

Wisconsin
Chapter DHS 157- Radiation Protection
Regulatory Guide
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Guidance for Portable Gauges or XRF Devices

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EXECUTIVE SUMMARY

Wisconsin Regulatory Guides (WISREGs) are issued to describe and make available to the applicant or licensee, acceptable methods of implementing specific parts of **Chapter DHS 157 ‘Radiation Protection’**, to delineate techniques used by the Department of Health Services (DHS) staff in evaluating past specific problems or postulated accidents, and to provide guidance to applicants or licensees. WISREGs are not substitutes for **Chapter DHS 157 ‘Radiation Protection’**; therefore compliance with them is not required. Methods and solutions different from those set forth in this guide will be acceptable if they provide a basis for the DHS, Radiation Protection Section to determine if a radiation protection program meets the current rule and protects public health and safety.

Comments and suggestions for improvements in this WISREG are encouraged. This WISREG will be revised, as appropriate, to accommodate comments and to reflect new information or experience. Comments should be sent to DHS, Radiation Protection Section, P.O. Box 2659, Madison, WI 53701-2659.

To request copies of this guide (which may be reproduced) call DHS, Radiation Protection Section at (608) 267-4797 or for electronic copy go to our web site at:

http://dhs.wisconsin.gov/dph_beh/RadioactiveMat/Index.htm

This WISREG “Guidance for Portable Gauges or XRF Devices” has been developed to streamline the application process for a Portable Gauge or XRF License. DPH Form F-45006 “*Application for Radioactive Material License Authorizing the use of Sealed Sources in Portable Gauges or XRF Devices*” is located in **Appendix A** of this guide.

Appendices C through **N** provide examples, models, and additional information that can be used when completing the application.

It typically takes 60-90 days for a license to be processed and issued if the application is complete. When submitting a new application be sure to include the appropriate application fee listed in **DHS 157.10** for either a portable gauge or an XRF device.

In summary, the applicant will need to do the following to submit an application for a portable gauge or XRF device license:

- Use this regulatory guide to prepare the application DPH Form F- 45006 ‘*Application for Radioactive Material License Authorizing the use of Sealed Sources in Portable Gauges or XRF Devices*’
- Complete the application DPH Form F- 45006 (**Appendix A**). See ‘Contents of Application’ of the guide for additional information.
- Include any additional attachments.
All supplemental pages should be 8 ½” x 11” size paper.
Please identify all attachments with the applicant’s name and license number (if a renewal).
- Do not submit proprietary information.
- Submit an original signed application along with attachments (if any).
- Submit the application fee.
- Retain one copy of the licensee application and attachments (if any) for your future reference. You will need this information because the license will require that radioactive material be possessed and used in accordance with statements, representation, and procedures provided in the application and supporting documentation.

If you have any questions about the application process please contact DHS, Radiation Protection Section at (608) 267-4797.

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ABBREVIATIONS

ALARA	As low as reasonably achievable
Bq	Becquerel
DHS	Department of Health Services (State of Wisconsin)
DOE	United States Department of Energy
DOT	United States Department of Transportation
IN	Information Notice
mrem	millirem
mSv	millisievert
NIST	National Institute of Standards and Technology
NRC	United States Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
OSL	Optical Stimulated Luminescent Dosimeters
RIS	Regulatory Issue Summary
RQ	Reportable Quantities
RSO	Radiation Safety Officer
SSD	Sealed Source and Device
Sv	Sievert
TEDE	Total effective dose equivalent
TI	Transportation Index
TLD	Thermoluminescent dosimeters
XRF	X-ray Fluorescence Analyzer

The format within this guide for each item of technical information is as follows:

Rule--references the requirements applicable to the item;

Criteria--outlines the criteria used to judge the adequacy of the applicant's response;

Discussion--provides additional information on the topic sufficient to meet the needs of most readers; and

Response from Applicant--indicates that a written response is required and/or offers the option of an alternative reply, or indicates that no response is needed on that topic during the licensing process.

The information submitted in the application must be sufficient to demonstrate that proposed equipment, facilities, personnel, and procedures are adequate to protect the health and safety of the citizens of Wisconsin according to DHS's guidelines. Submission of incomplete or inadequate information will result in delays in the approval process for the license. Additional information will be requested when necessary to ensure that an adequate radiation safety program has been established. Such requests for additional information will be requested when necessary. Such requests for additional information will delay completion of the application's review and may be avoided by a thorough study of the rule and these instructions prior to submitting the application.

WHO REGULATES AT FEDERAL FACILITIES IN WISCONSIN?

In the special situation of work at federally-controlled sites in Wisconsin, it is necessary to know the jurisdictional status of the land to determine whether the Nuclear Regulatory Commission (NRC) or DHS has regulatory authority. The NRC has regulatory authority over land determined to be under “exclusive federal jurisdiction,” while DHS has jurisdiction over non-exclusive federal jurisdiction land (see **Table 1**). Applicants and licensees are responsible for finding out, in advance, the jurisdictional status of the specific areas where they plan to conduct licensed operations. DHS recommends that applicants and licensees ask their local contacts for the federal agency controlling the site (e.g., contract officer, base environmental health officer, district office staff) to help determine the jurisdictional status of the land and to provide the information in writing, so that licensees can comply with NRC or DHS regulatory requirements, as appropriate.

Table 1 Who Regulates the Activity?

Applicant and Proposed Location of Work	Regulatory Agency
Federal agency regardless of location (except that Department of Energy [DOE] and, under most circumstances, its prime contractors are exempt from licensing [10 CFR 30.12])	NRC
Non-federal entity in non-Agreement State (see map on next page), U.S. territory, or possession	NRC
Non-federal entity in WI at non-federally controlled site	DHS
Non-federal entity in WI at federally-controlled site <i>not</i> subject to exclusive Federal jurisdiction	DHS
Non-federal entity in WI at federally-controlled site subject to exclusive federal jurisdiction	NRC

MANAGEMENT RESPONSIBILITY

DHS recognizes that effective radiation safety program management is vital to achieving safe and compliant operations. DHS also believes that consistent compliance with **Chapter DHS 157 ‘Radiation Protection’** provides reasonable assurance that licensed activities will be conducted safely. Through its experience, DHS has found that effective management has been shown to be key to a well-run radiation safety program. Management refers to a senior-level manager who has responsibility for overseeing licensed activities.

To ensure adequate management involvement, a management representative must sign the submitted application acknowledging management’s commitments and responsibility for all the following:

- Radiation safety, security and control of radioactive materials, and compliance with Chapter DHS 157 ‘Radiation Protection’;
- Completeness and accuracy of the radiation safety records and all information provided to DHS;
- Knowledge about the contents of the license and application;
- Committing adequate resources (including space, equipment, personnel, time and if needed, contractors) to the radiation protection program to ensure that public and worker safety is protected from radiation hazards and compliance with the rule is maintained; and
- Selecting and assigning a qualified individual to serve as the Radiation Safety Officer (RSO) for their licensed activities.

Management may delegate individuals (i.e., an RSO or other designated individual) to submit amendment requests to DHS. A correspondence delegation letter must be completed, signed by management and submitted to DHS. A sample letter has been included in **Appendix M**.

APPLICABLE SUBCHAPTERS

It is the applicant's or licensee's responsibility to obtain read and follow **Chapter DHS 157 'Radiation Protection'**.

The following subchapters of **Chapter DHS 157 'Radiation Protection'** contain regulations applicable to portable gauge devices or XRFs.

- Subchapter I: 'General Provisions';
- Subchapter II: 'Licensing of Radioactive Materials';
- Subchapter III: 'Standards for Protection from Radiation';
- Subchapter X: 'Notices, Instructions and Reports to Workers';
- Subchapter XI: 'Inspection by the Department';
- Subchapter XII: 'Enforcement'; and
- Subchapter XIII: 'Transportation'.

To request copies of the above document, call DHS, Radiation Protection Section at (608) 267-4797 or for electronic copy go to our web site at: http://dhs.wisconsin.gov/dph_beh/RadioactiveMat/Index.htm

HOW TO FILE

PAPER APPLICATION

Applicants for a materials license should do the following:

- Be sure to use the current guidance from DHS in preparing an application.
- Complete DPH Form F-45006 '*Application for Radioactive Material License Authorizing the Use of Sealed Sources in Portable Gauges or XRF Device*'. (**Appendix A**).
- For each separate sheet, other than submitted with the application, identify and key it to the item number on the application, or the topic to which it refers.
- Submit all documents on 8 ½ x 11 inch paper.
- Avoid submitting proprietary information unless it is absolutely necessary.
- Submit an original, signed application.
- Retain one copy of the license application for your future reference.

Deviations from the suggested wording of responses as shown in this guide or submission of alternative procedures may require a more detailed review.

Personal employee information, i.e., home address, home telephone number, social security number, date of birth, and radiation dose information, should not be submitted .

WHERE TO FILE

Applicants wishing to possess or use radioactive material in Wisconsin are subject to the requirements of **Chapter DHS 157 ‘Radiation Protection’** and must file a license application with:

*Department of Health Services
Radiation Protection Section
P.O. Box 2659
Madison, WI 53701-2659*

LICENSE FEES

The appropriate fee must accompany each new application or license amendment request. Refer to ***DHS 157.10*** to determine the amount of the fee. DHS will not issue the new license prior to fee receipt. Once technical review has begun, no fees will be refunded. Application fees will be charged regardless of DHS' disposition of an application or the withdrawal of an application.

Licensees are also subject to annual fees; refer to ***DHS 157.10***.

Direct all questions about DHS' fees or completion of Item 10 of DPH Form F-45006 '*Application for Radioactive Material License Authorizing the Use of Sealed Sources in Portable Gauges or XRF Device*' (**Appendix A**) to the DHS, Radiation Protection Section at (608) 267-4797.

CONTENTS OF AN APPLICATION

Item 1: License Action Type

On the application check the appropriate box and list the license number for a renewal.

Response from Applicant:

APPLICATION TYPE Item 1 Type of Application (Check one box) <input type="checkbox"/> New License <input type="checkbox"/> Renewal License Number _____
--

Item 2: Applicant's Name and Mailing Address

List the legal name of the applicant's corporation or other legal entity with direct control over use of the radioactive material; a division or department within a legal entity may not be a licensee. An individual may be designated, as the applicant only if the individual is acting in a private capacity and the use of the radioactive material is not connected with employment in a corporation or other legal entity. Provide the mailing address where correspondence should be sent. A Post Office box number is an acceptable mailing address.

Licensees must notify DHS of changes in the mailing address. This notice is for "information only" and does not require a license amendment or a fee.

Response from Applicant:

Item 2 Applicant - Name and Mailing Address
Applicant - Telephone Number (Include area code)

Note: DHS must be notified in the event of change of ownership or control and bankruptcy proceedings; see below for more details.

Timely Notification of Change of Ownership or Control:

Rule: *DHS 157.13(10)*

Criteria: Licensees must provide full information and obtain DHS's written consent prior to transferring ownership or control of the license, or, as some licensees call it, "transferring the license."

Discussion: Changes in ownership may be the results of mergers, buyouts, or majority stock transfers. Although it is not DHS's intent to interfere with the business decisions of licensees, it is necessary for licensees to obtain prior DHS written consent. This is to ensure the following:

- Radioactive materials are possessed, used, or controlled only by persons who have valid DHS licenses;
- Materials are properly handled and secured;
- Persons using these materials are competent and committed to implementing appropriate radiological controls;
- A clear chain of custody is established to identify who is responsible for final disposal of gauge or XRF; and
- Public health and safety are not compromised by the use of such materials.

Appendix C identifies the information to be provided about changes of ownership or control.

Notification of Bankruptcy Proceedings

Rule: *DHS 157.13(10)*

Criteria: Within 10 days following filing of voluntary or involuntary petition for bankruptcy for or against a licensee, the licensee must notify DHS in writing, identifying the bankruptcy court in which the petition was filed and the date of filing.

Discussion: Even though a licensee may have filed for bankruptcy, the licensee remains responsible for all regulatory requirements. DHS needs to know when licensees are in bankruptcy proceedings in order to determine whether all licensed material is accounted for and adequately controlled, and whether there are any public health and safety concerns (e.g.; contaminated facility). DHS shares the results of its determinations with other involved entities (e.g.; trustees), so that health and safety issues can be resolved before bankruptcy actions are completed.

Item 3: Person To Be Contacted About This Application

Identify the individual who can answer questions about the application and include his or her telephone number. This is typically the proposed Radiation Safety Officer (RSO), unless the applicant has named a different person as the contact. DHS will contact this individual if there are questions about the application.

Notify DHS if the contact person or his or her telephone number changes so that DHS can contact the applicant or licensee in the future with questions, concerns, or information. This notice is for "information only" and does not require a license amendment or a fee.

Response from Applicant:

Item 3 Contact Person – Name
Contact Person - Telephone Number (Include area code)

Item 4: Address(es) Where Licensed Material Will Be Used or Possessed

Applicants need to provide the following information in response to **Item 4**:

- Description of storage, use, and dispatch locations;
- Indicate whether they intend to use the portable gauge or XRF at temporary job sites; and
- Indicate whether they intend to store the portable gauge at temporary jobsites.

Specify the street address, city, and state or other descriptive address (such as on Highway 10, 5 miles east of the intersection of Highway 10 and State Route 234, Anytown) for each permanent facility used as a location of storage or use, and each facility from which the applicant will dispatch gauge and XRF users to job sites. The descriptive address should be sufficient to allow a DHS inspector to find the storage location. A Post Office Box address is not acceptable.

DHS does not consider long-term storage in vehicles or personal residences not listed on the license an acceptable practice. As discussed in the above paragraph, in responding to **Item 4**, license applicants should also include a description of those locations, such as personal residences where portable gauges or XRFs may be stored by licensee staff for dispatch to customer job sites.

A DHS-approved license amendment is required before receiving, using and storing licensed material at an address or location not listed on the license. See DHS '*Information Notice concerning changing location of use or storage*' dated December 2005.

Being granted a DHS license does not relieve a licensee from complying with other applicable federal, state, or local regulations (e.g.; local zoning requirements for storage locations).

If you will only use the portable gauge or XRF device at a specific location check the 'Used' box. If you will only store the portable gauge or XRF device at a specific location check the 'Stored' box. If you will use and store the portable gauge or XRF device at a specific location check the 'Used/Stored' box. To conduct operations at temporary jobsites (i.e., locations where work is conducted for limited periods of time and from which gauge or XRF users are NOT dispatched to jobsites for other customers), check the 'Yes' box.

If the applicant needs to store licensed material at a temporary jobsite, check the "Yes" box to the question: "Are portable gauging devices stored at temporary jobsites?" and check the applicable boxes. DHS requires a commitment that surveys are conducted to assure **DHS 157.23(1)** requirement is met. The applicant shall ensure the portable gauge is secured from unauthorized removal. The applicant shall follow ALARA principles when selecting the storage location. Temporary jobsite storage is limited to 180 days at each location. A license condition will authorize the licensee for this provision.

Response from Applicant:

LOCATION OF RADIOACTIVE MATERIAL		
Item 4 List all address(es) where radioactive material(s) will be used or possessed. Attach additional pages if necessary.		
	Address (Do not use Post Office box)	Telephone Number (Include area code)
<input type="checkbox"/> Used <input type="checkbox"/> Stored <input type="checkbox"/> Used/Stored		
<input type="checkbox"/> Used <input type="checkbox"/> Stored <input type="checkbox"/> Used/Stored		
<input type="checkbox"/> Used <input type="checkbox"/> Stored <input type="checkbox"/> Used/Stored		

Are portable gauge devices and/or portable XRFs used at temporary jobsites?: Yes No

Are portable gauge devices stored at temporary jobsites?: Yes No

If yes, check the following boxes:

- We will perform and maintain documentation of radiation surveys to ensure that radiation levels are less than 2 mR in any one hour and 100 mR/yr at all temporary job site storage locations.
- We will store the device at the temporary job site in a locked room, trailer or other secure location utilizing two independent barriers to prevent unauthorized removal of the device.
- We will minimize exposures for occupational and non-occupational workers when selecting storage location.
- We will limit storage at a temporary job site to 180 days per calendar year.

Note: As discussed later under ‘Financial Assurance and Record keeping for Decommissioning,’ licensees need to maintain permanent records of locations where licensed material was used or stored. This is important for making future determinations about the release of these locations for unrestricted use (e.g., before the license is terminated). For portable gauge licensees, acceptable records are sketches or written descriptions of storage or use locations specifically listed on the license. Licensees do not need to maintain this information for temporary job sites or temporary storage locations where sources have never leaked.

Item 5: Individual(s) Responsible for Radiation Safety Program and Their Training and Experience - Radiation Safety Officer (RSO)

Rule: *DHS 157.05(4); DHS 157.13(2)*

Criteria: RSOs must have adequate training and experience. DHS will accept successful completion of one of the following as evidence of adequate training and experience:

- Portable gauge or XRFs manufacturer's course for users or for RSOs; or
- Equivalent course that meets **Appendix D** criteria.

Discussion: The person responsible for the radiation protection program is called the RSO. The RSO needs independent authority to stop operations that he or she considers unsafe. He or she must have sufficient time and commitment from management to fulfill certain duties and responsibilities to ensure that radioactive materials are used in a safe manner. Typical RSO duties are illustrated in **Figure 3** and described in **Appendix E**. DHS requires the name of the RSO on the license to ensure that licensee management has always identified a responsible, qualified person and that the named individual knows of his or her designation as RSO.



Figure 3. RSO Responsibilities: *Typical duties and responsibilities of RSOs.*

Response from Applicant:

RADIATION SAFETY OFFICER	
Item 5 Radiation Safety Officer (RSO) (Attach evidence of training and experience and check one box)	
Name – Radiation Safety Officer	Telephone Number (Include area code)
<input type="checkbox"/> Before obtaining radioactive material, the proposed RSO will have successfully completed one of the training courses described in the Criteria section titled “Individual(s) Responsible for Radiation Safety Program and Their Training and Experience- Radiation Safety Officer” in WISREG ‘Guidance for Portable Gauge Devices or Portable XRFs’.	
Or	
<input type="checkbox"/> Alternative information demonstrating that the proposed RSO is qualified by training and experience is attached.	

Note:

- It is important to notify DHS, as soon as possible, of changes in the designation of the RSO.
- Alternative responses will be reviewed against the criteria listed above.

Item 6: Training for Individuals Working in or Frequenting Restricted Areas

Rule: *DHS 157.03(87); DHS 157.05(4); DHS 157.13(2); DHS 157.88(1-2)*

Criteria: Authorized users must have adequate training and experience. DHS will accept successful completion of one of the following as evidence of adequate training and experience:

- Portable gauge or XRFs manufacturer's course for users or
- Equivalent course that meets **Appendix D** criteria

Discussion: The individuals using the gauges or XRFs are usually referred to as authorized users. Authorized users have the responsibility to ensure the surveillance, proper use, security, and routine maintenance of portable gauges or XRFs containing licensed material.

DHS has determined that portable gauge manufacturer on-line training course will be accepted. In addition to the manufacturer on-line training course all authorized users shall receive hands on training prior to using a gauge. Refer to **Appendix D** for the criteria required to be completed for hands on training.

Annual radiation safety training must be provided to individuals working in or frequenting restricted areas who receive or are likely to receive 100 mrem per year (*DHS 157.88(2)*).

Response from Applicant:

AUTHORIZED USERS	
Item 6 Training for individuals working in or frequenting restricted areas (Check one box)	
<input type="checkbox"/>	Before using radioactive material, authorized users will have successfully completed one of the training courses described in the Criteria section titled "Training for Individuals Working In or Frequenting Restricted Areas" in WISREG 'Guidance for Portable Gauge Devices or Portable XRFs.'
	NOTE: If using an in-house training program, submit copy of course content, sample course examination and course instructor qualifications.
Or	
<input type="checkbox"/>	Documentation of the training and experience for the proposed gauge user(s) is attached.
	NOTE: These individuals will be listed on the license as authorized users. An amendment request is required to add new authorized users.

Note:

- Records of training should be maintained.
- Alternative responses will be evaluated against the criteria listed above.

Item 7: Radioactive Material

Item 7.1: Radioactive Material - Sealed Sources and Devices and Purpose(s) for Which Licensed Material will be Used

Rule: *DHS 157.13(1-2)*

Criteria: Proposed activity is authorized by **Chapter DHS 157 'Radiation Protection'** and devices will be used only for the purposes for which they are designed and according to the manufacturer's recommendations for use as specified in an approved Sealed Source and Device (SSD) Registration Sheet.

Discussion: The NRC or an Agreement State performs a safety evaluation of gauges or XRFs before authorizing a manufacturer to distribute the gauges or XRFs to specific licensees. The safety evaluation is documented in an SSD Registration Certificate. When issuing a portable gauge or XRF license, DHS usually provides a generic authorization to allow the licensee to possess and use any sealed source/device combination that has been registered by the NRC or an Agreement State.

Consult with the proposed manufacturer or distributor to ensure that sources and devices conform to the sealed source and device designations registered with the NRC or an Agreement State. Licensees may not make any changes to the sealed source, device, or source/device combination that would alter the description or specifications from those indicated in the respective registration certificates, without obtaining DHS’s prior permission in a license amendment. Such changes may necessitate a custom review, increasing the time needed to process a licensing action.

SSD Registration Certificates contain sections on “Conditions of Normal Use” and “Limitation and Other Considerations of Use.” These sections may include limitations derived from conditions imposed by the manufacturer or distributor, by particular conditions of use that would reduce radiation safety of the device, or by circumstances unique to the sealed source or device. For example, working life of the device or appropriate temperature and other environmental conditions may be specified. Except as specifically approved by DHS, licensees are required to use gauges according to their respective SSD Registration Certificates. Accordingly, applicants may want to obtain a copy of the certificate and review it with the manufacturer or distributor, or with the NRC or the issuing Agreement State to ensure that it correctly reflects the radiation safety properties of the source or device.

- Identify each radionuclide that will be used in each source in the gauging device(s);
- Identify the manufacturer or distributor and model number of each type of sealed source and device requested;
- Confirm that the activity per source will not exceed the maximum activity listed on the approved certificate of registration issued by the NRC or an Agreement State;
- The typical portable gauge license authorizes use "to measure physical properties of materials"; and
- Unusual uses will be evaluated on a case-by-case basis and the authorized use condition will reflect approved uses.

Response from Applicant:

RADIOACTIVE MATERIAL	
Item 7 Radioactive Material (Attach additional pages if necessary)	
Element and mass number	Chemical and physical form SEALED SOURCE
Source manufacturer and model number	Maximum activity per source
Device manufacturer and model number	Intended Use

Item 7.2: Radioactive Material - Financial Assurance and Record Keeping for Decommissioning

Rule: *DHS 157.13(10) and (15); DHS 157.15*

Criteria: Portable gauge or XRF licensees possessing sealed sources containing radioactive material in excess of the limits specified in *DHS 157.15* must provide evidence of financial assurance for decommissioning.

Licensees are required to maintain, in an identified location, decommissioning records related to structures and equipment where gauges or XRFs are used or stored and to leaking sources. Licensees must transfer records important to decommissioning either to the new licensee before licensed activities are transferred or assigned in accordance with *DHS 157.13(10) & (15)* or to DHS before the license is terminated.

Discussion: The requirements for financial assurance are specific to the types and quantities of radioactive material authorized on a license. Most portable gauge applicants and licensees do not need to comply with the financial assurance requirements because the thresholds for sealed sources are 3.7×10^6 gigabecquerels (100,000 curies) of cesium-137 or 3.7×10^3 gigabecquerels (100 curies) of americium-241 or californium-252. Thus, a licensee would need to possess hundreds of gauges (typically containing about 0.30 gigabecquerels (8 millicuries) of cesium-137 and 1.5 gigabecquerels (40 millicuries) of americium-241) before the financial assurance requirements would apply. The standard portable gauge license does specify the maximum number of gauges that the licensee may possess. Applicants and licensees desiring to possess gauges exceeding the threshold amounts must submit evidence of financial assurance.

The same rule also requires that licensees maintain records important to decommissioning in an identified location. All portable gauge licensees need to maintain records of structures and equipment where gauges are used or stored at locations specifically listed on the license. As-built drawings with modifications of structures and equipment shown as appropriate fulfill this requirement. If drawings are not available, licensees may substitute appropriate records concerning the areas and locations. In addition, if portable gauge licensees have experienced unusual occurrences (e.g., leaking sources, other incidents that involve spread of contamination), they also need to maintain records about contamination that remains after cleanup or that may have spread to inaccessible areas.

For portable gauge licensees whose sources have never leaked, acceptable records important to decommissioning are sketches or written descriptions of portable gauge storage or use locations specifically listed on the license. Similar information need not be maintained for temporary job sites.

Licensees must transfer records important to decommissioning either to the new licensee before licensed activities are transferred or assigned in accordance with **DHS 157.13(10) & (15)** or to DHS before the license is terminated.

Reference: If financial assurance is required, submit the documentation required under **DHS 157.15**. NRC NUREG-1757, Vol. 3, ‘*Consolidated NMSS Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness*’ dated September 2003 contains acceptable wording for each mechanism authorized by the regulation to guarantee or secure funds. This document is available from the NRC website at: www.nrc.gov or DHS upon request.

Item 8: Facilities and Equipment

Rule: **DHS 157.05(5); DHS 157.13; DHS 157.21; DHS 157.22; DHS 157.23; DHS 157.28.**

Criteria: Facilities and equipment must be adequate to protect health and to minimize danger to life or property.

Discussion: **Chapter DHS 157 ‘Radiation Protection’** states that an application will be approved if, among other things, the applicant’s proposed equipment, facilities, and procedures are adequate to minimize danger to the public’s health and safety. **DHS 157.28(1) & (2)** states that (1) sources of radiation shall be secured against unauthorized removal from the place of storage and (2) sources of radiation in an unrestricted area and not in storage shall be under the constant surveillance and immediate control of the licensee or registrant. In addition **DHS 157.05(5)** requires a minimum of 2 independent physical controls that form tangibles barriers to secure the device.

The key elements for portable gauge or XRF applicants are ensuring compliance with public dose limits and maintaining adequate security and control over the gauges or XRFs. These issues are covered under ‘Public Dose’ and ‘Operating and Emergency Procedures.’

Response from Applicant:

FACILITIES AND EQUIPMENT
Item 8 Facilities And Equipment (Check box and attach diagram.)
<input type="checkbox"/> Diagrams of radioactive material storage area(s) are attached.

Note: Diagrams should include the following:

- An annotated sketch or drawing of the facility and its surroundings. The scale to which the sketch or drawing is made. The same scale should be used for all sketches and drawings. The recommended scale is 1/4 inch = 1 foot. Drawings to this scale that do not fit on 8 1/2" X 11" paper may be provided as sectional drawings;
- Indicate how the storage area is secured to prevent unauthorized removal of portable gauges and/or XRF devices;
- The locations of entranceways and other points of access to the facility; and
- A description of the areas adjacent to the facility and the distance to these areas. Include information on areas adjacent to, above, and below the facility.

Item 9: Radiation Safety Program

Item 9.1: Audit Program

Rule: *DHS 157.21; DHS 157.31(2)*

Criteria: Licensees must review the content and implementation of their radiation protection programs annually to ensure the following:

- Compliance with DHS and DOT regulations, and the terms and conditions of the license;
- Occupational doses and doses to members of the public are as low as reasonably achievable (*ALARA*) (*DHS 157.21*); and
- Records of audits and other reviews of program content are maintained for 3 years.

Discussion: **Appendix F** contains a suggested audit program that is specific to the use of portable gauges or XRFs and is acceptable to DHS. All areas indicated in **Appendix F** may not be applicable to every licensee and may not need to be addressed during each audit.

Currently DHS's emphasis in inspections is to perform actual observations of work in progress. As a part of their audit programs, applicants should consider performing unannounced audits of gauge users in the field to determine if, for example, Operating and Emergency Procedures are available, are being followed, etc.

It is essential that once identified, problems be corrected comprehensively and in a timely manner; NRC *Information Notice (IN) 96-28, "Suggested Guidance Relating to Development and Implementation of Corrective Action,"* provides guidance on this subject. DHS will review the licensee's audit results and determine if corrective actions are thorough, timely, and sufficient to prevent recurrence. If violations are identified by the licensee and these steps are taken, DHS can exercise discretion and may elect not to cite a violation. DHS's goal is to encourage prompt identification and prompt, comprehensive correction of violations and deficiencies.

With regard to audit records, **DHS 157.31(2)** requires licensees to maintain records of "... audits and other reviews of program content and implementation." DHS has found audit records that contain the following information to be acceptable: date of audit, name of person(s) who conducted audit, persons contacted by the auditor(s), areas audited, audit findings, corrective actions, and follow-up.

Response from Applicant:

Item 9.1 Audit Program

The applicant is not required to submit its audit program to the department for review during the licensing phase. This matter will be examined during an inspection.

Item 9.2: Termination of Activities

Rule: *DHS 157.13(10), (11) and (15); DHS 157.15; DHS 157.31*

Criteria: The licensee must do the following:

- Notify DHS in writing, within 30 days of the decision to permanently discontinue all activities involving materials authorized under the license.
- Notify DHS in writing, within 60 days, when principal activities have not been conducted for a period of 24 months.
- Certify the disposition of licensed materials by submission of DPH Form F-45007 "*Certificate of Disposition of Materials.*" (See **Appendix B**).
- Before a license is terminated, send the records important to decommissioning (as required by **DHS 157.15**) to DHS. If licensed activities are transferred or assigned in accordance with **DHS 157.13(15)**, transfer records important to decommissioning to the new licensee.

Discussion: For guidance on the disposition of licensed material, see the **Item 9.11 Waste Management - Gauge Disposal or Transfer**. For guidance on decommissioning records, see the section on 'Financial Assurance and Record keeping for Decommissioning.'

Response from Applicant:

<p>Item 9.2 Termination Of Activities (Check box)</p> <p><input type="checkbox"/> We will notify DHS, in writing, within 30 days of the decision to permanently cease radioactive material use. (s. DHS 157.13(10)(d))</p>

Item 9.3: Instruments

Rule: *DHS 157.05(3); DHS 157.13(2); DHS 157.25(1); DHS 157.52(4)(a)-(c)*

Criteria: A radiation survey meter should:

- Be capable of detecting gamma radiation;
- Be calibrated on an interval not to exceed 12 months and after each instrument servicing; and
- Be checked for functionality before use (e.g., with the gauge or a check source).

Discussion: Each year there are a number of incidents involving gauges at construction sites (e.g., construction equipment running over the gauge). It is important to determine as soon as possible after an incident, by the use of a radiation survey meter, whether the shielding and source are intact.

Portable gauge licensees are required by **DHS 157.05(3)** to have a calibrated and operable radiation survey instrument available at each site where the portable gauge is used. Licensees may request consideration of alternate procedures indicating how survey meters will be dispatched to a temporary jobsite. DHS requires a commitment that a survey meter will be available no more than 1 hour from a temporary jobsite and that an adequate number of survey meters are available for each temporary jobsite.

XRF licensees are not required to have a radiation survey instrument.

Response from Applicant:

<p>Item 9.3 Instruments (Check one box)</p> <p><input type="checkbox"/> We will possess and use a radiation survey meter that meets the Criteria in the section titled "Instruments" in WISREG 'Guidance for Portable Gauges or XRF Devices.'</p> <p style="text-align: center;">Or</p> <p><input type="checkbox"/> We will submit an alternative procedure for determining source integrity after an incident involving the portable gauge(s). (Procedures are attached)</p> <p style="text-align: center;">Or</p> <p><input type="checkbox"/> Not Applicable [XRF Device(s)]</p>

Note: Prior to non-routine maintenance that requires removing the source or source rod from the gauge a calibrated and operable radiation survey instrument will be required.

Item 9.4: Material Receipt and Accountability

Rule: *DHS 157.06, DHS 157.13(9)(b), (10), (15) and (18); DHS 157.31*

Criteria: Licensees must do the following:

- Maintain records of receipt, transfer, and disposal of gauges or XRFs; and
- Conduct physical inventories at intervals not to exceed 6 months (or some other interval justified by the applicant) to account for all sealed sources.

Discussion: As illustrated in **Figure 4**, licensed materials must be tracked from "cradle to grave" in order to ensure gauge accountability, identify when gauges or XRFs could be lost, stolen, or misplaced, and ensure that, if the licensee possesses gauges exceeding threshold amounts, the licensee complies with

financial assurance requirements in *DHS 157.15*. Many licensees record daily use of gauges or XRFs in a logbook as part of their accountability program; see the suggested Operating Procedures in **Appendix H**.

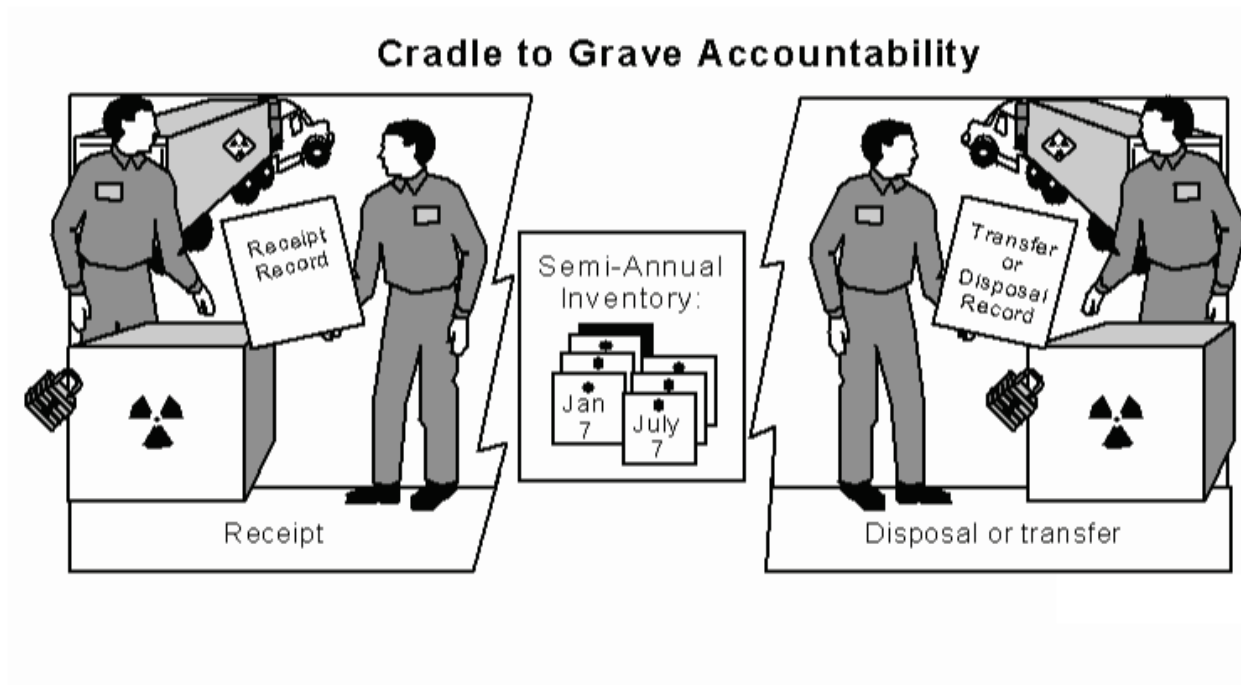


Figure 4. Material Receipt and Accountability. Licensees must maintain records of receipt and disposal and conduct semiannual inventories.

Response from Applicant:

<p>Item 9.4 Material Receipt And Accountability (Check one box)</p>	
<input type="checkbox"/>	<p>We will conduct physical inventories, at intervals not to exceed 6 months, to account for all sealed sources and devices received and possessed under the license.</p>
<p>Or</p>	
<input type="checkbox"/>	<p>We will submit a description of the frequency and procedures for ensuring that no gauge has been lost, stolen or misplaced. (Procedures are attached)</p>

Note:

- Alternative responses will be evaluated against the criteria listed above.
- Inventory records should be maintained and contain the following types of information:
 - Radionuclide and amount (in units of becquerels or curies) of radioactive material in each sealed source;
 - Manufacturer's name, model number, and serial number (if appropriate) of each device containing radioactive material;
 - Location of each sealed source and device; and
 - Date of the inventory.

Item 9.5: Occupational Dosimetry

Rule: *DHS 157.22(1)(7-8); DHS 157.25(2)*

Criteria: Applicants must do either of the following:

- Provide dosimetry processed and evaluated by a National Voluntary Laboratory Accreditation Program (NVLAP) approved processor that is exchanged at a frequency recommended by the processor.

OR

- Maintain, for inspection by DHS, documentation demonstrating that unmonitored individuals are not likely to receive, in one year, a radiation dose in excess of 10 percent of the allowable limits as shown in **Figure 5**.

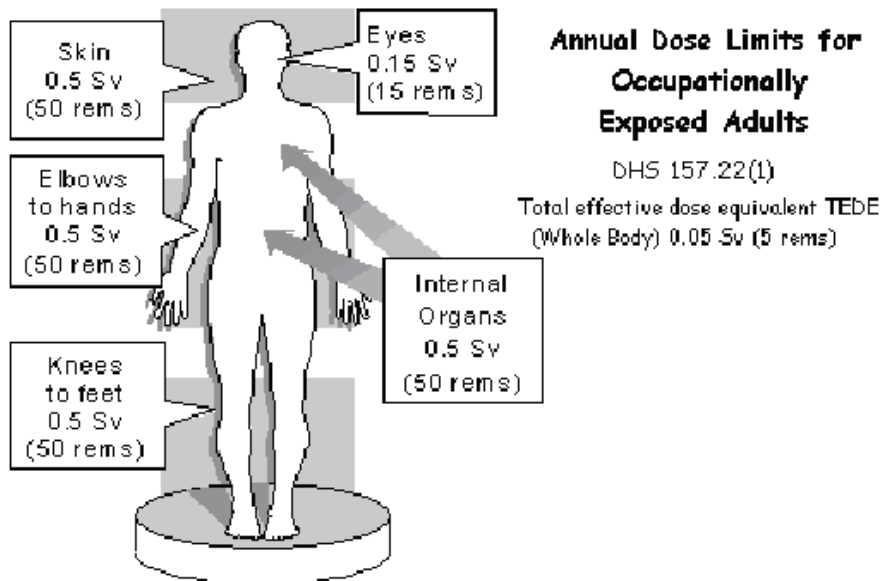


Figure 5. Annual Dose Limits for Radiation Workers.

Discussion: Under conditions of routine use, the typical gauge or XRF user does not require a personnel monitoring device (dosimetry). However a written evaluation demonstrating that portable gauge and XRF users are not likely to exceed 10 percent of the applicable limits and thus, are not required to have personnel dosimetry is required. **Appendix I Part 1 and 2** provides guidance on preparing this written evaluation. Licensees may use historical dosimetry records and typical workload to determine whether dosimetry is required.

Most licensees use either optically stimulated luminescent (OSLs) or thermoluminescent dosimeters (TLDs) that are supplied by an NVLAP-approved processor. The exchange frequency for TLDs is usually

quarterly. Applicants should verify that the processor is NVLAP-approved. Consult the NVLAP-approved processor for its recommendations for exchange frequency and proper use.

Response from Applicant:

<p>Item 9.5 Occupational Dosimetry (Check one box)</p> <p><input type="checkbox"/> We will provide dosimetry processed and evaluated by a NVLAP-approved processor that is exchanged at a frequency recommended by the processor.</p> <p style="text-align: center;">Or</p> <p><input type="checkbox"/> We will maintain, for inspection by DHS, documentation demonstrating that unmonitored individuals are not likely to receive, in one year, a radiation dose in excess of 10 percent of the allowable limits in s. DHS 157.22(1). (See Appendix I in WISREG 'Guidance for Portable Gauges or XRF Devices.')</p>
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Reference: *National Institute of Standards and Technology (NIST) Publication 810, "National Voluntary Laboratory Accreditation Program Directory,"* is published annually and is available for purchase from **United States Government Printing Office** and on the Internet at the following address:

<http://ts.nist.gov/standards/accreditation/index.cfm>

Item 9.6: Public Dose

Rule: *DHS 157.03; DHS 157.23 (1-2); DHS 157.28 (1) (a) and (b); DHS 157.31 (8)*

Criteria: Licensees must do the following:

- Ensure that licensed gauges will be used, transported, and stored in such a way that members of the public will not receive more than 1 millisievert (100 millirem) in one year, and the dose in any unrestricted area will not exceed 0.02 millisievert (2 millirem) in any one hour, from licensed operations.
- Control and maintain constant surveillance over gauges that are not in storage and secure stored gauges from unauthorized removal or use.

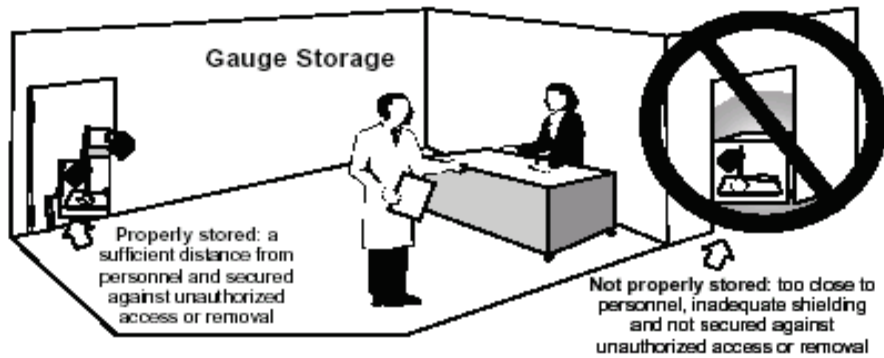


Figure 6. Storing Gauges. *Gauges should be stored away from occupied areas and secured against unauthorized removal.*

Discussion: Members of the public include persons who live, work, or may be near locations where portable gauges or XRFs are used or stored and employees whose assigned duties do not include the use of licensed materials and who work in the vicinity where gauges or XRFs are used or stored.

Operating and emergency procedures regarding security and surveillance specified under that section of this document should be sufficient to limit the exposure to the public during use or storage and after accidents. Public dose is controlled, in part, by ensuring that gauges and XRFs not in use are stored securely (e.g., stored in a locked area) to prevent unauthorized access or use. See **Figure 6**. If gauges and XRFs are not in storage, then authorized users must maintain constant surveillance to ensure that members of the public, who could be co-workers, cannot get near the gauges or XRFs nor use them, and thus receive unneeded radiation exposure.

Public dose is also affected by the choice of storage location and conditions. A gauge or XRF must be stored so that the radiation dose in an unrestricted area (e.g., an office or the exterior surface of an outside wall) does not exceed 1 mSv (100 mrem) in a year or 0.02 mSv (2 mrem) in any one hour. Use the concepts of time, distance, and shielding when choosing a permanent or temporary storage location. Decreasing the time spent near a gauge or XRF, increasing the distance from the gauge or XRF, and using shielding (i.e., brick, concrete, lead, or other solid walls) will reduce the radiation exposure. As a rule of thumb, gauges and XRFs should be stored as far away as possible from areas that are occupied by members of the public.

Licenseses can determine the radiation levels adjacent to the storage location either by calculations or a combination of direct measurements and calculations using any or all of the following: typical known radiation levels provided by the manufacturer, the "inverse square" law to evaluate the effect of distance on

radiation levels, and occupancy factors to account for the actual presence of the member of the public and of the gauge(s) or XRF(s). See **Part 3 of Appendix I** for examples.

If, after making an initial evaluation, a licensee makes changes affecting the storage area (e.g., changing the location of gauges or XRFs within the storage area, removing shielding, adding gauges or XRFs, changing the occupancy of adjacent areas, moving the storage area to a new location), then the licensee must ensure that gauges and XRFs are properly secured, perform a new evaluation to ensure that the public dose limits are not exceeded, and take corrective action, as needed.

Response from Applicant:

Item 9.6 Public Dose

No response is required in this license application; however, the licensee's evaluation of public dose will be examined during an inspection.

Item 9.7: Operating and Emergency Procedures

Rule: *DHS 157.05(5); DHS 157.13(9)(a) and (b); DHS 157.13(17); DHS 157.21; DHS 157.28(1)(a) and (b); DHS 157.32 (1-3).*

Criteria: Each applicant must do the following:

- Develop, implement, and maintain operating and emergency procedures containing the following elements:
 - Instructions for using the portable gauge or XRF and performing routine maintenance, according to the manufacturer's recommendations and instructions;
 - Instructions for maintaining security during storage and transportation (i.e., two barrier rule);
 - Instructions to keep the gauge or XRF under control and immediate surveillance during use;
 - Steps to take to keep radiation exposures ALARA;
 - Steps to maintain accountability during use;
 - Steps to control access to a damaged gauge or XRF; and
 - Steps to take, and whom to contact, when a gauge or XRF has been damaged.

- If gauges are used for measurements with the unshielded source extended more than 3 feet beneath the surface, licensees must do the following:
 - require use of surface casing or alternative procedures to ensure the source can move freely in the hole;
 - provide instructions for procedures to follow to retrieve a stuck source; and
 - require reporting to DHS, pursuant to *DHS 157.13(17)*, when a stuck source cannot be retrieved.
- Provide copies of operating and emergency procedures to all gauge or XRF users and at each job site.

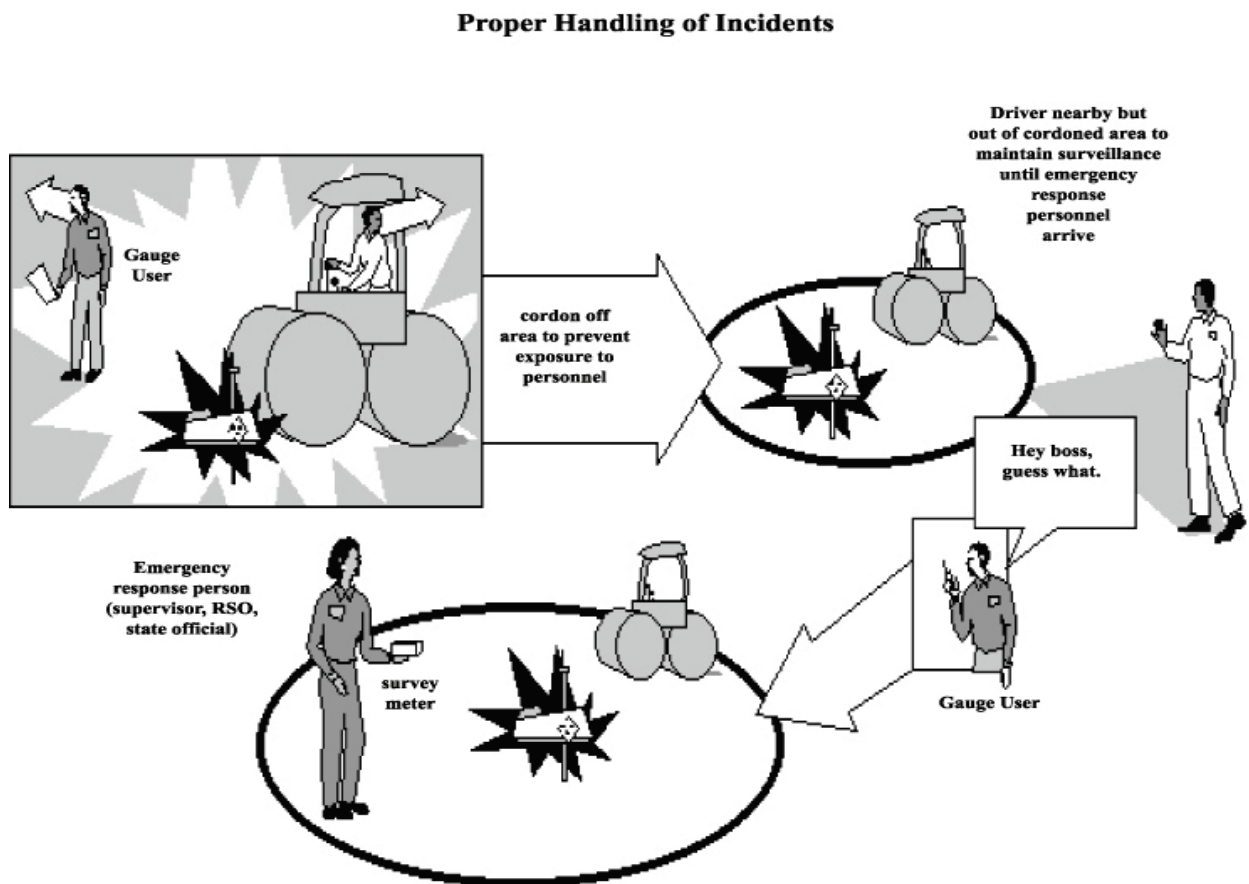


Figure 7. Proper Handling. Gauges are often damaged by heavy equipment at job sites and emergency procedures need to minimize radiation safety risk.

Discussion: Lost or stolen gauges or XRFs and, as illustrated in **Figure 7**, gauges damaged by heavy equipment during use at temporary jobsites are the most common occurrences that present a potentially significant radiation safety risk. **Figure 8** illustrates steps that should be taken to prevent loss, theft, or

unauthorized use. Additional discussion on the prevention of thefts can be found in NRC IN 2001-11, *'Thefts of Portable Gauges'* and NRC REGULATORY ISSUE SUMMARY 2007- 28 SECURITY REQUIREMENTS FOR PORTABLE GAUGES issued by the NRC on December 7, 2007 concerning the to portable gauge licensees to increase awareness of the need to secure portable gauges. . In particular, when gauges or XRFs are not in use, licensees are encouraged to:

- Keep gauges or XRFs locked in covered vehicle compartments; and
- Avoid parking vehicles in areas vulnerable to theft.

Operating and emergency procedures should be developed to minimize these risks. DHS considers security of gauges and XRFs extremely important and lack of security is a significant violation for which gauge or XRF licensees may be fined. **Appendix H** contains sample operating and emergency procedures and guidance on the two barrier rule.

Certain portable gauges are used to make measurements with the unshielded source extended more than 3 feet beneath the surface. Unless precautionary measures are taken, it is possible for the source to be buried under dirt or concrete that collapses around the source during the measurements. Precautionary measures need to be planned in advance to prevent these sources from being buried and to recover sources should they become stuck. To ensure that the hole is free of debris, it is not likely that debris will re-enter the cased hole, and the source will be able to move freely, it is acceptable for licensees to use surface casing from the lost depth to 12 inches above the surface. If it is not feasible to extend the casing 12 inches above the surface, licensees may cap the hole and use dummy probes before making measurements with an unshielded source to ensure that the hole is free of obstructions.

Notify DHS when portable gauges or XRFs are lost, stolen, or certain other conditions are met. Refer to the rule for a description of when and where notifications are required.

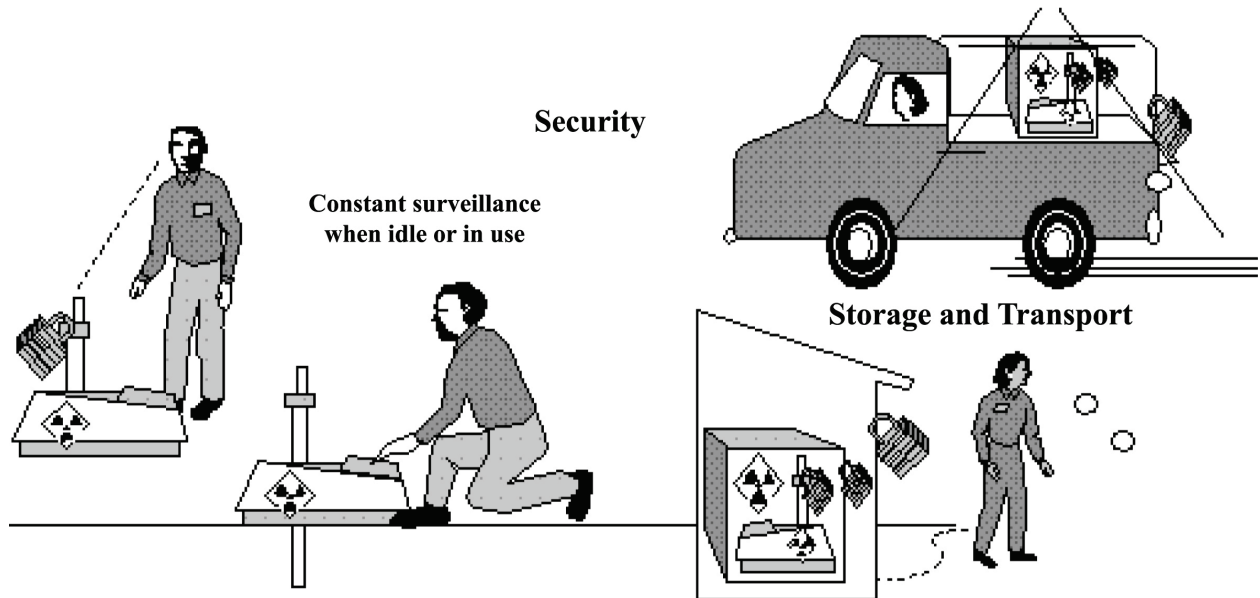


Figure 8. Security. To avoid lost or stolen gauges, licensees must keep the gauges under constant surveillance, or secured against unauthorized use or removal.

Response from Applicant:

<p>Item 9.7 Operating And Emergency Procedures (Check one box)</p> <p><input type="checkbox"/> We will implement and maintain the operating and emergency procedures in Appendix H of WISREG 'Guidance for Portable Gauges or XRF Devices' and provide copies of these procedures to all gauge or XRF users and at each job site.</p> <p style="text-align: center;">Or</p> <p><input type="checkbox"/> Operating and emergency procedures will be developed, implemented, maintained and provided to all gauge or XRF users at each job site and will meet criteria in the section titled "Radiation Safety Program – Operating and Emergency Procedures" in WISREG 'Guidance for Portable Gauges or XRF Devices.' (Procedures are attached)</p>
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Note: Alternative procedures will be reviewed against the criteria listed above.

Item 9.8: Leak Tests

Rule: *DHS 157.24*

Criteria: DHS requires testing to determine whether there is any radioactive leakage from the source in the device. DHS finds testing to be acceptable if it is conducted by an organization approved by DHS, the NRC or another Agreement State or according to procedures approved by DHS, the NRC or another Agreement State.

Discussion: A licensee will be required to perform leak tests at intervals not to exceed six months unless otherwise approved by DHS, the NRC or another Agreement State and it is documented in the SSD Registration Sheet. The measurement of the leak-test sample is a quantitative analysis requiring that instrumentation used to analyze the sample be capable of detecting 185 becquerels (0.005 microcurie) of radioactivity.

Manufacturers, consultants, and other organizations may be authorized by DHS, the NRC or another Agreement State to either perform the entire leak test sequence for other licensees or provide leak test kits to licensees. In the latter case, the licensee is expected to take the leak test sample according to the gauge or XRF manufacturer's and the kit supplier's instructions and return it to the kit supplier for evaluation and reporting results. Licensees may also be authorized to conduct the entire leak test sequence themselves. Leak test samples should be collected at the most accessible area where contamination would accumulate if the sealed source is leaking.

Response from Applicant:

<p>Item 9.8 Leak Tests (Check one box)</p> <p><input type="checkbox"/> Leak tests will be performed by an organization authorized by DHS, the NRC or another Agreement State to provide leak testing services to other licensees; or by using a leak test kit supplied by an organization licensed by DHS, the NRC or another Agreement State to provide leak test kits to other licensees according to kit supplier's instructions.</p> <p>List Name and License number of organization authorized to perform or analyze leak test. (Specify whether DHS, NRC, or another Agreement State)</p> <p>Organization Name _____ License Number _____</p> <p>Issuing Agency _____</p> <p>NOTE: An alternate organization may be used to perform or analyze leak test, without amending the license, provided the organization is specifically authorized by DHS, the NRC, or another Agreement State.</p> <p>Or</p> <p><input type="checkbox"/> We will perform leak testing and sample analysis and will follow the model procedures in Appendix K of WISREG 'Guidance for Portable Gauges or XRF Devices.'</p> <p>Or</p> <p><input type="checkbox"/> We will submit alternative procedures. (Procedures are attached)</p>
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Note: Requests for authorization to perform leak testing and sample analysis will be reviewed on a case-by-case basis and, if approved, DHS staff will authorize via a license condition.

Item 9.9: Maintenance

Rule: *DHS 157.13(9)(b) and (10); DHS 157.21.*

Criteria: Licensees must routinely clean and maintain gauges and XRFs according to the manufacturer's recommendations and instructions. For gauges with a source rod, radiation safety procedures for routine cleaning and lubrication of the source rod and shutter mechanism (e.g., to remove caked dirt, mud, asphalt, or residues from the source rod; lubricate the shutter mechanism) must consider the possibility of receiving exposures to the whole body, as well as to the hands, from handling the source rod. Licensees should keep such exposures ALARA and ensure that the gauge functions as designed and source integrity is not compromised.

Non-routine maintenance or repair (beyond routine cleaning and lubrication) that involves detaching the source or source rod from the device and any other activities during which personnel could receive radiation doses exceeding DHS limits must be performed by the gauge manufacturer or a person specifically authorized by DHS, the NRC or another Agreement State. XRF users are not allowed to perform non-routine maintenance. The XRF manufacturer must perform all non-routine maintenance. Requests for specific authorization to perform non-routine maintenance or repair (see **Appendix G**) must demonstrate that personnel performing the work do the following:

- Have adequate training and experience;
- Use equipment and procedures that ensure compliance with regulatory requirements, and consider ALARA; and
- Ensure that the gauge functions as designed and that source integrity is not compromised.

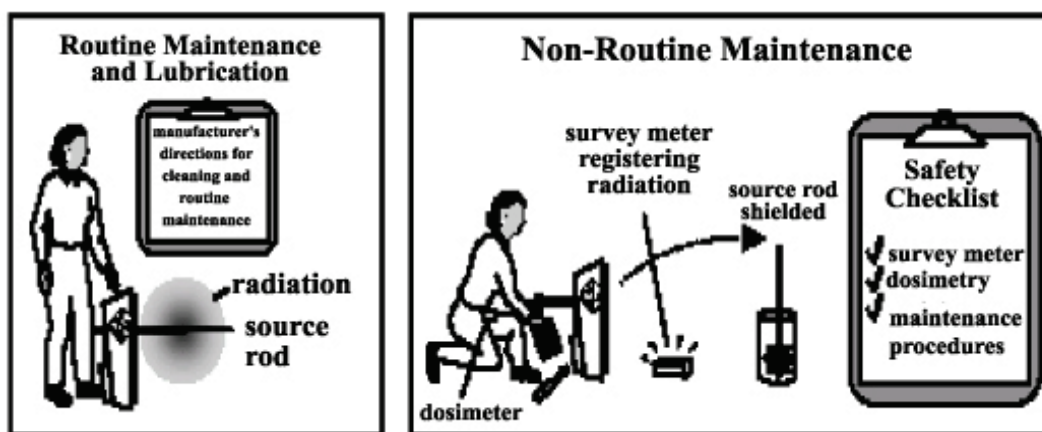


Figure 9. Maintenance. All licensees need to perform routine cleaning and lubrication to ensure proper operation of gauges and XRFs.

Discussion: Figure 9 illustrates routine cleaning and lubrication and non-routine maintenance. DHS permits portable gauge licensees to perform routine maintenance of the gauges provided that they follow the gauge manufacturer's recommendations and instructions. Although manufacturers may use different terms, "routine maintenance" includes, but is not limited to, cleaning, lubrication, changing batteries or fuses, repairing or replacing a handle. Routine maintenance does NOT include any activities that require removing the sealed source or source rod from the gauge.

DHS license will state that any cleaning, maintenance, or repair of gauges that requires detaching the source or source rod from the gauge shall be performed only by the manufacturer or other persons specifically licensed by DHS, the NRC or another Agreement State to perform such services. Most licensees do not perform non-routine maintenance or repair operations that require detaching the source or source rod from the gauge; they usually return the gauge to the manufacturer. Applicants seeking authorization to detach the source or source rod from the device must submit specific procedures for review. See **Appendix G** for more information.

Response from Applicant:

<p>Item 9.9 Maintenance (Check one box for routine cleaning and lubrication and one for non-routine maintenance)</p> <p>Routine cleaning and lubrication:</p> <p><input type="checkbox"/> We will implement and maintain procedures for routine maintenance of our gauge(s) or XRF(s) according to each manufacturer's recommendations and instructions.</p> <p style="text-align: center;">Or</p> <p><input type="checkbox"/> Alternative procedures are attached.</p> <p style="text-align: center;">AND</p> <p>Non-routine maintenance:</p> <p><input type="checkbox"/> We will send the gauge(s) or XRF(s) to the manufacturer or other person authorized by DHS, the NRC or another Agreement State to perform non-routine maintenance or repair operations that require the removal of the source or source rod from the gauge(s) or XRF(s).</p> <p style="text-align: center;">Or</p> <p><input type="checkbox"/> We will provide the information listed in Appendix G of WISREG 'Guidance for Portable Gauges or XRF Devices' to support a request to perform this work "in house."</p>
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Note:

- Alternative procedures for performing routine cleaning and lubrication will be reviewed according to the criteria listed above.

- Information requested in **Appendix G** will be reviewed on a case-by-case basis; if approved, the portable gauge license will contain a condition authorizing the licensee to perform non-routine maintenance.

Item 9.10: Transportation

Rule: *DHS 157.05(5); DHS 157.21; DHS 157.92(3); 49 CFR Parts 171-178.*

Criteria: Applicants must develop, implement, and maintain safety programs for public transport of radioactive material to ensure compliance with DOT regulations.

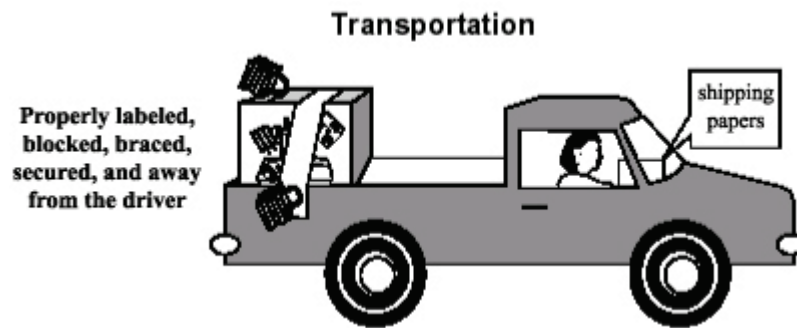


Figure 10. *Transportation.*

Discussion: **Figure 10** illustrates some DOT requirements often overlooked by portable gauge licensees. For example, the labeling of the transport container must be maintained in a legible condition. With regard to blocking and bracing, the licensee must assure that the transport container does not shift during transport. DHS inspects and enforces DOT regulations governing the transport of radioactive materials. **Appendix K** lists major DOT regulations and provides a sample shipping paper for portable gauges.

XRF users are not required to have shipping papers however, a UN 2911 marking must be placed on the outside of the package *49 CFR 173.422(a)* whenever it is transported or shipped. See *49 CFR 173.424* for DOT requirements concerning excepted packages for radioactive instruments and articles. See **Appendix L** for sample UN 2911 label.

Response from Applicant:

Item 9.10 Transportation

No response is needed during the license process; this issue will be reviewed during inspection.

Item 9.11: Waste Management - Gauge Disposal and Transfer

Rule: *DHS 157.13(15) and (18); DHS 157.30(1).*

Criteria: Licensed material must be disposed of in accordance with DHS requirements by transfer to an authorized recipient. Appropriate records must be maintained.

Discussion: Significant problems can arise from improper gauge or XRF transfer or failure to dispose of gauges or XRFs in a proper and timely manner. Such problems include the possession of radioactive materials by unauthorized individuals which could result in exposures to members of the general public. When disposing of portable gauges or XRFs, licensees must transfer them to an authorized recipient. Authorized recipients are the original manufacturer of the device, a commercial firm licensed by DHS, the NRC or another Agreement State to accept radioactive waste from other persons, or another specific licensee authorized to possess the licensed material (i.e., their license specifically authorizes the radionuclide and the use).

Before transferring radioactive material, a licensee must verify that the recipient is properly authorized to receive it using one of the methods described in *DHS 157.13(15)*. In addition, all packages containing radioactive sources must be prepared and shipped in accordance with DHS and DOT regulations. Records of the transfer must be maintained as required by *DHS 157.13(18)*.

Response from Applicant:

Item 9.11 Waste Management - Gauge or XRF Disposal And Transfer (Check box)

- We will transfer the gauge or XRF to the manufacturer for disposal or transfer the device to a specific licensee, authorized to receive radioactive material.

Note: Because of the difficulties and costs associated with disposal of Americium-241 sealed neutron sources, applicants should preplan the disposal. Applicants may want to consider contractual arrangements with the source supplier as part of a purchase agreement.

Item 10: Fees

On DPH Form F-45006 ‘*Application for Radioactive Material License Authorizing the Use of Sealed Sources in Portable Gauges or XRF Devices*’, enter the fee category and the amount for a new application. Enclose fee with the new application.

Response from Applicant:

SPECIFIC LICENSE FEE	
Item 10 License Fees (Refer to Wisconsin Administrative Code DHS 157.10)	
Category:	Application Fee Enclosed (For new applications only): <input type="checkbox"/> Yes <input type="checkbox"/> No Amount Enclosed \$

Item 11: Certification

Individuals acting in a private capacity are required to sign and date DPH Form F-45006 ‘*Application for Radioactive Material License Authorizing the Use of Sealed Sources in Portable Gauges or XRF Devices*’. Otherwise, senior representatives of the corporation or legal entity filing the application should sign and date DPH Form F-45006 ‘*Application for Radioactive Material License Authorizing the Use of Sealed Sources in Portable Gauges or XRF Devices*’.

Representatives signing an application must be authorized to make binding commitments and sign official documents on behalf of the applicant. As discussed previously in ‘Management Responsibility,’ signing the application acknowledges management's commitment and responsibilities for the radiation protection program. **DHS will return all unsigned applications for proper signature.**

DHS generally only accepts license correspondence from a senior representative of the applicant or licensee. If the representative would like to delegate authority to another individual (i.e., the Radiation Safety Officer) to submit routine amendment requests on behalf of the licensee or respond to DHS requests for information, the representative should complete and sign the optional box in Item 11, designating one or more individuals for this purpose. **A representative of the licensee’s senior management must sign all license renewal applications.**

Note:

- It is a violation of **Chapter DHS 157 ‘Radiation Protection’** to make a willful false statement or representation on applications or correspondence.

- When the application references commitments, those items become part of the licensing conditions and regulatory requirements.

Response from Applicant:

Item 11	
I hereby certify that this application was prepared in conformance with Wisconsin Administrative Code Chapter DHS 157 "Radiation Protection" and that all information contained herein, including any supplements attached hereto, is true and correct to the best of my knowledge and belief.	
SIGNATURE - Applicant Or Authorized Individual	Date signed
Print Name and Title of above signatory	
OPTIONAL: CORRESPONDENCE AUTHORITY	
I have delegated correspondence authority for matters pertaining to our Radioactive Materials License to _____. The designee named here has approval to submit amendment requests concerning this Radioactive Materials License. I understand that license renewal applications must be signed by a member of upper management.	
SIGNATURE - Applicant Or Authorized Individual	Date signed

Appendix A:

DPH Form F-45006 Application for Radioactive Material License Authorizing the Use of Sealed Sources in Portable Gauges or XRF Devices

DPH Form F-45006 'Application for Radioactive Material License Authorizing the Use of Sealed Sources in Portable Gauges or XRF Devices' is available on the Department's website at:

<http://dhs.wisconsin.gov/forms/F4/F45006.pdf>

For help accessing or completing this form, contact the Radiation Protection Section by telephone at 608-267-4797.

Appendix B:

DPH Form F-45007

Certificate of Disposition of Materials

CERTIFICATE OF DISPOSITION OF MATERIALS

Completion of this form is required to complete termination of a Radioactive Material License as outlined in Chapter DHS 157.13 (11). Failure to provide information will result in this request for termination of a specific license not being processed.

Instructions – Complete all items. Retain one copy and submit original to State of Wisconsin, Department of Health Services (DHS), P.O. Box 2659, Madison, WI 53701-2659. Telephone (608) 267-4797 Fax (608) 267-3695

CONTACT INFORMATION

Item 1 Name and Mailing Address of Applicant:	Item 2 Wisconsin Radioactive Material License Number
	Item 3 Contact Person – Name
	Contact Person - Telephone Number (Include area code)

TERMINATION AND DISPOSITION INFORMATION

The following information is provided in accordance with s. DHS 157.13 (11) "Expiration and Termination of Licenses." (Check all that apply)

- Item 4** All use of radioactive material authorized under the above referenced license has been terminated.
- Item 5** Radioactive contamination has been removed to the level outlined in s. DHS 157.13 (11) to the extent Practicable.
- Item 6** All radioactive material previously procured and/or possessed under the authorization granted by the above referenced license has been disposed of as follows. (Check all that apply)

<input type="checkbox"/> Transferred to:	_____	_____
	_____	_____
	_____	_____
	_____	_____

Who is(are) authorized to possess such material under Licensed Number _____

Issued by (Licensing Agency) _____

- Decayed, surveyed and disposed of as non-radioactive waste.
- No radioactive material has ever been procured and/or possessed by the licensee under the authorization granted by the above referenced license.
- Other (Attach additional pages)

- Item 7** Attached are radiation surveys or equivalent as specified in s. DHS 157.13 (11)(L).

Item 8 Records required to be maintained for the license termination requested are available at the following locations:

Name

Address

Contact Person Telephone Number (Include area code)

Item 9 Additional remarks (Attach additional pages if necessary.)

CERTIFICATION (To be completed by an individual authorized to make binding commitments on behalf of the applicant.)

Item 10.

The undersigned, on behalf of the licensee, hereby certifies that licensable quantities of radioactive material under the jurisdiction of the State of Wisconsin, Department of Health Services are not possessed by the licensee. It is therefore requested that the above referenced radioactive material license be terminated.

SIGNATURE (Applicant or Authorized Individual):

Date signed:

Print Name and Title of above signatory

Appendix C:
**Information Needed for Change of Ownership or
Control Application**

Definitions

Control: Control of a license is in the hands of the person or persons who are empowered to decide when and how that license will be used. That control is to be found in the person or persons who, because of ownership or authority explicitly delegated by the owners, possess the power to determine corporate policy and thus the direction of the activities under the license.

Transferee: A transferee is an entity that proposes to purchase or otherwise gain control of a DHS-licensed operation.

Transferor: A transferor is a DHS licensee selling or otherwise giving up control of a licensed operation.

Discussion

Licensees must provide full information and obtain DHS's *prior written consent* before transferring control of the license. Provide the following information concerning changes of control by the applicant (transferor and/or transferee, as appropriate). If any items are not applicable, so state.

1. Provide a complete description of the transaction (transfer of stocks or assets, or merger). Indicate whether the name has changed and include the new name. Include the name and telephone number of a licensee contact whom DHS may contact if more information is needed.
2. Describe any changes in personnel or duties that relate to the licensed program. Include training and experience for new personnel.
3. Describe any changes in the organization, location, facilities, equipment or procedures that relate to the licensed program.
4. Describe the status of the surveillance program (surveys, wipe tests, quality control) at the present time and the expected status at the time that control is to be transferred.
5. Confirm that all records concerning the safe and effective decommissioning of the facility will be transferred to the transferee or to DHS, as appropriate. These records include documentation of surveys of ambient radiation levels and fixed and/or removable contamination, including methods and sensitivity.
6. Confirm that the transferee will abide by all constraints, conditions, requirements and commitments of the transferor or that the transferee will submit a complete description of the proposed licensed program.

Licensees should refer to NRC Information Notice 89-25, Revision 1, "Unauthorized Transfer of Ownership or Control of Licensed Activities," available on the NRC's webpage at <http://www.nrc.gov>.

Appendix D:
**Criteria for Acceptable Training Courses for
Portable Gauge or XRF Users**

DHS considers it important that an individual be knowledgeable in radiation safety and competent in the operation of portable gauges and XRF devices. The course shall be at least 8 hours in length and should contain the following:

Course Content

- I. PRINCIPLES AND FUNDAMENTALS OF RADIATION SAFETY**
 - A. Types and Characteristics of Radiation
 - 1. Alpha, Beta, Gamma, X-ray and Neutron Radiation
 - 2. Exposure: Natural versus Man-made Radiation
 - 3. Irradiation versus Contamination/Internal vs. External
 - 4. Radioactive Material Used in Portable Gauges and XRF Devices
 - B. Units of Radiation Dose and Quantities of Radioactivity
 - 1. Curie, Rad, Rem and Roentgen
 - 2. Prefixes
 - 3. SI Units
 - C. Basic Math and Calculations Related to Radioactivity
 - 1. Radioactive Decay
 - 2. Dose Rates from the sources commonly used
 - 3. Inverse Square Law
 - D. Biological Effects of Radiation
 - 1. Acute, Chronic, and Genetic Effects of Exposure
 - 2. Radiation Protection Standards
 - 3. The ALARA Philosophy
 - E. Radiation levels from Radioactive Sealed Sources
 - 1. Survey Meter Use for Portable Gauge Users, not including XRF devices
 - F. Methods of Controlling Radiation Dose
 - 1. Time
 - 2. Distance
 - 3. Shielding
- II. STATE AND FEDERAL REGULATIONS**
 - A. **Chapter DHS 157, 'Radiation Protection'**
 - B. Title 10, Code of Federal Regulations, US Nuclear Regulatory Commission
 - C. Title 49, Code of Federal Regulations, Transportation
- III. LICENSING AND INSPECTION**
 - A. License Items and Conditions
 - B. Notices, Instructions and Reports to Workers
 - C. Inspection by DHS

IV. OPERATING AND EMERGENCY PROCEDURES

A. Operating Procedures

1. Training and Supervision
2. Personnel Monitoring
3. Availability of Procedures
4. Security of the Gauges or Devices When Stored and At The Work Location
5. ALARA Philosophy
6. Transportation of the Gauges or Devices and Security
7. General Rules of Use
8. Posting Requirements
9. Routine Maintenance
10. Radiation Surveys Using Survey Meters at the Work Site for Portable Gauges

B. Emergency Procedures

1. Preventive Measures
2. Emergency Response
3. Notification Requirements
4. Case Histories

V. TRANSFER/ DISPOSAL REQUIREMENTS

- A. DHS and NRC Regulations
- B. Transportation Requirements

VI. PRACTICAL TRAINING

- A. Transport/ Storage Containers
- B. Hands-on Training Specific to the Gauge or Device
 1. Proper Use
 2. Safe Handling
 3. Calibration of XRF Device Including Substrate Corrections
 4. Demonstration of Measurements of Various Materials
 5. Use of Survey Meters by Portable Gauge Users.

VII. Q&A SESSION

Course Examination

- 25-50 question, closed-book written test -- 70 percent passing grade
 - Emphasis on radiation safety of portable gauge storage, use, sealed source location, maintenance, and transportation, rather than the theory and art of making portable gauge measurements; and
 - Review of correct answers to missed questions with prospective gauge user immediately following the scoring of the test.

Course Instructor Qualifications

Instructor should have either:

- Bachelor's degree in a physical or life science or engineering;
- Successful completion of a portable gauge user course;
- Successful completion of an 8 hour radiation safety course; and
- 8 hours hands-on experience with portable gauges.

OR

- Successful completion of portable gauge user course;
- Successful completion of 40 hour radiation safety course; and
- 30 hours of hands-on experience with portable gauges.

Note: Licensees should maintain all training records for review during inspection.

Appendix E:
**Typical Duties and Responsibilities of the Radiation
Safety Officer**

The RSO's duties and responsibilities are illustrated in **Figure 3** and typically include ensuring the following:

- Stopping licensed activities that the RSO considers unsafe;
- Possession, use, storage, and maintenance of sources and gauges or XRFs are consistent with the limitations in the license, the Sealed Source and Device Registration sheet(s), and manufacturer's recommendations and instructions;
- Individuals using gauges are properly trained;
- When necessary, personnel monitoring devices are used and exchanged at the proper intervals; records of the results of such monitoring are maintained;
- Gauges or XRFs are properly secured;
- Proper authorities are notified in case of accident, damage to gauges, fire, or theft;
- Unusual occurrences involving the gauge (e.g., accident, damage) are investigated, cause(s) and appropriate corrective action are identified, and corrective action is taken;
- Audits are performed at least annually and documented, and corrective actions taken;
- Licensed material is transported in accordance with all applicable DOT requirements;
- Licensed material is properly transferred to either a manufacturer or a specific licensee;
- Appropriate records are maintained;
- Up-to-date license is maintained and amendment and renewal requests are submitted in a timely manner;
- Up-to-date operating and emergency procedures are developed, maintained, distributed, and implemented;
- Non-routine operations are performed by the manufacturer, distributor, or person specifically authorized by DHS, the NRC or another Agreement State;
- Documentation is maintained to demonstrate, by measurement or calculation, that the TEDE to the individual member of the public likely to receive the highest dose from the licensed operation does not exceed the annual limit in ***DHS 157.23(1)***;
- When the licensee identifies rule violations or license conditions or program weaknesses, corrective actions are developed, implemented, and documented; and
- Posting of documents required by ***DHS 157.88(1)***.

Appendix F:

Portable Gauge or XRF Audit Checklist

NOTE: All areas indicated in audit notes may not be applicable to every license and may not need to be addressed during each audit.

Licensee's name: _____ License No. _____

Auditor: _____ Date of Audit _____ Telephone No. _____

(Signature)

1. AUDIT HISTORY

- a. Last audit of this location conducted on (date) _____
- b. Are previous audits conducted yearly? (**DHS 157.21**)
- c. Are records of previous audits maintained? (**DHS 157.31(2)**)
- d. Are any deficiencies identified during last two audits or two years, whichever is longer?
- e. Are corrective actions taken? (Look for repeated deficiencies).

2. ORGANIZATION AND SCOPE OF PROGRAM

- a. If the mailing address or places of use changed, was the license amended?
- b. If ownership changed or bankruptcy filed, was DHS prior consent obtained or was DHS notified?
- c. If the RSO was changed, was license amended? Does new RSO meet DHS training requirements?
- d. If the designated contact person changed, was DHS notified?
- e. Does the license authorize all of the DHS regulated radionuclides contained in the gauges?
- f. Are the gauges or XRFs as described in the Sealed Source and Device (SSD) Registration Certificate or Sheet? Are copies of the SSD Certificates, manufacturers' manuals for operation and maintenance available?
- g. Are the actual uses of gauges consistent with the authorized uses listed on the license?
- h. Is RSO fulfilling his/her duties?

3. TRAINING AND INSTRUCTIONS TO WORKERS

- a. Are all workers who are likely to exceed 100 mrem (1 mSv) in a year given training annually per **DHS 157.88(2)**?
- b. Did each gauge or XRF operator attend an approved course prior to using gauges?
- c. Are training records maintained for each gauge or XRF operator?
- d. Do operators have adequate knowledge of emergency procedures?
- e. Did this audit include observations of operators using the gauge or XRF in a field situation? Operating gauge or XRF? Performing routine cleaning and lubrication? Transporting gauge or XRF? Storing gauge or XRF?
- f. Did the operator demonstrate safe handling and security during transportation, use and storage?

- g. HAZMAT training provided as required? [*49 CFR 172.700, 49 CFR 172.701, CFR 172.702, 49 CFR 172.703, 49 CFR 172.704*]
- 4. RADIATION SURVEY INSTRUMENTS (For Portable Gauges Users Only)**
- a. Does the licensee possess a calibrated and operable survey meter? (*DHS 157.05(3)*)
 - b. Is a survey meter available for use at each job site or is a DHS approved procedure in place? (*DHS 157.05(3); L/C*)
 - c. Are calibration records maintained (*DHS 157.31 (3)*)?
- 5. GAUGE AND XRF INVENTORY**
- a. Is a record kept showing the receipt of each gauge or XRF? (*DHS 157.06(1)*)
 - b. Are all gauges or XRFs received physically inventoried every 6 months? (*L/C*)
 - c. Are records of inventory results with appropriate information maintained? (*L/C*)
- 6. PERSONNEL RADIATION PROTECTION**
- a. Are ALARA considerations incorporated into the radiation protection program? (*DHS 157.21*)
 - b. Is documentation kept showing that unmonitored Portable Gauge or XRF users receive <10% of limit?
 - c. Did unmonitored users activities change during the year which could put them over 10% of limit?
 - d. If yes to c. above, was a new evaluation performed?
 - e. Is external dosimetry provided to users?
 - 1) Is the dosimetry supplier NVLAP approved? (*DHS 157.25(1)*)
 - 2) Are the dosimeters exchanged at industry recommended frequencies?
 - 3) Are dosimetry reports reviewed by the RSO when they are received?
 - 4) Is DPH Form F-45003 “*Occupational Exposure Record for a Monitoring Period*” or equivalent used for annual reports to workers? (*DHS 157.88(3)*)
 - 5) If a worker declared her pregnancy, did licensee comply with *DHS 157.22(8)*?
 - 6) Are records kept of embryo/fetus dose per *DHS 157.31 (7)*?
 - f. Are records of exposures, surveys, monitoring, and evaluations maintained? (*DHS 157.31(2-3) and (7)*)
- 7. PUBLIC DOSE**
- a. Are gauges or XRFs stored in a manner to keep doses below 100 mrem (1 mSv) in a year? (*DHS 157.23(1)*)
 - b. Has a survey or evaluation been performed per *DHS 157.25(1)*?
Have there been any additions or changes to the storage, security, number of gauges, or use of surrounding areas that would necessitate a new survey or evaluation?
 - c. Do unrestricted area radiation levels exceed 2 mrem (0.02 mSv) in any one hour? (*DHS 157.23(1)*)
 - d. Records maintained? (*DHS 157.31(3) and (8)*)

8. OPERATING AND EMERGENCY PROCEDURES

- a. Have operating and emergency procedures been developed?
- b. Do they contain the required elements?
- c. Does each operator have a current copy of the operating and emergency procedures including emergency contact information?

9. LEAK TESTS (DHS 157.24(1))

- a. Was each sealed source leak tested every 6 months or at other prescribed intervals?
- b. Was the leak test performed as described in correspondence with DHS and according to the license?
- c. Are records of results retained with the appropriate information included?
- d. Are any sources found leaking and if yes, was DHS notified?

10. MAINTENANCE OF GAUGES or XRFs

- a. Are manufacturer's procedure followed for routine cleaning and lubrication of gauge and XRF?
- b. Does the source or source rod remain attached to the portable gauge or XRF during cleaning?
- c. Is non-routine maintenance performed where the source or source rod is detached from the gauge or XRF? If yes, was it performed according to license requirements (e.g., extent of work, individuals performing the work, procedures, dosimetry, survey instrument available and used, compliance with **DHS 157.23(1)** limits)? *(This applies only to Portable Gauge Users. XRF users are not allowed to perform non-routine maintenance.)*

11. STORAGE AND SECURITY OF PORTABLE GAUGES

- a. Are gauges being stored in a manner that would prevent unauthorized use or removal? **(DHS 157.28(1)(a))**
- b. Are the gauges secured using two independent physical barriers when in not under the control and constant surveillance of an authorized user? **(DHS 157.05(5))**

12. TRANSPORTATION

Portable Gauges

- a. DOT-7A or other authorized packages used? **(49 CFR 173.415, 49 CFR 173.416(b))**
- b. Package performance test records on file?
- c. Special form sources documentation? **(49 CFR 173.476(a))**
- d. Package has 2 labels (ex. Yellow-II) with TI, Nuclide, Activity, and Hazard Class? **(49 CFR 172.403, 49 CFR 173.441)**
- e. Package properly marked? **(49 CFR 172.301, 49 CFR 172.304, 49 CFR 172.310, 49 CFR 172.324)**
- f. Package closed and sealed during transport? **(49 CFR 173.475(f))**
- g. Shipping papers prepared and used? **(49 CFR 172.200(a))**

- h. Shipping papers contain proper entries? {Shipping name, Hazard Class, Identification Number (UN Number), Total Quantity, Package Type, Nuclide, RQ, Radioactive Material, Physical and Chemical Form, Activity, category of label, TI, Shipper's Name, Certification and Signature, Emergency Response Phone Number, Cargo Aircraft Only (if applicable)} **(49 CFR 172.200, 49 CFR 172.201, 49 CFR 172.202, 49 CFR 172.203, 49 CFR 172.204, 49 CFR 172.604)**
- i. Shipping papers within drivers reach and readily accessible during transport? **(49 CFR 177. 817(e))**
- j. Secured against movement? **(49 CFR 177. 834)**
- k. Placarded on vehicle, if needed? **(49 CFR 172.504)**
- l. Proper overpacks, if used? **(49 CFR 173.25)**
- m. Any incidents reported to DOT? **(49 CFR 171.15, 16)**
- n. Security two-barrier rule met? **(DHS 157.05(5))**

XRF

- a. If shipping papers are not required **(49 CFR 173.422(a))** is the package marked with UN 2911 when the XRF is transported?

13. AUDITOR'S INDEPENDENT SURVEY MEASUREMENTS (IF MADE)

- a. Describe the type, location, and results of measurements. Does any radiation level exceed regulatory limits?

14. NOTIFICATION AND REPORTS

- a. Was any radioactive material lost or stolen? Are reports made? **(DHS 157.32)**
- b. Did any reportable incidents occur? Are reports made? **(DHS 157.32)**
- c. Did any overexposures and high radiation levels occur? Reported? **(DHS 157.32)**
- d. If any events (as described in items a through c above) did occur, what was root cause? Are corrective actions appropriate?
- e. Is the licensee aware of telephone number for radiation emergencies in the State of Wisconsin? **(608) 258-0099**

15. POSTING AND LABELING

- a. DPH Form F-45027 “*Notice to Employees*” posted? **(DHS 157.88 (1))**
- b. **Chapter DHS 157 ‘Radiation Protection’, Subchapter III and X**, license documents posted or a notice posted? **(DHS 157.88 (1))**
- c. Any notice of violation, forfeiture assessment or order issued under **s. 254.37 or 254.45, Stats.**, or **Chapter DHS 157 ‘Radiation Protection’** and any response from the licensee or registrant is posted until removal is authorized by DHS? **(DHS 157.88(1))**
- d. Emergency procedures that apply to activities conducted under the license posted? **(DHS 157.88(1)).**
- e. Other posting and labeling? **(DHS 157.29(2) and (4))**

16. RECORD KEEPING FOR DECOMMISSIONING

- a. Records kept of information important to decommissioning? **(DHS 157.15)**
- b. Records include all information outlined **(DHS 157.15)**

17. BULLETINS AND INFORMATION NOTICES

- a. Are Information Notices received?
- b. Appropriate training and action taken in response?

18. SPECIAL LICENSE CONDITIONS OR ISSUES

- a. Did auditor review special license conditions or other issues (e.g., non-routine maintenance)?

19. DEFICIENCIES IDENTIFIED IN AUDIT; CORRECTIVE ACTIONS

- a. Summarize problems/deficiencies identified during audit.
- b. If problems/deficiencies identified in this audit, describe corrective actions planned or taken. Are corrective actions planned or taken at ALL licensed locations (not just location audited)?
- c. Provide any other recommendations for improvement.

20. EVALUATION OF OTHER FACTORS

- a. Senior licensee management is appropriately involved with the radiation protection program and/or RSO oversight?
- b. RSO has sufficient time to perform his/her radiation safety duties?
- c. Licensee has sufficient staff to support the radiation protection program?

Appendix G:

**Information Needed to Support a Portable Gauge
Licensee's Request to Perform Non-Routine
Maintenance**

Non-routine maintenance or repair (beyond routine cleaning and lubrication) involves detaching the source or source rod from the device and any other activities during which personnel could receive radiation doses exceeding DHS limits. See **Figure 9**. If this maintenance or repair is not performed properly with attention to good radiation safety principles, the gauge may not operate as designed and personnel performing these tasks could receive radiation doses exceeding DHS limits.

A typical moisture-density gauge contains 0.37 gigabecquerels (10 millicuries) of cesium-137 and 1.5 gigabecquerels (40 millicuries) of americium-241 as a neutron source. In about 9 minutes, an unshielded cesium-137 source of this activity can deliver 0.05 sievert (5 rems) to a worker's hands or fingers (i.e., extremities), assuming the extremities are 1 centimeter from the source. Some gauges contain sources of even higher activities with correspondingly higher dose rates. The threshold for extremity monitoring is 0.05 sievert (5 rems) per year.

Thus, applicants wishing to perform non-routine maintenance must use personnel with special training and follow appropriate procedures consistent with the manufacturer's instructions and recommendations that address radiation safety concerns (e.g., use of radiation survey meter, shielded container for the source, personnel dosimetry). Accordingly, provide the following information:

- Describe the types of work, maintenance, cleaning, repair, etc., to be performed that necessitate detaching the source or source rod from the device or that could cause personnel to receive radiation doses exceeding DHS limits. The principal reason for obtaining this information is to assist in the evaluation of the qualifications of individuals who will conduct the work and the radiation safety procedures they will follow.
- Identify who will perform non-routine maintenance, their training and experience, and why they are competent to perform non-routine maintenance.
- Submit procedures for safe handling of the radioactive source while the source or source rod is detached from the gauge. These procedures should ensure the following:
 - doses to personnel and members of the public are within regulatory limits and ALARA (e.g., use of shielded containers or shielding);
 - the source or source rod is secured against unauthorized removal access or under constant surveillance;

- appropriate labels and signs are used; and
 - manufacturer's instructions and recommendations are followed.
- Confirm that individuals performing non-routine maintenance on gauges will always use whole body and extremity monitoring devices or that an evaluation will be available to demonstrate that these individuals are not likely to receive, in one year, more than 10 percent of the applicable dose limits. The dose limits are illustrated in **Figure 5**.
 - Verify possession of at least one survey instrument meeting the following criteria:
 - Be capable of detecting gamma radiation;
 - Be capable of measuring from 0.01 to 0.5 mSv/hr [1 to 50 mrem/hr];
 - Be calibrated at least annually with radionuclide point sources emitting radiation of the type and energy of the sealed sources in the gauge;
 - Be calibrated at least 2 points located at approximately 1/3 and 2/3 of each scale; readings within $\pm 20\%$ are acceptable;
 - Be calibrated by a person specifically licensed by DHS, the NRC, or another Agreement State to calibrate radiation detection instruments; and
 - Be checked for functionality prior to use (e.g., with the gauge or a check source).

Note: Records of instrument calibration must be maintained for 3 years after the record is made (**DHS 157.31(3)**).

- Describe steps to be taken to ensure that radiation levels in areas where non-routine maintenance will take place do not exceed **DHS 157.23(1)** limits. For example, applicants can do the following:
 - commit to performing surveys with a survey instrument (as described above);
 - specify where and when surveys will be conducted during non-routine maintenance; and
 - commit to maintaining, for 3 years from the date of the survey, records of the survey (e.g., who performed the survey, date of the survey, instrument used, measured radiation levels correlated to location of those measurements), as required by **DHS 157.31 (3)**.

Appendix H:
Operating and Emergency Procedures

Operating Procedures

- If personnel dosimetry is provided:
 - Always wear your assigned thermoluminescent dosimeter (TLD) or OSL when using the gauge or XRF;
 - Never wear another person's TLD or OSL; and
 - Never store your TLD or OSL near the gauge or XRF.
- Before removing the gauge or XRF from its place of storage, ensure that, where applicable, each gauge source is in the fully shielded position and that in gauges with a movable rod containing a sealed source, the source rod is locked (e.g., keyed lock, padlock, mechanical control) in the shielded position. Place the gauge in the transport case and lock the case.
- Sign out the gauge or XRF in the utilization log (that remains at the storage location) including the date(s) of use, name(s) of the authorized users who will be responsible for the gauge, and the temporary jobsite(s) where the gauge will be used.
- Block and brace the case to prevent movement during transportation. Lock the case in or to the vehicle. Follow all applicable Department of Transportation (DOT) requirements when transporting the gauge.
- Use the gauge or XRF according to the manufacturer's instructions and recommendations.
- Do not touch the unshielded source rod with your fingers, hands, or any part of your body.
- Do not place hands, fingers, feet, or other body parts in the radiation field from an unshielded source.
- Perform routine cleaning and maintenance according to the manufacturer's instructions and recommendations.
- When the gauge or XRF is not in use at a temporary jobsite, place the gauge or XRF in a secured location (e.g., locked in the trunk of a car or locked in a storage shed).
- Return the gauge or XRF to its proper locked storage location at the end of the work shift.
- Sign in the gauge or XRF in the utilization log when returned to storage.
- After making changes affecting the gauge storage area (e.g., changing the location of gauges within the storage area, removing shielding, adding gauges or XRFs, changing the occupancy of adjacent areas), reevaluate compliance with public dose limits and ensure proper security of gauges or XRFs.

For Portable Gauges Only

- Unless absolutely necessary, do not look under the gauge when the source rod is being lowered into the ground. If you must look under the gauge to align the source rod with the hole, follow the manufacturer's procedures to minimize radiation exposure.

- After completing each measurement in which the source is unshielded, immediately return the source to the shielded position.
- Always maintain constant surveillance and immediate control of the gauge when it is not in storage. At job sites, do not walk away from the gauge when it is left on the ground. Take actions necessary to protect the gauge and yourself from danger of moving heavy equipment.
- When the portable gauge is not in use at a temporary job site, place the portable gauge in a secured storage location with two independent physical controls. Examples of two independent physical controls are: (1) securing the portable gauge in a locked storage facility located in a separate secured area in a warehouse; (2) securing the portable gauge inside a locked van and secured to the vehicle with a steel cable with a lock or a chain with a lock; (3) or storing the portable gauge inside a locked, nonremovable box and further securing the transportation case with a steel cable or chain.
- Always keep unauthorized persons away from the gauge.
- If gauges are used for measurements with the unshielded source extended more than 3 feet beneath the surface, use piping, tubing, or other casing material to line the hole from the lost depth to 12 inches above the surface. If the piping, tubing, or other casing material cannot extend 12 inches above the surface, cap the hole liner or take other steps to ensure that the hole is free of debris (and it is unlikely that debris will re-enter the cased hole) so that the unshielded source can move freely (e.g., use a dummy probe to verify that the hole is free of obstructions).

Emergency Procedures for Portable Gauges:

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

- Immediately secure the area and keep people at least 15 feet away from the 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.
- Gauge users and other potentially contaminated individuals should not leave the scene until emergency assistance arrives.
- Notify the persons in the order listed below of the situation:

NAME*	WORK PHONE NUMBER*	HOME PHONE NUMBER*

* Fill in with (and update, as needed) the names and telephone numbers of appropriate personnel (e.g., the *RSO*, or other knowledgeable licensee staff, licensee's consultant, gauge manufacturer) to be contacted in case of emergency.

- Follow the directions provided by the person contacted above.

Emergency Procedures for XRFs

If the XRF is lost, damaged or stolen, or if any other emergency or other unusual event occurs:

- Immediately secure the area and keep people at least 15 feet away from the XRF 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.
- XRF users and other potentially contaminated individuals should not leave the scene until emergency assistance arrives.
- Notify the persons in order listed below of the situation:

NAME*	WORK PHONE NUMBER*	HOME PHONE NUMBER*

* Fill in with (and update, as needed) the names and telephone numbers of appropriate personnel (e.g., the RSO, or other knowledgeable licensee staff, licensee's consultant, XRF manufacturer) to be contacted in case of emergency.

- Follow the directions provided by the person contacted above.

RSO and Licensee Management:

- Arrange for a radiation survey to be conducted as soon as possible by a knowledgeable person using appropriate radiation detection instrumentation. This person could be a licensee employee using a survey meter located at the jobsite or a consultant. To accurately assess the radiation danger, it is essential that the person performing the survey be competent in the use of the survey meter.
- If portable gauges are used for measurements with the unshielded source extended more than 3 feet below the surface, contact persons listed on the emergency procedures need to know the steps to be followed to retrieve a stuck source and to convey those steps to the staff on site.
- Notify law enforcement if the gauge or XRF is believed to be lost or stolen.
- DHS notification is required when gauges containing licensed material are lost or stolen, when gauges are damaged or involved in incidents that result in doses in excess of **DHS 157.32(3)** limits, and when it becomes apparent that attempts to recover a source stuck below the surface will be unsuccessful. Telephone notifications shall be made to DHS at (608) 267-4797 during normal business hours (8 a.m. – 4:30 p.m.). For immediate notifications after normal business hours, DHS's 24 hour emergency telephone number is (608) 258-0099. **Identify the emergency as radiological.**
- Reports to DHS must be made within the reporting timeframes specified by **Chapter DHS 157 'Radiation Protection.'**

Reporting requirements are found in **DHS 157.13(17)** and **DHS 157.32(1-3)**

Appendix I:
Dosimetry-related Guidance

**Part 1: Worksheet for Determining if Personnel Dosimetry
is Required for XRF Users**

WORKSHEET FOR DETERMINING IF PERSONNEL DOSIMETRY IS REQUIRED FOR XRF USERS

Instructions: To meet the requirement of *DHS 157.25(2)(a)* complete **Steps 1** through **6** and sign and date the evaluation on the line provided.

Disclaimer: If there is a change in workload or if a new source (new XRF) is acquired a new evaluation will need to be performed.

Step 1.

Determine the radiation level while the shutter is open in one of the following ways. Record the results below.

- Obtain from the manufacturer's specifications: the radiation level approximately 30 centimeters from the XRF when shutter is open, or
- Measure the radiation level with a calibrated survey meter.
 - When making the radiation measurement while the shutter is open, place the survey instrument approximately 30 centimeters from the XRF while following good radiation safety practices.

_____ mrem per hour

Step 2.

Record the average number of minutes per week that the XRF is used with the shutter in open position.

_____ minutes per week

Step 3.

Divide the minutes per week (**Step 2.**) by 60 to determine hours per week and record below.

_____ minutes per week (**Step 2.**) / 60

= _____ hours per week

Step 4.

Multiply the hours per week (**Step 3.**) by 52 weeks to equal hours per year and record below.

_____ hours per week (**Step 3.**) X 52 weeks

= _____ hours per year

Step 5.

Multiply hours per year (**Step 4.**) by mrem per hour (**Step 1.**) to equal mrem received per year and record below.

_____ hours per year (**Step 4.**) X _____ mrem per hour (**Step 1.**)

= _____ mrem per year

Step 6.

Is the # of mrem per year (**Step 5.**) greater than 500? Yes No

- If yes provide dosimetry as required by **DHS 157.25(2)(a)1**
- If no, proceed to **Step 7.**

Step 7.

Is the # of mrem per year (**Step 5.**) greater than 100? Yes No

- If yes, and you have an employee that is a declared pregnant worker as defined by **DHS 157.03(90)** provide dosimetry to that individual. In addition, provide annual radiation safety training as required by **DHS 157.88(2)** to all employees that use the XRF.
- If no, you are not required under **Chapter DHS 157 ‘Radiation Protection’** to provide dosimetry to your employees.

Signature of Person Performing the Evaluation

Date

Part 2: Worksheet for Determining if Personnel Dosimetry is Required for Portable Gauge Users

WORKSHEET FOR DETERMINING IF PERSONNEL DOSIMETRY IS REQUIRED FOR PORTABLE GAUGE USERS

Instructions: To meet the requirement of *DHS 157.25(2)(a)* complete **Steps 1** through **6** and sign and date the evaluation on the line provided.

Disclaimer: If there is a change in workload or if a new source (new portable gauge) is acquired a new evaluation will need to be performed.

Step 1.

Determine the highest radiation level while the source is shielded in one of the following ways. Record the results below.

- Obtain from the manufacturer's specifications: the radiation level approximately 30 centimeters from the gauge or;
- Measure the radiation level with a calibrated survey meter at approximately 30 centimeters from the gauge.

_____ mrem per hour

Step 2.

Record the average number of minutes per week that the gauge is used.

_____ minutes per week

Step 3.

Divide the minutes per week (**Step 2.**) by 60 to determine hours per week and record below.

_____ minutes per week (**Step 2.**) / 60

= _____ hours per week

Step 4.

Multiply the hours per week (**Step 3.**) by 52 weeks to equal hours per year and record below.

_____ hours per week (**Step 3.**) X 52 weeks

= _____ hours per year

Step 5.

Multiply hours per year (**Step 4.**) by mrem per hour (**Step 1.**) to equal mrem received per year and record below.

_____ hours per year (**Step 4.**) X _____ mrem per hour (**Step 1.**)

= _____ mrem per year

Step 6.

Is the # of mrem per year (**Step 5.**) greater than 500? Yes No

- If yes provide dosimetry as required by **DHS 157.25(2)(a)1**
- If no, proceed to **Step 7.**

Step 7.

Is the # of mrem per year (**Step 5.**) greater than 100? Yes No

- If yes, and you have an employee that is a declared pregnant worker as defined by **DHS 157.03(90)** provide dosimetry to that individual. In addition, provide annual radiation safety training as required by **DHS 157.88(2)** to all employees that use gauges.
- If no, you are not required under **Chapter DHS 157 ‘Radiation Protection’** to provide dosimetry to your employees.

Signature of Person Performing the Evaluation

Date

**Part 3: Guidance for Demonstrating that Individual
Members of the Public will not Receive Doses Exceeding
the Allowable Limit**

Licensees must ensure that:

- The radiation dose received by individual members of the public does not exceed 1 mSv (100 mrem) in one calendar year resulting from the licensee's possession and/or use of licensed materials.

Members of the public include persons who live, work, or may be near locations where portable gauges or XRFs are used or stored. (For storage of gauges in personal residences, occupants are considered members of the public.) Employees whose assigned duties do not include the use of licensed materials but who work in the vicinity where gauges or XRFs are used or stored are also considered members of the public.

- The radiation dose in unrestricted areas does not exceed 0.02 mSv (2 mrem) in any one hour.

Typical unrestricted areas may include offices, shops, laboratories, areas outside buildings, property, and non-radioactive equipment storage areas. The licensee does not control access to these areas for purposes of controlling exposure to radiation or radioactive materials. However, the licensee may control access to these areas for other reasons such as security.

Licensees must show compliance with both portions of the rule. Calculations or a combination of calculations and measurements (e.g., using an environmental TLD) are often used to prove compliance.

Calculational Method

The calculational method takes a tiered approach, going through a three-part process starting with a worst case situation and moving toward more realistic situations. It makes the following simplifications: (1) each gauge is a point source, (2) typical radiation levels encountered when the source is in the shielded position are taken from either the SSD Registration Sheet or the manufacturer's literature, and (3) no credit is taken for any shielding found between the gauges and the unrestricted areas.

Part 1 of the calculational method is simple but conservative. It assumes that an affected member of the public is present 24 hours a day and uses only the "inverse square law" to determine if the distance between the gauge and the affected member of the public is sufficient to show compliance with the public dose limits. Part 2 considers not only distance, but also the time that the affected member of the public is actually in the area under consideration. Part 3 considers distance and the portion of time that both the gauge and the affected member of the public are present. Using this approach, licensees make only those calculations that are needed to demonstrate compliance. In many cases licensees will need to use the calculational method through Part 1 or Part 2. The results of these calculations typically result in higher radiation levels than would exist at typical facilities, but provide a method for estimating conservative doses which could be received.

Example 1

To better understand the calculational method we will look at Moisture-Density Measurements, Inc., a portable gauge licensee. Yesterday, the company's president noted that the new gauge storage area is very close to his secretary's desk and he asked Joe, the RSO, to determine if the company is complying with **Chapter DHS 157 'Radiation Protection.'**

The secretary's desk is near the wall separating the reception area from the designated, locked gauge storage area, where the company is storing its three gauges. Joe measures the distances from each gauge to the wall and looks up in the manufacturer's literature the radiation levels individuals would encounter for each gauge. **Figure 11** is Joe's sketch of the areas in question, and **Table 2** summarizes the information Joe has on each gauge.

A Bird's Eye View of Office and Gauge Storage Area

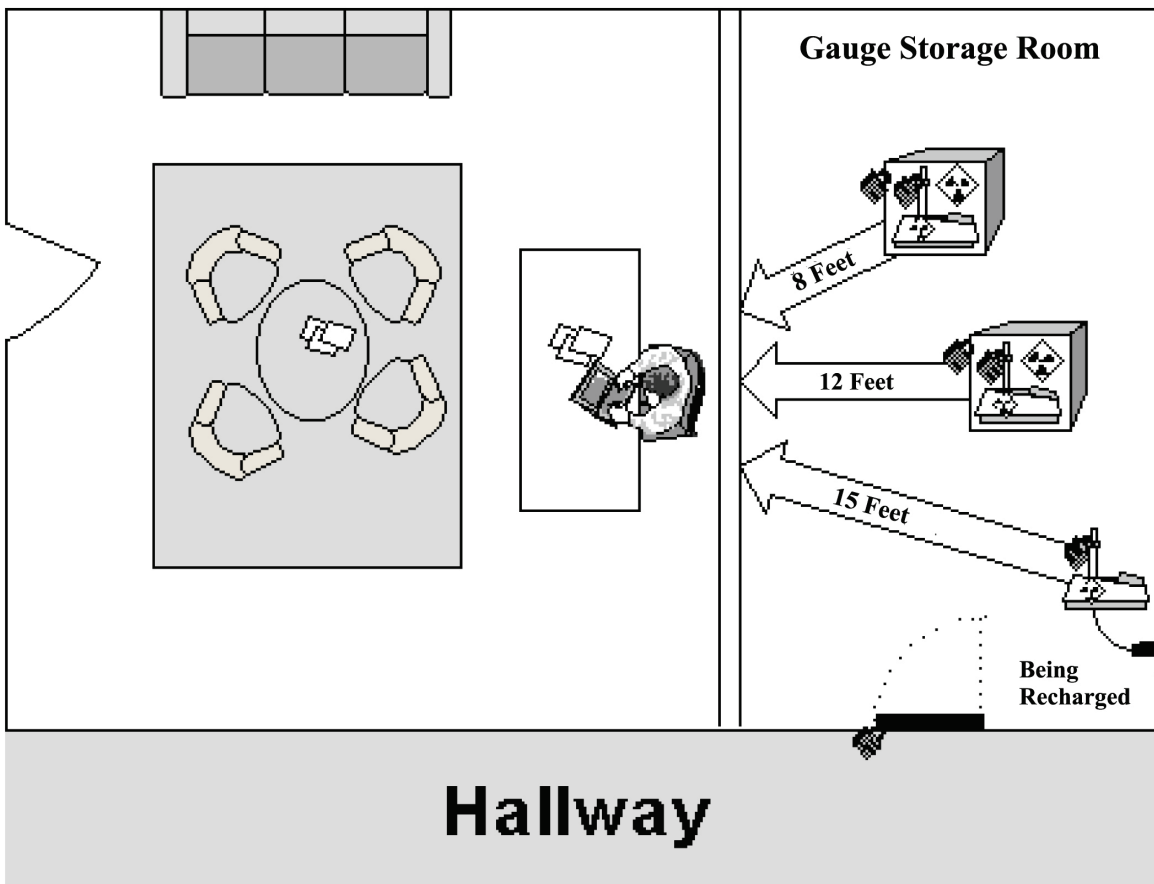


Figure 11. Diagram of Office and Gauge Storage Area. This sketch shows the areas described in Examples 1 and 2.

Table 2: Information Known about Each Gauge

DESCRIPTION OF KNOWN INFORMATION	GAUGE 1	GAUGE 2	GAUGE 3
How gauge is stored	Gauge in transport container	Gauge in transport container	Gauge out of transport container and being recharged
Dose rate in mrem/hr encountered at specified distance from the gauge (from manufacturer's literature)	2 mrem/hr at 1 ft	8 mrem/hr at 1 ft	2 mrem/hr at 3 ft
Distance in ft to secretary's chair	8 ft	12 ft	15 ft

Example 1: Part 1

Joe's first thought is that the distance between the gauges and the secretary's chair may be sufficient to show compliance with the rule in **DHS 157.23 (1)**. So, taking a "worst case" approach, he assumes: 1) the gauges are constantly present (i.e., 24 hr/d), 2) all three gauges remain in storage with no other use, and 3) the secretary is constantly sitting in the desk chair (i.e., 24 hr/d). Joe proceeds to calculate the dose she might receive hourly and yearly from each gauge as shown in **Tables 3, 4, and 5** below.

Table 3 Calculational Method, Part 1---Hourly and Annual Dose Received from Gauge 1

		GAUGE 1	
Step No.	Description	Input Data	Results
1	Dose received in an hour at known distance from gauge (e.g., from manufacturer's data), in mrem/hr	2	2
2	Square of the distance (ft) at which the Step 1 rate was measured, in ft ²	(1) ²	1
3	Square of the distance (ft) from the gauge to the secretary's desk in an unrestricted area, in ft ²	(8) ²	64
4	Multiply the results of Step 1 by the results of Step 2 (this is an intermediate result)	2 x 1 = 2	
5	Divide the result of Step 4 by the result of Step 3 to calculate the dose received by an individual at the secretary's desk, HOURLY DOSE RECEIVED FROM GAUGE 1 , in mrem in an hour.	2/64 = 0.031	
6	Multiply the result of Step 5 by 24 hr/d x 365 d/yr = MAXIMUM ANNUAL DOSE RECEIVED FROM GAUGE 1 , in mrem in a year.	0.031 x 24 x 365 = 0.031 x 8760 = 272	

Table 4. Calculational Method, Part 1---Hourly and Annual Dose Received from Gauge 2

		GAUGE 2	
Step No.	Description	Input Data	Results
1	Dose received in an hour at known distance from gauge (e.g., from manufacturer's data), in mrem/hr	8	8
2	Square of the distance (ft) at which the Step 1 rate was measured, in ft ²	(1) ²	1
3	Square of the distance (ft) from the gauge to the secretary's desk in an unrestricted area, in ft ²	(12) ²	144
4	Multiply the results of Step 1 by the results of Step 2 (this is an intermediate result)	8 x 1 = 8	
5	Divide the result of Step 4 by the result of Step 3 to calculate dose received in an hour by an individual at the secretary's desk, HOURLY DOSE RECEIVED FROM GAUGE 2 , in mrem in an hour	8/144 = .056	
6	Multiply the result of Step 5 by 24 hr/d x 365 d/yr = MAXIMUM ANNUAL DOSE RECEIVED FROM GAUGE 2 , in mrem in a year	0.056 x 24 x 365 = 0.056 x 8760 = 491	

Table 5. Calculational Method, Part 1---Hourly and Annual Dose Received from Gauge 3

		GAUGE 3	
Step No.	Description	Input Data	Results
1	Dose received in an hour at known distance from gauge (e.g., from manufacturer's data), in mrem/hr	2	2
2	Square of the distance (ft) at which the Step 1 rate was measured, in ft ²	(3) ²	9
3	Square of the distance (ft) from the gauge to the secretary's desk in an unrestricted area, in ft ²	(15) ²	225
4	Multiply the results of Step 1 by the results of Step 2 (this is an intermediate result)	2 x 9 = 18	
5	Divide the result of Step 4 by the result of Step 3 to calculate dose received by an individual at the secretary's desk, HOURLY DOSE RECEIVED FROM GAUGE 3 , in mrem in an hour	18/225 = 0.08	
6	Multiply the result of Step 5 by 24 hr/d x 365 d/yr = MAXIMUM ANNUAL DOSE RECEIVED FROM GAUGE 3 , in mrem in a year	0.08 x 24 x 365 = 0.08 x 8760 = 701	

To determine the total hourly and total annual dose received, Joe adds the pertinent data from the preceding tables.

Table 6. Calculational Method, Part 1---Total Hourly and Annual Dose Received from Gauge 1, 2, and 3

Step No.	Description	Gauge 1	Gauge 2	Gauge 3	Sum
7	TOTAL HOURLY DOSE RECEIVED from Step 5 of Tables I-3, I-4, and I-5, in mrem in an hour	0.031	0.056	0.08	$0.031 + 0.056 + 0.08 = \mathbf{0.167}$
8	TOTAL ANNUAL DOSE RECEIVED from Step 6 of Tables I-3, I-4, and I-5, in mrem in a year	272	491	701	$272 + 491 + 701 = \mathbf{1464}$

NOTE: The Sum in Step 7 demonstrates compliance with the 2 mrem in any one hour limit. Reevaluate if assumptions change. If the Sum in Step 8 exceeds 100 mrem/yr, proceed to Part 2 of the calculational method.

At this point, Joe is pleased to see that the total dose that an individual could receive in any one hour is only 0.167 mrem, but notes that an individual could receive a dose of 1,464 mrem in a year, much higher than the 100 mrem limit.

Example 1: Part 2

Joe reviews his assumptions and recognizes that the secretary is not at the desk 24 hr/d. He decides to make a realistic estimate of the number of hours the secretary sits in the chair at the desk, keeping his other assumptions constant (i.e., the gauges are constantly present (i.e., 24 hr/d), all three gauges remain in storage with no other use). He then recalculates the annual dose received.

Table 7. Calculational Method, Part 2--Annual Dose Received from Gauges 1, 2, and 3

Step No.	Description	Results
9	A. Average number of hours per day that individual spends in area of concern (e.g., secretary sits at desk 5 hr/day; the remainder of the day the secretary is away from the desk area copying, filing, etc.)	5
	B. Average number of days per week in area (e.g., secretary is part time and works 3 days/week)	3
	C. Average number of weeks per year in area (e.g., secretary works all year)	52
10	Multiply the results of Step 9.A. by the results of Step 9.B. by the results of Step 9.C. = AVERAGE NUMBER OF HOURS IN AREA OF CONCERN PER YEAR	$5 \times 3 \times 52 = \mathbf{780}$
11	Multiply the sum in Step 7 by the results of Step 10 = ANNUAL DOSE RECEIVED FROM GAUGES CONSIDERING REALISTIC ESTIMATE OF TIME SPENT IN AREA OF CONCERN , in mrem in a year	$0.167 \times 780 = \mathbf{130}$

NOTE: If Step 11 exceeds 100 mrem in a year, proceed to Part 3 of the calculational method.

Although Joe is pleased to note that the calculated annual dose received is significantly lower, he realizes it still exceeds the 100 mrem in a year limit.

Example 1, Part 3

Again Joe reviews his assumptions and recognizes that the gauges are not always in storage when the secretary is seated at the desk. As he examines the situation, he realizes he must consider each gauge individually.

Table 8. Calculational Method, Part 3---Summary of Information

INFORMATION ON WHEN GAUGES ARE PRESENT IN THE STORAGE AREA:

- GAUGE 1: an old gauge located in the storage area continuously (24 hr/d)
- GAUGE 2: a new gauge located in the storage area continuously (24 hr/d) for 8 months of the year; for the remaining 4 months of the year it is at temporary job sites
- GAUGE 3: a new gauge located in the storage area overnight; it is used every day at temporary job sites all year and returned to the storage location at the end of each day. The gauge is usually present during the secretary's first and last hours of work each day.

INFORMATION FROM EXAMPLE 1, PART 2 ON WHEN THE SECRETARY IS SITTING AT THE DESK

- 5 hours per day
- 3 days per week
- 52 weeks per year

Table 9. Calculational Method, Part 3---Annual Dose Received from Gauges 1, 2, and 3

Step No.	Description	GAUGE 1	GAUGE 2	GAUGE 3
12	Average number of hours per day gauge is in storage while secretary is present	5	5	2
13	Average number of days per week gauge is in storage while secretary is present	3	3	3
14	Average number of weeks per year gauge is in storage while secretary is present	52	32	52
15	Multiply the results of Step 12 by the results of Step 13 by the results of Step 14 = TOTAL HOURS EACH GAUGE IS STORED PER YEAR WHILE SECRETARY IS PRESENT	$5 \times 3 \times 52 = 780$	$5 \times 3 \times 32 = 480$	$2 \times 3 \times 52 = 312$
16	Multiply the results of Step 15 by the results of Step 7 = ANNUAL DOSE RECEIVED FROM EACH GAUGE , in mrem in a year	$780 \times 0.031 = 24$	$480 \times 0.056 = 27$	$312 \times 0.08 = 25$
17	Sum the results of Step 16 for each gauge = TOTAL ANNUAL DOSE RECEIVED CONSIDERING REALISTIC ESTIMATE OF TIME SPENT IN AREA OF CONCERN AND TIME GAUGE IS IN STORAGE , in mrem in a year	$24 + 27 + 25 = 76$		

NOTE: If the result in Step 17 is greater than 100 mrem/yr, the licensee must take corrective actions.

Joe is pleased that the result in Step 17 shows compliance with the 100 mrem/yr limit. Had the result in Step 17 been higher than 100 mrem/yr, then Joe could have done one or more of the following:

- Consider whether the assumptions used to determine occupancy and the time each gauge is in storage are accurate, revise the assumptions as needed, and recalculate using the new assumptions;
- Calculate the effect of any shielding located between the gauge storage area and the secretarial workstation--such calculation is beyond the scope of this Appendix;
- Take corrective action (e.g., move gauges within storage area, move the storage area, move the secretarial workstation) and perform new calculations to demonstrate compliance; and
- Designate the area outside the storage area as a restricted area and the secretary as an occupationally exposed individual. This would require controlling access to the area for purposes of radiation protection and training the secretary as required by ***DHS 157.88(2)***.

Note that in the example, Joe evaluated the unrestricted area outside only one wall of the gauge storage area. Licensees also need to make similar evaluations for other unrestricted areas and to keep in mind the ***ALARA*** principle, taking reasonable steps to keep radiation dose received below regulatory requirements. In addition, licensees need to be alert to changes in situations (e.g., moving any of the gauges closer to the secretarial workstation, adding a gauge to the storage area, changing the secretary to a full-time worker, or changing the estimate of the portion of time spent at the desk) and to perform additional evaluations, as needed.

RECORD KEEPING: *DHS 157.31(8)* requires licensees to maintain records demonstrating compliance with the dose limits for individual members of the public.

Combination Measurement-Calculational Method

This method, which allows the licensee to take credit for shielding between the gauge and the area in question, begins by measuring radiation levels in the areas, as opposed to using manufacturer-supplied rates at a specified distance from each gauge. These measurements must be made with calibrated survey meters sufficiently sensitive to measure background levels of radiation. However, licensees must exercise caution when making measurements with currently calibrated radiation survey instruments. A maximum dose of 1 mSv (100 mrem) received by an individual over a period of 2080 hours (i.e., a "work" year of 40 hr/wk for 52 wk/yr) is equal to less than 0.5 microsievert (0.05 mrem) per hour.

This rate is well below the minimum sensitivity of most commonly available G-M survey instruments.

Instruments used to make measurements for calculations must be sufficiently sensitive. An instrument equipped with a scintillation-type detector (e.g., NaI (Tl)) or a micro-R meter used in making very low gamma radiation measurements should be adequate.

Licenseses may also choose to use environmental TLDs in unrestricted areas next to the gauge storage area for monitoring. This direct measurement method would provide a definitive measurement of actual radiation levels in unrestricted areas without any restrictive assumptions. Records of these measurements can then be evaluated to ensure that rates in unrestricted areas do not exceed the 1 mSv/yr (100 mrem/yr) limit.

Note: TLDs used for personnel monitoring (e.g., LiF) may not have sufficient sensitivity for this purpose. Generally, the minimum reportable dose received is 0.1 mSv (10 mrem). Suppose a TLD monitors dose received and is changed once a month. If the measurements are at the minimum reportable level, the annual dose received could have been about 1.2 mSv (120 mrem), a value in excess of the 1 mSv/yr (100 mrem/yr) limit. If licenseses use TLDs to evaluate compliance with the public dose limits, they should consult with their TLD supplier and choose more sensitive TLDs, such as those containing CaF₂ that are used for environmental monitoring.

Example 2

As in Example 1, Joe is the RSO for Moisture-Density Measurements, Inc., a portable gauge licensee. The company has three gauges stored in a designated, locked storage area that adjoins an unrestricted area where a secretarial work station is located. See **Figure 11** and **Table 2** for information. Joe wants to see if the company complies with the public dose limits at the secretarial station.

During the winter while all the gauges re in storage, Joe placed an environmental TLD badge in the secretarial workspace for 30 days. Joe chose a winter month so he did not have to keep track of the number of hours that each gauge was in the storage area. The TLD processor sent Joe a report indicating the TLD received 100 mrem.

Table 10. Combination Measurement-Calculational Method

Step No.	Description	Input Data and Results
PART 1		
1	Dose received by <i>TLD</i> , in mrem	100
2	Total hours <i>TLD</i> exposed	24 hr/d x 30 d/mo = 720
3	Divide the results of Step 1 by the results of Step 2 to determine HOURLY DOSE RECEIVED , in mrem in an hour	0.14
4	Multiply the results of Step 3 by 365 d/yr x 24 hr/d = 8760 hours in one year = MAXIMUM ANNUAL DOSE RECEIVED FROM GAUGES , in mrem in a year	365 x 24 x 0.14 = 8760 x 0.14 = 1226

NOTE: For the conditions described above, Step 3 indicates that the dose received in any one hour is less than the 2 mrem in any one hour limit. However, if there are any changes, then the licensee would need to

reevaluate the potential doses which could be received in any one hour. Step 4 indicates that the annual dose received would be much greater than the 100 mrem in a year allowed by the rule.

PART 2

At this point Joe can adjust for a realistic estimate of the time the secretary spends in the area as he did in Part 2 of Example 1.

PART 3

If the results of Joe's evaluation in Part 2 show that the annual dose received in a year exceeds 100 mrem, then he can make adjustments for realistic estimates of the time spent in the area of concern while the gauges are actually in storage as in Part 3 of Example 1. (Recall that the **TLD** measurement was made while all the gauges re in storage--i.e., 24 hr/d for the 30 days that the **TLD** was in place.)

Appendix J:
**Requests to Perform Leak Testing and Sample
Analysis**

Leak Test Program

Training

Before allowing an individual to perform leak testing, the RSO will ensure that he or she has sufficient classroom and on-the-job training to show competency in performing leak tests independently.

Classroom training may be in the form of lecture, videotape, or self-study, and will cover the following subject areas:

- Principles and practices of radiation protection;
- Radioactivity measurements, monitoring techniques, and the use of instruments;
- Mathematics and calculations basic to the use and measurement of radioactivity; and
- Biological effects of radiation.

Appropriate on-the-job-training consists of:

- Observing authorized personnel collecting and analyzing leak test samples;
- Collecting and analyzing leak test samples under the supervision and in the physical presence of an individual authorized to perform leak tests.

Facilities and Equipment

- To ensure achieving the required sensitivity of measurements, leak tests will be analyzed in a low-background area.
- Individuals conducting leak tests will use a calibrated and operable survey instrument to check leak test samples for gross contamination before they are analyzed.
- An NaI (Tl) well counter system with a single or multichannel analyzer will be used to count samples from gauges containing gamma-emitters (e.g., Cs-137, Co-60).
- A liquid scintillation or gas-flow proportional counting system will be used to count samples from gauges containing beta-emitters (e.g., Sr-90) or alpha emitters (e.g., Am-241).

Frequency for Conducting Leak Tests of Sealed Sources

- Leak tests will be conducted at the frequency specified in the respective SSD Registration Certificate.

Procedure for Performing Leak Testing and Analysis

- For each source to be tested, list identifying information such as gauge serial number, radionuclide, activity.
- If available, use a survey meter to monitor exposure.
- Prepare a separate wipe sample (e.g., cotton swab or filter paper) for each source.
- Number each wipe to correlate with identifying information for each source.
- Wipe the most accessible area where contamination would accumulate if the sealed source re leaking.
- Select an instrument that is sensitive enough to detect 185 Bq (0.005 microcurie) of the radionuclide contained in the gauge.
- Using the selected instrument, count and record background count rate.
- Check the instrument's counting efficiency using standard source of the same radionuclide as the source being tested or one with similar energy characteristics. Accuracy of standards should be within +/-5 percent of the stated value and traceable to a primary radiation standard such as those maintained by the National Institutes of Standards and Technology (NIST).
- Calculate efficiency.

For example:
$$\frac{[(\text{cpm from std}) - (\text{cpm from bkg})]}{\text{activity of std in Bq}} = \text{efficiency in cpm/Bq}$$

where: cpm = counts per minute

std = standard

bkg = background

Bq = Becquerel

- Count each wipe sample; determine net count rate.

- For each sample, calculate and record estimated activity in Bq (or microcuries).

For example: $\frac{[(\text{cpm from wipe sample}) - (\text{cpm from bkg})]}{\text{efficiency in cpm/Bq}} = \text{Bq on wipe sample}$

- Sign and date the list of sources, data, and calculations. Retain records for 3 years.
- If the wipe test activity is 185 Bq (0.005 microcurie) or greater, notify the RSO so that the source can be withdrawn from use and disposed of properly. Also notify DHS.




Appendix K:
Major DOT Regulations; Sample Bill of Lading

The major areas in the DOT regulations that are most relevant for transportation of typical portable gauges that are shipped as Type A quantities are as follows:

- Table of Hazardous Materials and Special Provisions **49 CFR 172.101**, and **App. A, Table 2**: Hazardous materials table, list of hazardous substances and reportable quantities
- Shipping Papers **49 CFR 172.200-204**: general entries, description, additional description requirements, shipper's certification
- Package Markings **49 CFR 172.300, 49 CFR 172.301, 49 CFR 172.303, 49 CFR 172.304, 49 CFR 172.310, 49 CFR 172.324**: General marking requirements for non-bulk packagings, prohibited marking, marking requirements, radioactive material, hazardous substances in non-bulk packaging
- Package Labeling **49 CFR 172.400, 49 CFR 172.401, 49 CFR 172.403, 49 CFR 172.406, 49 CFR 172.407, 49 CFR 172.436, 49 CFR 172.438, 49 CFR 172.440**: General labeling requirements, prohibited labeling, radioactive materials, placement of labels, specifications for radioactive labels
- Placarding of Vehicles **49 CFR 172.500, 49 CFR 172.502, 49 CFR 172.504, 49 CFR 172.506, 49 CFR 172.516, 49 CFR 172.519, 49 CFR 172.556**: Applicability, prohibited and permissive placarding, general placarding requirements, providing and affixing placards: highway, visibility and display of placards, RADIOACTIVE placard
- Emergency Response Information, Subpart G, **49 CFR 172.600, 49 CFR 172.602, 49 CFR 172.604**: Applicability and general requirements, emergency response information, emergency response telephone number
- Training, Subpart H, **49 CFR 172.700, 49 CFR 172.702-704**: purpose and scope, applicability and responsibility for training and testing, and training requirements
- Radiation Protection Program for Shippers and Carriers, Subpart I, **49 CFR 172.800**, etc.
- Security Plans **49 CFR 172.800, 49 CFR 172.802**: Purpose and applicability, components of a security plan;
- Shippers - General Requirements for Shipments and Packaging, Subpart I, **49 CFR 173.403, 49 CFR 173.410, 49 CFR 173.412, 49 CFR 173.415, 49 CFR 173.433, 49 CFR 173.435, 49 CFR 173.441, 49 CFR 173.475, 49 CFR 173.476**: Definitions, general design requirements, additional design requirements for Type A packages, authorized Type A packages, requirement for determining A₁ and A₂, table of A₁ and A₂ values for radionuclides, radiation level limit, quality control requirements prior to each shipment, approval of special form radioactive materials

Carriage by Public Highway **49 CFR 177.816, 49 CFR 177.817, 49 CFR 177.834(a), 49 CFR 177.842**: Driver training, shipping paper, general requirements (secured against movement), Class 7 (radioactive) material

Portable gauges and XRFs are generally shipped either as excepted packages for instruments and articles of radioactive material or as Type A packages. Packages containing XRFs may be shipped as excepted packages if the radiation level at any point on the external surface of the package does not exceed 0.005 mSv/hour (0.5 mrem/hour). Packages with higher radiation levels are shipped as Type A packages. The following tables summarize labeling, marking, and shipping paper requirements for Type A packages.

Labeling Packages (49 CFR 172.400-450)			
NOTE: IAEA, ICAO, and IMO may require additional hazard communication information for international shipments. This table must not be used as a substitute for the DOT and NRC regulations on the transportation of radioactive materials.			
<ul style="list-style-type: none"> Labeling is required to be: (1) placed near the required marking of the proper shipping name, (2) printed or affixed to the package surface, (3) in contrast with its background, (4) unobscured by markings or attachments, (5) within color, design, and size tolerance, and (6) representative of the HAZMAT contents of the package. Two labels are required on opposite sides of the package, excluding the bottom. 			
Determination of Required Label			
Size: Sides: ≥ 100 mm Border: 5-6.3 mm	 49 CFR 172.436 WHITE-I	 49 CFR 172.438 YELLOW-II	 49 CFR 172.440 YELLOW-III
Required when:	Surface radiation level ≤ 0.005 mSv/hour (0.5 mrem/hour)	0.005 mSv/hour (0.5 mrem/hour) < surface radiation level ≤ 0.5 mSv/hour (50 mrem/hour)	0.5 mSv/hour (50 mrem/hour) < surface radiation level ≤ 2 mSv/hour (200 mrem/hour)
Or:	TI = 0 [1 meter dose rate < 0.5 mrem/hour]	TI ≤ 1 [1 meter dose rate ≤ 1 mrem/hour]	1 < TI ≤ 10 [1 meter dose rate ≤ 10 mrem/hour]
Content on Radioactive Labels			
RADIOACTIVE label must contain (entered using a durable, weather-resistant means): <ol style="list-style-type: none"> The radionuclides in the package. Symbols (e.g., Cs-137) are acceptable. The activity in SI units (e.g., Bq, TBq) or both SI units with customary units (e.g., Ci, mCi) in parenthesis. The Transport Index (TI) in the supplied box. The TI is entered only on YELLOW-II and YELLOW-III labels. 			
Some Special Considerations for Labeling Requirements			
<ul style="list-style-type: none"> Radioactive material, excepted packages (e.g., Limited Quantity, Radioactive Instrument and Article) are excepted from labeling. The “Cargo Aircraft Only” label is typically required for radioactive materials packages shipped by air [§172.402(c)] 			

Marking Packages (49 CFR 172.300-308)

NOTE: IAEA, ICAO, and IMO may require additional hazard communication information for international shipments. This table must not be used as a substitute for the DOT and NRC regulations on the transportation of radioactive materials.

Always Required, Unless Excepted	Sometimes Required	Optional
<ul style="list-style-type: none"> • Proper shipping name • U.N. Identification Number • Name and address of consignor or consignee, unless: <ul style="list-style-type: none"> -Highway only and no motor carrier transfers, or -Part of truckload lot and entire contents of freight container are shipped from one consignor to one consignee (§172.301(d)) 	<ul style="list-style-type: none"> • If in excess of 50 kg, Gross Weight • If hazardous substance, “RQ” in association with the proper shipping name • The package type if Type A or Type B (1/2” or greater letters) • The specification-required markings (see §178.350-353) • For approved packages, the certificate ID number 	<ul style="list-style-type: none"> • Both the name and address of consignor and consignee are recommended. • Other markings (e.g., advertising) are permitted, but must be sufficiently away from markings and labeling
Some Special Considerations for Marking Requirements		
<ul style="list-style-type: none"> • Marking is required to be (1) durable, (2) printed on a package, label, tag, or sign, (3) unobscured by labels or attachments, (4) isolated from other marks, and (5) be representative of the hazmat contents of the package. • Limited quantity packages (§173.421) must bear the marking “radioactive” on the outside of the inner package, or the outer package itself, and are excepted from other marking. • Empty (§173.428) and Radioactive Instrument and Article (§173.424) packages are excepted from marking. 		

DOT Shipping Papers (49 CFR 172.200-205)

NOTE: IAEA, ICAO, and IMO may require additional hazard communication information for international shipments. This table must not be used as a substitute for the DOT and NRC regulations on the transportation of radioactive materials.

Always Required, Unless Excepted	Sometimes Required
<ul style="list-style-type: none"> • The basic description, in sequence <ul style="list-style-type: none"> Proper shipping name Hazard Class (7) U.N. Identification Number • 24 hour emergency response telephone number • Name of shipper • Proper page numbering (Page 1 of 4) • The total quantity (mass), in appropriate units • The name of each radionuclide and total package activity. The activity must be in SI units (e.g., Bq, TBq) or both SI units and customary units (e.g., Ci, mCi). • For each labeled package: <ul style="list-style-type: none"> - The category of label used - The transport index of each package with a Yellow-II or Yellow-III label - Shipper’s certification (not required of private carriers) 	<ul style="list-style-type: none"> • If hazardous substance, “RQ” as part of the basic description
	Optional
	<ul style="list-style-type: none"> • The type of packaging (e.g., Type A) • Other information is permitted (e.g., functional description of product), provided it does not confuse or detract from the proper shipping name or other required information • Emergency response hazards and guidance information (§§172.600-604) may be entered on the shipping papers, or may be carried with the shipping papers
Some Special Considerations/Exceptions for Shipping Paper Requirements	
<ul style="list-style-type: none"> • Shipments of Radioactive Material, excepted packages, under UN2908-UN2911 (e.g., Limited Quantity, Empty, or Instrument and Article), are excepted from shipping papers. For limited quantities (§173.421), this is only true if the limited quantity is not a hazardous substance (RQ) or hazardous waste. • Shipping papers must be in the pocket on the left door, or readily visible to a person entering the driver’s compartment and within arm’s reach of the driver. • For shipments of multiple cargo types, any HAZMAT entries must appear as the first entries on the shipping papers, be designated by an “X” (or “RQ”) in the hazardous material column, or be highlighted in a contrasting color. 	

SAMPLE BILLS OF LADING

		DATE SHIP DATE	P.O. NO.	SHIPPER NO.	
CONSIGNEE RED E. WAITING		SHIPPER/CONSIGNOR (FROM) ABC PAVING COMPANY			
DEF PAVING INTERNATIONAL		456 MAIN STREET			
123 DIRT ROAD		ANY OTHER TOWN, USA 67890			
ANYTOWN, USA 12345					
PHONE NO.	EMERGENCY RESPONSE NUMBER (REQUIRED IN HM COLUMN MARKED) 123-456-7890			ROUTE	
Number of Packages	HM *	Kind of Packaging, Description of Articles, Special Marks and Exceptions	Weight (lb)	Class or Rate Ref.	Cube (Optional)
1	x	RQ, Radioactive Material, Type A package,			
		Special Form, 7, UN3332			
		Cs-137, 0.30 GBq (8.0 mCi)			
		Am-241, 1.48 GBq (40 mCi)			
		Radioactive Yellow II Label, TI = 0.3			
		Dim 35 x 45 x 78 cm			
		Emergency Contact: (123) 456-7890			
THIS IS TO CERTIFY THAT THE ABOVE-NAMES MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED, AND LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.					
SHIPPER/CONSIGNOR WANDA SHIPPITT			CARRIER SB FREIGHTWAYS		
AUTHORIZED SIGNATURE		DATE	AUTHORIZED SIGNATURE		

Your Company's Letterhead

BILL OF LADING

Shipper: ABS Paving Company
0000 Road Drive
Anywhere, USA

RQ, Radioactive material, Type A package,
Special Form, 7, UN 3332

CS-137, 0.30 GBq (8.0 mCi) Am-241, 1/48 GBq (40.0 mCi)

Radioactive Yellow II Label, TI = 0.3

*****EMERGENCY CONTACT: (123) 456-7890*****

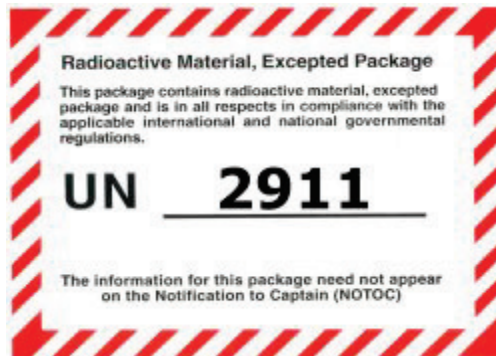
(Signature)
SHIPPER

SAMPLE SHIPPERS DECLARATION FOR DANGEROUS GOODS

Shipper <div style="background-color: #cccccc; height: 40px; width: 100%;"></div>	Air Waybill No. 548974 Page of Pages Shipper's Reference Number 856		
Consignee APEX TESTING LABS 355 MAIN STREET ATLANTA, GA USA			
Two completed and signed copies of this Declaration must be handed to the operator			
TRANSPORT DETAILS			
This shipment is within the limitations prescribed for: <i>(delete non applicable)</i>	Airport of Departure CHICAGO, OHARE		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">PASSENGER AIRCRAFT</td> <td style="width: 50%; padding: 2px;">CARGO AIRCRAFT ONLY</td> </tr> </table>	PASSENGER AIRCRAFT	CARGO AIRCRAFT ONLY	
PASSENGER AIRCRAFT	CARGO AIRCRAFT ONLY		
Airport of Destination: ATLANTA, HARTSFIELD	Shipment Type: <i>(delete non-applicable)</i> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; text-align: center;">XXXXXXXXXXXXXXXXXX</td> <td style="width: 40%; text-align: center;">RADIOACTIVE</td> </tr> </table>	XXXXXXXXXXXXXXXXXX	RADIOACTIVE
XXXXXXXXXXXXXXXXXX	RADIOACTIVE		
NATURE AND QUANTITY OF DANGEROUS GOODS <i>UN NUMBER OR IDENTIFICATION Number, Proper Shipping name, Class or Division (subsidiary risk), Packing Group (if required), and all other required information</i> UN 3332, Radioactive Material, Type A Package, Special Form, 7, RQ Cs-137, 0.30 GBq (8 mCi) Am-241, 1.48 GBq (40 mCi) All packed in one Type A package II-Yellow, TI = 0.6, Dim 35 x 42 x 75 cm			
Additional Handling Information This shipment may be carried on passenger aircraft outside U.S. jurisdiction. Emergency response sheet attached to Dangerous Goods Declaration Emergency Telephone Number (011) 123-456-7890			
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable International and National Governmental Regulations. I declare that all of the applicable air transport requirements have been met	Name/Title of Signatory A. BROWN, SHIPPING MANAGER Place and Date CHICAGO, IL JAN. 1, 2006 Signature (see warning above)		

Appendix L

Sample XRF UN 2911 Marking



Appendix M

Sample Correspondence Delegation Letter

(DATE)

Radiation Protection Section
1 West Wilson St.
P.O. Box 2659
Madison, WI 53701-2659

To Radioactive Materials Program Supervisor:

As [*job title*] of [*name of licensee*], I have delegated authority for all matters pertaining to our Radioactive Materials License to [*name of designee*]. [*Name of designee*] has management approval to sign and submit amendment requests to the Department of Health Services on behalf of [*name of licensee*]. I understand that license renewals must still be signed by a representative of upper management.

[This document must be signed by a management representative who has independent authority to reassign job duties and/or provide finances, if necessary, to support an effective radiation safety program.]

_____	_____	_____
Signature	Title	Date

Appendix N
Security Guidance

DHS regulations require a portable gauge licensee to use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal whenever the portable gauge **is not** under the control and constant surveillance by the licensee. “Control and maintain constant surveillance” of portable gauges means being immediately present or remaining in close proximity to the portable gauge to prevent unauthorized removal of the portable gauge. The objective of the security guidance is to reduce the opportunity for unauthorized removal and/or theft by providing a delay and deterrent mechanism.

The following security requirements apply to portable gauge licensees regardless of the location, situation, and activities involving the portable gauge. Licensees are required to either maintain control and constant surveillance of the portable gauge when in use or use two independent physical controls to secure the portable gauge from unauthorized removal while in storage. The physical controls used must be designed and constructed of materials suitable for securing the portable gauge from unauthorized removal, and both physical controls must be defeated in order for the portable gauge to be removed. Using two chains is not the preferred method; licensees are encouraged to use other combinations.

As long as the licensee maintains constant control and surveillance while transporting the portable gauges, the licensee need only to comply with the DOT requirements for transportation (e.g., placarding, labeling, shipping papers, blocking and bracing). However, if the licensee leaves the vehicle and portable gauge unattended (e.g., while visiting a gas station, restaurant, store), the licensee needs to ensure that the portable gauge is secured by two independent controls in order to comply with the requirements of **DHS 157.05(5)**.

While transporting a portable gauge, a licensee should not modify the transportation case if it is being used as the Type A 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. In order to maintain its approval as a Type A shipping container, the modified package must be re-evaluated by any of the methods described in **49 CFR Part 178.350 or 173.461(a)**. The re-evaluation must be documented and maintained on file in accordance with DOT regulations.

Physical controls used may include, but are not limited to, a metal chain with a lock, a

steel cable with a lock, a secured enclosure, a locked tool box, a locked camper, a locked trailer, a locked trunk of a car, inside a locked vehicle, a locked shelter, a secured fenced-in area, a locked garage, a locked non-portable cabinet, a locked room, or a secured building. To assist licensees, some common scenarios are illustrated and examples of two independent physical controls are provided below.

Securing a Portable Gauge at a Licensed Facility

When a portable gauge is stored at a licensed facility, the licensee is required to use two independent physical controls to secure the gauge. **Examples of two independent physical controls used to secure a portable gauge when stored at a licensed facility are --**

1. The portable gauge or transportation case containing the portable gauge is stored inside a locked storage shed within a secured outdoor area, such as a fenced parking area with a locked gate;
2. The portable gauge or transportation case containing the portable gauge is stored in a room with a locked door within a secured building for which the licensee controls access by lock and key or by a security guard;
3. The portable gauge or transportation case containing the portable gauge is stored inside a locked, non-portable cabinet inside a room with a locked door, if the building is not secured;
4. The portable gauge or transportation case containing the portable gauge is stored in a separate secured area inside a secured mini-warehouse or storage facility; or
5. The portable gauge or transportation case containing the portable gauge is physically secured to the inside structure of a secured mini-warehouse or storage facility.

Securing a Portable Gauge in a Vehicle

Chapter DHS 157, Subchapter XIII requires that licensees who transport licensed material, or who may offer such material to a carrier for transport, must comply with the applicable requirements of the United States Department of Transportation (DOT) that are found in **49 CFR Parts 170 through 189**.

Licensees commonly use a chain and a padlock to secure a portable gauge in its transportation case to the open bed of a pickup truck, while using the vehicle for storage. Because the transportation case is portable, a theft could occur if the chain is cut and the transportation case with the portable gauge is taken. If a licensee simply loops the chain through the handles of the transportation case, a thief could open the transportation case and take the portable gauge without removing the chain or the case. Similarly, because the transportation case is also portable, it must be protected by two independent physical controls if the portable gauge is inside. A lock on the transportation case, or a lock on the portable gauge source rod handle, is not sufficient because both the case and the gauge are portable.

A vehicle may be used for storage, however, it is recommended by DHS and DOT that this practice only be used for short periods of time or when a portable gauge is in transit. Storage in a hotel room is not authorized. When a portable gauge is being stored in a vehicle, the licensee is specifically required to use a minimum of two independent physical controls to secure the portable gauge.

Examples of two such independent physical controls approved by DHS to secure portable gauges in this situation are --

1. The locked transportation case containing the portable gauge is physically secured to a vehicle with brackets, and a chain or steel cable (attached to the vehicle) is wrapped around the transportation case such that the case can not be opened unless the chain or cable is removed;
2. The portable gauge or transportation case containing the portable gauge is stored in a box physically attached to a vehicle, and the box is secured with (1) two independent locks; (2) two separate chains or steel cables attached independently to the vehicle in such a manner that the box cannot be opened without the removal of the chains or cables; or (3) one lock and one chain or steel cable is attached to the vehicle in such a manner that the transportation case cannot be opened without the removal of the chain or cable; or

3. The portable gauge or transportation case containing the portable gauge is stored in a locked trunk, camper shell, van, or other similar enclosure and is physically secured to the vehicle by a chain or steel cable in such a manner that one would not be able to open the case or remove the portable gauge without removal of the chain or cable.

Securing a Portable Gauge at a Temporary Jobsite or at Locations Other Than a Licensed Facility

When a job requires storage of a portable gauge at a temporary jobsite or at a location other than a licensed facility, the licensee should use a permanent structure for storage, if practicable. When storing a portable gauge at a temporary jobsite, the licensee should limit access by storing the gauge as far away from members of the public as possible. The licensee must also meet the radiation exposure limits specified in **DHS 157.23**. When a portable gauge is stored at a temporary jobsite or at a location other than an authorized facility, the licensee is required to use two independent physical controls to secure the portable gauge. **Examples of two independent physical controls to secure portable gauges at these locations are --**

1. At a temporary job site, the portable gauge or transportation case containing the portable gauge is stored inside a locked building or in a locked non-portable structure (e.g., construction trailer, sea container, etc.), and is physically secured by a chain or steel cable to a non-portable structure in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable. A lock on the transportation case or a lock on the portable gauge source rod handle would not be sufficient because the case and the portable gauge are portable;
2. The portable gauge or transportation case containing the portable gauge is stored in a locked garage, and is within a locked vehicle or is physically secured by a chain or steel cable to the vehicle in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable; or
3. The portable gauge or transportation case containing the portable gauge is stored in a locked garage, and is within a locked enclosure or is physically secured by a chain or steel cable to a permanent or non-portable structure in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable.