoring

Licensees are require to monitor any individual that is likely to receive more than 10% of any annual occupational radiation dose limit. Workers likely to exceed a 500 mrem whole body dose or 5000 mrem extremity dose in one year will be issued a radiation dosimeter.

In order for a dosimeter to provide an accurate indication of an individual's dose, it must be worn properly. For assessing whole body doses, the dosimeter should be worn on the front of the torso such as a breast pocket, lapel, or belt. For additional guidance refer to the Proper Dosimetry Use Guide on how to wear and store your dosimeter.

## Safety Audits

Performance audits for Sealed Source Use Authorizations are performed by EH&S at least annually. During each audit, the PI's radionuclide inventory, authorization, security, training records, usage log, and shipping paperwork are reviewed and worker performance is evaluated. General safety conditions may also be assessed. Any problems encountered by EH&S during the audit are communicated to laboratory personnel and the PI. The PI is responsible for correcting any problems identified through EH&S audits. Written corrective action plans may be required based upon the audit findings. EH&S is available to assist the laboratory in correcting problems. The sealed source inspection criteria is available for laboratory use.

## Leak Tests

Sealed sources have some type of encapsulation that prevents their radioactive contents from leaking or dispersing. Care must be used when handling sealed sources to avoid damage, contamination, and personal exposure. Avoid handling sealed sources with sharp forceps that may damage the source. Avoid holding the source in your hand to minimize exposure. To ensure that a sealed source is not leaking, IDPH requires leak testing of some sealed sources at regular intervals. Leaking sources must be removed from service. Devices with embedded sources may require repair by the manufacturer or their service representative.

A source that is in storage is exempt from leak testing requirements. However, it must be inventoried and leak tested prior to use. Stored sources must be leak tested before being returned to service.

**Note:**

Contact EH&S immediately if the source is damaged or you think it might be damaged!

| Type of Sealed Source | Frequency* |
|---|---|
| Static eliminators | 3 months |
| Alpha emitters > 10 uCi | 3 months |
| Gas chromatographs (E.C.D.) | 6 months |
| Nuclear gauges | 6 months |
| Beta, gamma emitters > 100 uCi | 6 months |
| After any incident that could result in damage | Immediately |
| After removal from storage | Immediately |

*or as specified by the Sealed Source and Device Registry certificate

If you are working with:

- Generally Licensed Materials – click here
- Check Sources – click here
- License-Specific Sources – click here
- Nuclear Gauges – click here

# C. Specific Safety Practices

## Generally Licensed Material

### Training

**Note:**

EH&S online training required one time.

Sealed Source Safety training is required prior to working with generally licensed devices. This training is offered through Learn@ISU Principal investigator (PI) and lab supervisors are required to take retraining annually. Annual retraining is not required for other authorized personnel if they are compliant with the procedures in this manual.

**Note:**

Laboratory-specific training required annually.

Documented laboratory-specific training is required annually. Recommended training topics include

- Manufacturer's operating instructions.
- Transfer and disposal requirements.
- Laboratory standard operating procedures (SOPs) including operational requirements and emergency protocols.
- Potential hazards.
- ISU Sealed Source Safety Manual.

### Procurement

All acquisitions of generally licensed materials must be pre-authorized by EH&S including materials funded through capital (new building, renovation, etc.) projects.

- Initiate the process by contacting EH&S to obtain a log number (pre-approval).
- The vendor must be instructed to
  - Reference the log number on the packing slip accompanying the order.
  - Address the shipment to EH&S.

    Environmental Health and Safety
    Iowa State University
    2408 Wanda Daley Drive
    Ames, Iowa 50011-3660
    Log Number: xxxx-xxxx
- For additional information regarding the procurement of sealed sources, refer to How do I Buy... Radioactive Isotopes.

### Receipt of sources

EH&S will receive all generally licensed materials at the

Environmental Health and Safety Services Building (EHSSB). EH&S will monitor each package for contamination and exposure, enter the source into the university's RAM inventory, generate a datapage (transfer document), and create an Inventory and Usage Log. The package will be delivered to the laboratory by EH&S staff.

With prior approval large items, such as gas chromatographs or liquid scintillation detectors, may be delivered directly to the PI.

### Security

PIs and lab personnel must ensure that generally licensed materials are secured from unauthorized use, transfer, tampering, or theft. Generally licensed materials must be secured by at least one of the following:

- Keeping them under constant 'line of sight' surveillance by an approved user.
- Locking the approved laboratory.
- Placing them in locked, permanent storage (such as a cabinet with a lock) within the approved use or storage area.

Any known or suspected loss or theft of sources must be reported to EH&S immediately.

### Inventory

PIs are required to maintain inventory records. To facilitate this process, EH&S provides an Inventory and Usage Log for each source/device. The location of each source/device is recorded by EH&S to facilitate leak testing and inventory requirements. If it becomes necessary to move a source/device to a new location, EH&S must be notified prior to the move. If a source cannot be located, contact EH&S immediately.

**Note:**

Contact EH&S immediately for any lost or missing source.

### Storage

Unused generally licensed materials, such as liquid scintillation counters and gas chromatographs, must be transferred to another user or transferred for disposal within two years of their last use. Equipment storage to avoid disposal fees is not permitted. Operable devices kept for future use are excluded from the two-year time limit, but must be inventoried quarterly by EH&S. This quarterly inventory is part of the EH&S fee-for-service program.

**Note:**

Storage cannot be used to avoid disposal fees!

### Transfer

If you intend to transfer the materials to another user or send it to ISU Surplus, you must notify EH&S prior to that transfer. All transfers of generally licensed material must follow Iowa

Department of Public Health (IDPH) rules, Iowa State University's export controls policy, and ISU Surplus procedures.

## Disposal

**Note:**

Transfers must have prior approval!

Disposal of large generally licensed devices must be completed through ISU Surplus or the equipment manufacturer, with EH&S guidance. To request a lab equipment disposal, submit a Laboratory Equipment Disposal Form to EH&S. Iowa State University is not licensed to remove embedded sources from generally licensed devices. Devices with embedded sources may require removal of the generally licensed material by the manufacturer or their service representative. Disposal costs are the responsibility of the PI. Equipment storage to avoid disposal expense is not permitted.

**Note:**

The PI is responsible for disposal costs.

Disposal of small generally licensed materials, such as static eliminators, are processed through EH&S. Place the vial consignment sheet from the Inventory and Usage Log with the sealed source, do not place the consignment sheet inside the container with the source. Contact EH&S to request material pick-up.

## Transportation

Transportation of generally licensed materials must be in accordance with Iowa State University procedures and Iowa Department of Public Health (IDPH) and U.S. Department of Transportation (USDOT) rules. EH&S must be notified before the transportation takes place. Only Iowa State University vehicles may be used to transport generally licensed materials. Contact EH&S for additional information.

**Campus** – All packages used to transport generally licensed devices on campus must be strong, tight containers that will not leak under normal transportation conditions. All transportation mishaps such as leakage, theft, or damage must be reported to EH&S upon discovery. The outside of the package must include the:

- Radioactive marking
- Name of the PI
- Radionuclide(s)
- Activity (in dpm, µCi, mCi, or Bq)

**Off-Campus** – Iowa State University personnel may be required to transport generally licensed materials across public roads to off-campus locations. IDPH, Nuclear Regulatory Commission (NRC), and Department of Transportation (DOT) transportation rules for shipment and carriage must be followed. EH&S must review and approve all transportation of sources to off-campus locations. Proper documentation for off-campus work will be provided by EH&S.

**Note:**

Sealed source training is provided through the EH&S Learning Center!

## Check Sources

### Training

Sealed Source Safety training is required prior to working with check sources. Retraining is required annually. Those who do not complete the annual retraining within the established time frame (January-February) will be removed as authorized personnel.

Lab-specific training is required annually and must be documented. Recommended training topics include

- Iowa State's transfer and disposal requirements.
- Laboratory SOPs including operational requirements and emergency protocols.
- Potential hazards.
- ISU's Sealed Source Safety Manual.

### Exempt Sources

Exempt sources are sealed sources that are radioactive, but are considered exempt from Iowa Department of Public Health (IDPH) ruled. Exempt sources require one-time sealed source safety training which will serve as radiation safety awareness training. Exempt sources must follow the authorization, purchasing, inventory, security, safe handling, and disposal requirements of this manual.

### Procurement and Receipt

The Department of Environmental Health and Safety (EH&S) will receive all sealed sources at the Environmental Health and Safety Services Building (EHSSB). EH&S will monitor each package for contamination and exposure, enter the source into the university's RAM inventory, generate a datapage (transfer document), and create an Inventory and Usage Log. The package will be delivered to the laboratory by EH&S staff. **Do not have a radioactive source shipped directly to your laboratory.** If a radiation source is delivered directly to the laboratory, contact EH&S immediately.

- Initiate the process by contacting EH&S to obtain a log number (pre-approval).
- The vendor must be instructed to
  - ¤ Reference the log number on the packing slip accompanying the order.
  - ¤ Address the shipment to EH&S.

    Environmental Health and Safety

Iowa State University
2408 Wanda Daley Drive
Ames, Iowa 50011-3660
Log Number: xxxx-xxxx

- For additional information regarding the procurement of sealed sources refer to How do I Buy… Radioactive Isotopes.

## Security

Principal Investigators (PIs) and lab personnel must ensure that check sources are secured from unauthorized use, transfer, tampering, or theft. Check sources must be secured by at least one of the following:

- Keeping them under constant 'line of sight' surveillance by an approved user.
- Locking the approved laboratory.
- Placing them in locked, permanent storage (such as a cabinet with a lock) within the approved use or storage area.

Any known or suspected loss or theft of sources must be reported immediately to EH&S.

**Note:**

Any lost or missing source must be reported immediately to EH&S!

## Inventory

The PI is required to maintain inventory records. EH&S provides an Inventory and Usage Log with each check source. The Inventory and Usage Logs should be used by laboratory staff to track the check source inventory. EH&S staff can provide a copy of the laboratory's current inventory to assist with quarterly inventory checks. Sources are inventoried at least annually by EH&S staff.

If a source cannot be located, contact EH&S immediately.

## Equipment

A calibrated radiation detection meter may be required for verification of sources. Contact EH&S for the correct type of meter to use with your sources.

## Storage

The location of each sealed source is recorded by the radiation safety staff to facilitate leak testing and inventory requirements. If it becomes necessary to move a check source to a new location, either permanently or for an extended period of time, EH&S must be notified prior to the move.

**Note:**

Storage cannot be used to avoid disposal fees!

**Note:**

Transfers must have prior approval!

**Note**:

PI is responsible for disposal costs.

## Transfer

If you intend to transfer the materials to another user or send it to ISU Surplus, you must notify EH&S prior to that transfer. All transfers of generally licensed material must follow IDPH rules, Iowa State University's export controls policy, and ISU Surplus procedures.

## Disposal

Disposal of check sources is completed through EH&S. Place the vial consignment sheet from the Inventory and Usage Log with the sealed source, do not place the consignment sheet inside the container with the source. Contact EH&S to request material pick-up.

## Transportation

Transportation of check sources must be in accordance with Iowa State University procedures and Iowa Department of Public Health (IDPH) and U.S. Department of Transportation (USDOT) rules. EH&S must be notified before the transportation takes place. Only Iowa State University vehicles may be used to transport check sources. Contact EH&S for additional information.

**Campus** – All packages used to transport check sources on campus must be strong, tight containers that will not leak under normal transportation conditions. All transportation mishaps such as leakage, theft, or damage must be reported to EH&S upon discovery. The outside of the package must include

- Radioactive marking
- Name of the PI
- Radionuclide(s)
- Activity (in dpm, µCi, mCi, or Bq)

**Off-Campus** – Iowa State University personnel may be required to transport check sources to off-campus locations. IDPH, Nuclear Regulatory Comission, and DOT transportation rules for shipment and carriage must be followed. EH&S must review and approve all transportation of sources to off-campus locations. Proper documentation for off-campus work will be provided by EH&S.

## License-Specific Sources

**Note:**

Sealed source training is provided through EH&S Learning Center!

### Training

Sealed Source Safety training is required prior to working with license-specific sources. Retraining is required annually. Those who do not complete the annual retraining within the established time frame (January-February) will be removed as authorized personnel.

Lab-specific training is required annually and must be documented. Recommended training topics include

- Manufacturer's operating instructions.
- Iowa State University's (ISU's) transfer and disposal requirements.
- Laboratory SOPs including operational requirements and emergency protocols.
- Potential hazards.
- ISU's Sealed Source Manual.

**Note**:

It may take 4 to 6 weeks to get approval to purchase a license-specific source!

### Procurement and Receipt

License-specific sources require an amendment of ISU's Broadscope License. The amendment process takes four to six weeks to complete.

All acquisitions of license-specific sources must be pre-authorized by the Department of Environmental Health and Safety (EH&S). This includes sources purchased with capital project funds (new building, renovation, etc.). All incoming radioactive material packages are surveyed for leakage, assigned a datapage number, and entered into the inventory database. The package is then delivered to an authorized user.

- Initiate the process by contacting EH&S to obtain a log number (pre-approval).
- The vendor must be instructed to
  - ¤ Reference the log number on the packing slip accompanying the order.
  - ¤ Address the shipment to EH&S.

    Environmental Health and Safety

    Iowa State University

    2408 Wanda Daley Drive

    Ames, Iowa 50011-3660

    Log Number: xxxx-xxxx

- For additional information regarding the procurement of sealed sources refer to How do I Buy… Radioactive Isotopes.

## Security

Principal Investigators (PIs) and lab personnel must ensure that license-specific sources are secured from unauthorized use, transfer, tampering, or theft. License-specific sources must be secured by at least one of the following

- Keeping them under constant 'line of sight' surveillance by an approved user.
- Locking the approved laboratory.
- Placing them in locked, permanent storage (locked cabinet) within the approved use or storage area.

Any known or suspected loss or theft of sources must be reported immediately to EH&S.

## Inventory

PIs is required to maintain inventory records. To facilitate this process, EH&S provides an Inventory and Usage Log for each source/device. The location of each source is recorded by EH&S to facilitate leak testing and inventory requirements. If it becomes necessary to move a source to a new location, EH&S must be notified prior to the move.

**Note:**

Contact EH&S immediately for any lost or missing source.

EH&S conducts a physical inventory of all license specific sources received and possessed under ISU's Broadscope License at intervals not to exceed six months.

If a source cannot be located, contact EH&S immediately.

## Equipment

EH&S will help laboratories determine if a calibrated radiation detection meter is required for source verification. Contact EH&S to initiate the determination and receive assistance for selecting the correct meter.

## Storage

The location of each source is recorded by EH&S to facilitate leak testing and inventory requirements. If it becomes necessary to move a source to a new location, either permanently or for an extended period of time, you must notify EH&S (515) 294-5359 prior to the move.

**Note:**

Storage cannot be used to avoid disposal fees!

## Transfer

If you intend to transfer the materials to another user or send

**Note:**

Transfers must have prior approval!

**Note**:

PI is responsible for disposal costs.

it to ISU Surplus, you must notify EH&S prior to that transfer. All transfers of license-specific sources must follow IDPH rules, Iowa State University's export controls policy, and ISU Surplus procedures.

## Disposal

Disposal of license-specific sources, such as beta therapy sources, is completed through EH&S. Place the vial consignment sheet from the Inventory and Usage Log with the sealed source, do not place the consignment sheet inside the container with the source. Contact EH&S to request material pick-up.

Disposal of devices containing license-specific sources must be completed through ISU Surplus or the equipment manufacturer under EH&S guidance. Submit a Laboratory Equipment Disposal Form to EH&S to start the process.

## Transportation

All transportation of license-specific sources and devices must be in accordance with Iowa State University procedures and Iowa Department of Public Health (IDPH) and U.S. Department of Transportation (USDOT) rules. EH&S must be notified before any transfers or shipments take place.

**Campus** – All packages used to sources on campus must be strong, tight containers that will not leak under normal transportation conditions. All transportation mishaps such as leakage, theft, or damage must be reported to EH&S upon discovery. The outside of the package must include

- Radioactive marking
- Name of the PI
- Radionuclide(s)
- Activity (in dpm, µCi, mCi, or Bq)

**Off-Campus** – Iowa State University personnel may be required to transport license specific sources to off-campus locations. IDPH, NRC, and DOT transportation rules for shipment and carriage must be followed. EH&S must review and approve all transportation of sources to off-campus locations. Proper documentation for off-campus work will be provided by EH&S.

## Nuclear Gauges

### Training

The Principal Investigator (PI) or laboratory supervisor must maintain a valid training certificate from the gauge manufacturer in addition to Iowa State University (ISU) nuclear gauge training. Other gauge operators must receive manufacturer's training from the manufacturer, a manufacturer certificate holder, or a pre-approved third party. All operators must complete ISU nuclear gauge training annually. Those who do not complete the annual ISU retraining during the established course schedule (January-February) will be removed as authorized personnel.

If the gauge is transported by lab personnel at least one person traveling with the gauge must have radioactive materials shippers training which is available from the Department of Environmental Health and Safety (EH&S).

Laboratory-specific training is required annually and must be documented. This training must include

- Manufacturer's operating requirements.
- Laboratory SOPs including operational requirements and emergency protocols.
- Potential hazards.
- ISU's Sealed Source Safety Manual.

### Procurement and Receipt

Nuclear gauges are license specific and new gauges require an amendment of ISU's Broadscope License. The amendment process can take four to six weeks to complete.

All acquisitions of nuclear gauges must be pre-authorized by EH&S including gauges purchased with capital project (new building, renovation, etc.) funds. All incoming radioactive material packages are surveyed for leakage, assigned an identification number, and entered into the inventory database. The package is then delivered to an authorized user.

- Initiate the process by contacting EH&S to obtain a log number (Pre-approval).
- The vendor must be instructed to
  - ¤ Reference the log number on the packing slip accompanying the order.
  - ¤ Address the shipment to EH&S.
    Environmental Health and Safety

**Note:**

It may take 4 to 6 weeks to get approval to purchase a nuclear gauge!

Iowa State University
2408 Wanda Daley Drive
Ames, Iowa 50011-3602
Log Number: xxxx-xxxx

- For additional information regarding the procurement of sealed sources refer to How do I Buy… Radioactive Isotopes.

## Security

PIs and lab personnel must ensure that nuclear gauges are secured from unauthorized use, transfer, tampering, or theft. When in use the nuclear gauge shall be under constant 'line of sight' surveillance by an approved user.

When not in use, the nuclear gauge is required to be secured with two independent physical barriers. Examples of two independent physical barriers include

- Securing the nuclear gauge in a locked storage facility located inside a locked laboratory.
- Securing the nuclear gauge with a cable security restraint inside a locked vehicle.
- Storing the nuclear gauge inside a locked, non-removable box and further securing the box with a steel cable or chain.

If chains or cables are used as a method of providing security, one of the two chains or cables used should be substantially more robust and more difficult to cut than the other. Simply having two chains or cables with locks would not satisfy the security rule unless each chain and lock combination were physically robust enough to provide both a deterrence and a reasonable delay mechanism.

While transporting a nuclear gauge, a licensee should not modify the transportation case if it is being used as the primary container for transporting the device. This includes, but is not limited to, drilling holes to mount the case to the vehicle or to mount brackets or other devices used for securing the case to the vehicle.

**Note:**

Portable nuclear gauges must be secured using two independent physical barriers!

## Inventory

The PI is required to maintain inventory records. EH&S provides an Inventory and Usage log with each source. The Inventory and Usage Log form should be used by laboratory staff to document source inventory. EH&S conducts a physical inventory of all license specific sources received and possessed under Iowa State University's Broadscope License at intervals not to exceed six months.

**Note:**

Notify EH&S immediately if the gauge is missing!

Notify EH&S immediately (24/7) if a nuclear gauge is missing, damaged, or the source cannot be retracted. Nuclear gauge accidents have specific reporting schedules that must be observed.

## Equipment

A calibrated radiation detection meter is required for source verification and exposure measurements. Contact EH&S for the correct type of meter to use with your nuclear gauge.

## Storage

**Postings** – Once a room is approved for nuclear gauge storage or use, EH&S will post the required signs. No work involving nuclear gauges may be initiated until the following signs have been posted.

- "Caution Radioactive Materials" signage – This sign alerts personnel to the presence of sealed sources.
- ISU Radiation Safety Posting – This posting includes ISU procedures and contact information.
- Iowa Department of Public Health (IDPH) Notice to Employees – This document summarizes the rights and responsibilities of radiation workers and provides IDPH contact information.
- IDPH Notice to Workers – This posting includes information on where to find applicable rules for working with radioactive material.

## Safety

- Nuclear gauges should be stored no closer than 15 feet from the nearest work area.
- Always keep unauthorized/untrained persons away from the nuclear gauge.
- Members of the general public shall not receive an equivalent dose of more than 2 mrem (0.002 rem) in any one hour or 100 mrem (0.1 rem) per year.
- After making changes affecting the portable gauge storage area (e.g., changing the location of portable gauges within the storage area, removing shielding, adding portable gauges, changing the occupancy of adjacent areas, moving the storage area to a new location), contact EH&S to reevaluate compliance with public dose limits and ensure proper security of portable gauges.

**Temporary** – If the portable nuclear gauge is used at a remote job site and will not be returned to the permanent storage area at the end of the day, the temporary storage location must follow the

same rules for posting, safety, and security. Temporary storage locations must be approved by EH&S.

### Transfer

If you intend to transfer the materials to another user or send it to ISU Surplus, you must notify EH&S prior to that transfer. All transfers of nuclear gauges must follow IDPH rules, ISU's export controls policy and ISU Surplus procedures.

### Disposal

Disposal of nuclear gauges will be completed through ISU Surplus and an approved licensee, under EH&S guidance. To request a lab equipment disposal, submit a Laboratory Equipment Disposal Form to EH&S. If the equipment manufacturer cannot be located or refuses to take possession of the source, EH&S will assist the PI or department with an alternate disposal method. The PI and/or department will be responsible for all costs associated with equipment disposal. **Storing gauges to avoid disposal costs is not permitted.** Non-operational nuclear gauges should be identified and repaired, transferred, or disposed within a reasonable amount of time.

### Reciprocity

The use of sealed sources outside of Iowa requires licensing by the regulatory agency (Agreement State, USNRC, DOE, or DOD) with jurisdiction at the work location. Typically, the governing agency will grant a one-year reciprocal license allowing ISU to operate within their jurisdiction for up to 180 consecutive or non-consecutive days. All costs for reciprocal licensing are the responsibility of the PI or department conducting the work. Allow at least six weeks to complete approvals and licensing procedures.

**Note:**

Allow at least four weeks for reciprocity approval!

When requesting reciprocity, supply EH&S with the following information

- Specific and detailed work location.
- Planned work dates.
- Company or agency hosting site visit.
- Specific contact information for a representative of the company
  - Name
  - Address
  - Telephone number
  - Email
- Persons who will be performing the work.

- Worksite contact information.

Additional information may be required depending on the requirements of the specific state.

## Transportation

Nuclear gauges are required to meet the marking and labeling requirements described in IDPH, Department of Transportation (DOT), and NRC rules. Correct shipping papers, package certifications, sealed source certificates, leak tests documents, emergency notices and procedures, and driver instructions are also required. All shipping documents must be signed by a shipper holding a radioactive materials shippers certification. EH&S will serve as the shipper and assist the PI and laboratory with correct shipping documents.

Laboratory personnel or the vehicle driver will serve as the courier. A Certified Driver's License (CDL) is required to transport yellow-III labeled packages. DOT does list specific requirements for couriers.

## Operating Procedures

Laboratory SOPs for nuclear gauges should include the following safety guidelines.

- Use the nuclear gauge according to the manufacturer's instructions and recommendations.
- Wear personal dosimetry, if issued, and follow the proper dosimetry use guidelines.
- Ensure the gauge is in a shielded and locked position before handling.
- Always maintain constant line-of-sight surveillance and immediate control of the nuclear gauge when it is not in storage.
- Do not touch the unshielded source rod with your fingers, hands, or any part of your body.
- Do not look under the portable gauge when the source rod is being lowered into the ground.
- If the source is to be extended greater than 3 feet into the ground ensure that the hole is free of debris and that the walls will not collapse, resulting in the inability to retract the source.
- Return the source to the shielded position after each measurement. If the source cannot be retracted to its shielded position, follow your emergency procedures and contact EH&S.

- When not actively being used for field measurements, portable nuclear gauges must be locked and returned to their storage/ transportation case.
- When field operations are complete, portable nuclear gauges will be returned to their permanent storage locations as soon as possible.
- While the source is in the operator's possession, the operator will have a copy of
  - Sealed Source Safety Manual
  - instrument operating instructions
  - current leak test certificate
  - Inventory and Usage Log

### Maintenance Procedures

- The operator will have received proper instruction on how to clean and maintain the gauge.
- Perform routine cleaning and maintenance according to the manufacturer's instructions and recommendations.
- Maintenance or repairs that require source removal must be completed by a licensed service center.

### Emergency Procedures

If the source fails to return to the shielded position (e.g., as a result of being damaged, source becoming trapped below the surface), or if any other emergency or unusual situation arises (e.g., the portable gauge is struck by a moving vehicle, is dropped, or is in a vehicle involved in an accident),

- Immediately secure the area and keep people at least 15 feet away from the portable gauge until the situation is assessed and radiation levels are known. Perform first aid for any injured individuals and remove them from the area only when medically safe to do so.
- If any heavy equipment is involved, detain the equipment and operator until it is determined there is no contamination present.
- From a safe distance that minimizes personal radiation exposure, visually inspect the gauge to determine the extent of the damage to the source, source housing, and shielding.
- Portable gauge users and other potentially contaminated individuals should not leave the scene until emergency assistance arrives.

At the earliest opportunity after the situation is under control, contact EH&S at (515) 294-5359. After hours, contact the

**Note:**

Immediately contact EH&S in the event of an emergency.

Department of Public Safety (DPS) at (515) 294-4428. Never leave the instrument unattended. Describe the situation and follow the instructions of the Radiation Safety Officer (RSO).

# Appendix

**Personnel Information** – It is important that persons working with sealed sources have the proper knowledge to safely use radiation and maintain radiation exposures As Low As Reasonably Achievable (ALARA). The Radiation Safety Committee (RSC) and RSO evaluate all requests from the following information

- Principal Investigator (PI) – The person who is responsible for all radiation use. This person will establish and lead radiation safety within the laboratory. As the radiation safety lead, the PI is required to maintain their safety training annually.
- Laboratory Supervisor – The person most familiar with daily laboratory functions and radiation use. This person is authorized to make administrative changes to the radiation authorization. The laboratory supervisor shall maintain their safety training on an annual basis.
- Authorized Personnel – The people who will work with radiation under the supervision of the PI. The PI must be listed as authorized personnel. Annual radiation safety training is required for all authorized personnel. For each individual, list any applicable radiation safety training and laboratory experience.

**Facility Information** – A facility must meet certain requirements for sealed source work. Determination of facility suitability includes

- Locations of use – building, floor, and room number.
- Room diagram for each location – locations of hoods, sinks, benches, exterior/interior walls, windows, doors, intended use, and storage areas.

**Project Description** – A journal article, kit instructions, or similar written techniques can be used to satisfy some of these descriptions.

- The project description should include
- Standard operating procedures
- Diagrams
- Types of equipment used
- Safety procedures
- Radionuclides
- Activity (in dpm, μCi, mCi, or Bq)
- Radiation detection methods
- Hazardous materials
- Duration of project
- Any other information describing the procedure

## Non-discrimination Statement

"Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, 3350 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515 294-7612, email eooffice@iastate.edu"