

# **TROXLER LICENSING GUIDE**

## **A Guide for Preparing Radioactive Material License Applications for Troxler Portable Gauges**

Revision 4: May 2012



**Troxler Electronic Laboratories, Inc.**  
3008 E. Cornwallis Road, P.O. Box 12057  
Research Triangle Park, NC 27709  
(919) 549-8661 FAX (919) 549-0761  
E-mail: [webmaster@troxlerlabs.com](mailto:webmaster@troxlerlabs.com)

Troxler products are protected under U.S. and foreign patents.

Copyright © 1999 – 2012  
Troxler Electronic Laboratories, Inc.  
All Rights Reserved

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or information storage and retrieval systems, for any purpose without the express written permission of Troxler Electronic Laboratories, Inc.

PN 107484  
Revision 4  
May 2012

# TROXLER LICENSING GUIDE

---

## PURPOSE

Troxler Electronic Laboratories, Inc. has prepared this guide to assist you in preparing applications for radioactive materials licenses to use sealed sources in Troxler portable gauges. A license must be issued before a gauge may be purchased and possessed. The information in this guide applies specifically to Troxler gauges and may not apply to owners of other equipment. This guide also includes information that may be useful for developing and maintaining an effective radiation safety program.

The guide applies specifically to preparing U.S. Nuclear Regulatory Commission (NRC) license applications, but is generally applicable to preparing Agreement State license applications. There may be minor differences in application forms and requirements from state to state.

While every effort has been made to ensure the information in this guide is accurate as of the date of publication, Troxler assumes no responsibility for license applications based on this guide. The applicant is solely responsible for the accuracy and completeness of the license application.

## APPLICABLE REGULATIONS

You, as the applicant, should obtain a copy of the applicable NRC or Agreement State regulations, read them, and abide by them. The regulations that apply depend upon the regulatory agency that has jurisdiction at the location where radioactive material will be used and possessed. In general, the NRC has jurisdiction over all states and territories, except those states (called *Agreement States*), that have entered into agreements with the NRC that give them authority to license and inspect certain radioactive materials used or possessed within their borders. A list of Agreement State agencies and their contact information can be found in Appendix A. The states and territories under NRC jurisdiction, listed in Appendix B, are divided into four regions. To use radioactive material in an Agreement State, contact the applicable state agency for the license application forms and guidance. For states and territories where the NRC has jurisdiction, contact the applicable NRC regional office.

Certain exemptions to the above jurisdictional guidelines apply to federal agencies or federally controlled land in Agreement States. Federal agencies are subject to NRC regulatory authority, even in Agreement States, except the Department of Energy and, under most circumstances, its prime contractors are exempt from licensing. The NRC also has regulatory authority over land determined to be “exclusive Federal jurisdiction” in Agreement States. To determine the jurisdiction status of federally controlled land, contact the federal agency controlling the site.

The NRC regulations that pertain to portable gauges containing radioactive sealed sources are:

- ◆ 10 CFR Part 19, *Notices, Instructions and Reports to Workers: Inspection and Investigations*
- ◆ 10 CFR Part 20, *Standards for Protection Against Radiation*
- ◆ 10 CFR Part 21, *Reporting of Defects and Noncompliance*
- ◆ 10 CFR Part 30, *Rules of General Applicability to Domestic Licensing of Byproduct Material*
- ◆ 10 CFR Part 71, *Transportation*

These documents can be found at [www.nrc.gov/reading-rm/doc-collections/cfr/](http://www.nrc.gov/reading-rm/doc-collections/cfr/).

Applicants who will be transporting licensed material must comply with U.S. Department of Transportation (DOT) hazardous material regulations contained in 10 CFR Parts 170 through 189. For more information on transportation of nuclear gauges, refer to the [Troxler Transportation Guide](#) (found on the Troxler website).

NRC and DOT regulations can be ordered from the Government Printing Office (GPO), Superintendent of Documents, P. O. Box 371954, Pittsburgh, PA 15250-7954. Order *Title 10, Code of Federal Regulations, Parts 0-50 and 51-199* (two volumes) and *Title 49, Code of Federal Regulations, Parts 170-189*. Copies of Agreement State regulations can be ordered from the applicable state agency (see Appendix A).

## **OTHER GUIDANCE DOCUMENTS**

Applicants may find the following documents to be useful in preparing license applications or developing radiation safety programs:

- ◆ USNRC Regulatory Guide 8.7, *Instructions for Recording and Reporting Occupational Radiation Exposure Data*
- ◆ USNRC Regulatory Guide 8.13, *Instruction Concerning Prenatal Radiation Exposure*
- ◆ USNRC Regulatory Guide 8.29, *Instruction Concerning Risks from Occupational Radiation Exposure*

Regulatory guides can be found at [www.nrc.gov/reading-rm/doc-collections/reg-guides/occupational-health/rg/](http://www.nrc.gov/reading-rm/doc-collections/reg-guides/occupational-health/rg/).

## HOW TO FILE

To apply for a radioactive materials license, obtain copies of applicable NRC or state regulations, application forms, instructions, and guidance documents from your regulatory agency. You must complete and submit the license application form with an application fee to the regulatory agency. Some agencies may require you to submit multiple copies of the application form and their attachments. The application will include the following types of information:

- ◆ Licensee name and address
- ◆ Location where licensed radioactive materials will be used and possessed
- ◆ Type, quantity, and form of the licensed materials to be possessed
- ◆ Purpose for which the licensed materials will be used
- ◆ Persons who will use the materials and their training, qualifications, and experience
- ◆ Facilities and equipment
- ◆ Description of your radiation safety program

Be sure to submit the license application as far in advance of the anticipated date of first usage of licensed material as possible. The NRC and state licensing agencies vary in the amount of time required to review applications and issue licenses. If questions arise about your application during review by the agency, additional time may be required. Retain a copy of your license application, attachments, and all related correspondence. The regulatory agency holds the applicant responsible for complying with all commitments made in the license application as if they were regulations.

Licenses have expiration dates and must be periodically renewed. In general, you must submit the same application form as for a new license (except check the “renewal” block) with up-to-date information about your program. The renewal application must be submitted at least 30 days before the expiration date of the license to avoid a lapse.

Before you make any changes in the scope of the program as described in your license application, you must amend your license. This may be done by writing a letter to the agency referencing the license number and clearly describing the desired addition, deletion or change to the license. Examples of changes that require amendments include, but are not limited to:

- ◆ Changing the RSO
- ◆ Changing or adding a location at which licensed materials are possessed or stored (excluding temporary jobsites)
- ◆ Adding a new type of gauge or increasing the maximum quantity of licensed material that may be possessed
- ◆ Changing the radiation safety program from what was described in the original application

## CONTENTS OF THE APPLICATION

The following information is intended to be applicable to the NRC application form (NRC Form 313); however, it is generally applicable to most Agreement State application forms as well. Ensure that you have obtained all applicable instructions and guidance from the licensing agency.

### 1. This application is for:

- ◆ New license – Check if the application is for a new license.
- ◆ Amendment – Check if the application is to amend an existing license and list the license number.
- ◆ Renewal – Check if the application is for renewal of an existing license and list the license number. Renewal applications should be submitted at least 30 days prior to the expiration date of the current license to avoid a lapse in the license.

### 2. Applicants Name and Mailing Address

List the legal name and address of the applicant's corporation or other legal entity with direct control over the radioactive material. An individual acting in a private capacity may be designated as the applicant if the licensed material is not used in connection with employment in a corporation or other legal entity.

### 3. Address(es) Where Licensed Material Will Be Used or Possessed

Specify the street address, city, and state for each permanent facility where gauges will be stored, used, or dispatched to customer job sites. The address must be sufficiently descriptive to allow an inspector to find the location (a PO Box is not sufficient). If, in addition to the permanent storage location, gauges will also be used at temporary job sites, add the following statement:

“Anywhere [agency name] maintains jurisdiction for regulating the use of radioactive materials.”

### 4. Person to Be Contacted About the Application

Identify the person who can answer questions about the application. Typically, this will be the proposed radiation safety officer. Provide the individual's business telephone number.

## NOTE

Submit items 5-11 of the application on separate sheets of paper (8.5 x 11”).

### 5. Radioactive Material – Sealed Sources and Devices

- a. Element and mass number – specify the radionuclide in each sealed source in the gauge(s).
- b. Chemical and physical form – describe as “sealed source” and include the Troxler drawing number.
- c. Maximum amount that will be possessed at one time - specify the maximum activity per source.

List the above information for all gauges that you anticipate using to avoid having to amend your license later. Refer to Appendix C for the source information for all Troxler gauges, including gauge registry numbers. For example:

<b>a. Element and mass number</b>	<b>b. Chemical and/or physical form</b>	<b>c. Maximum amount that will be possessed at one time</b>
A. Cesium-137	Sealed source Troxler Dwg. 102112	No single source to exceed 9 mCi
B. Americium-241	Sealed source Troxler Dwg. 102451	No single source to exceed 44 mCi

### 6. Purposes for Which Licensed Material Will Be Used

For each source listed in item 5 above, indicate the type of gauge in which the source will be used as generally as possible. For example:

<b>Purpose(s) for which licensed material will be used.</b>
A & B: To be used in Troxler Model 3400 series gauges for measurement of physical properties of materials. A: To be used in Troxler Model 4640 series gauge for measurement of physical properties of materials.

## **7. Individual(s) Responsible for Radiation Safety Program and Their Training Experience**

List the name of the proposed Radiation Safety Officer (RSO). You may be required to specify or commit to certain duties and responsibilities for the RSO. Typical RSO duties and responsibilities are listed in Appendix D.

In general, the RSO must have training equivalent to Troxler's Nuclear Gauge Safety Training Class (one-day class) or Troxler's Radiation Safety Officer Training Class (also a one-day class). The NRC states that the training requirements must be met before obtaining licensed materials. Some Agreement States require that RSO training be completed before the license is issued.

Following are sample statements for the application that would meet the NRC criteria:

“Before obtaining licensed materials, the proposed RSO will have successfully completed Troxler's Nuclear Gauge Safety Training Class or Troxler's Radiation Safety Officer Training Class.”

**AND**

“Before being named as the RSO, future RSOs will have successfully completed Troxler's Nuclear Gauge Safety Training Class or Troxler's Radiation Safety Officer Training Class.”

## **8. Training for Individuals Working in or Frequenting Restricted Areas**

The NRC and all Agreement States accept the Troxler Nuclear Gauge Safety Training Class as meeting the training requirement for gauge users. Some states require evidence of successful completion of training for all users listed on the license, such as a training certificate, before the license is issued. The licensee must keep all records of training. Some states may require annual refresher training.

The NRC does not require the individual users to be listed by name on the license application. Following is a sample statement that could be used on the application:

“Before using licensed materials, all gauge users will have successfully completed the Troxler Nuclear Gauge Safety Training Class.”

You may be required to commit that before an individual is permitted to use a gauge the individual will have:

- ◆ Successfully completed the Troxler safety training course.
- ◆ Received copies of, and been trained in, the applicant's gauge operating and emergency procedures.
- ◆ Been designated as an authorized user by the RSO.



## 9. Facilities and Equipment

Although the NRC does not require any response for this item on the application, compliance with security, posting, and public dose requirements will be verified during inspections.

Some Agreement States may require submitting a sketch or drawing describing your permanent gauge storage area, which should be an unoccupied area, such as a storage room. Typical information that may be required includes:

- ◆ Storage area and building security and key control
- ◆ Where “Caution – Radioactive Material” sign is posted
- ◆ Distance to the nearest work station (at least 15 feet)
- ◆ Total number of gauges to be stored at this location
- ◆ Additional shielding material and thickness, if any, in storage area
- ◆ What is in adjacent areas (all sides, above, and below)

## 10. Radiation Safety Program

The applicant must describe the radiation safety program they will implement to ensure compliance with all regulatory requirements. The closer your application responses are to those suggested by this licensing guide, the more likely your application is to be processed without undue delay. The main elements of a radiation safety program are discussed in the following sections.

### 10.1. PERSONNEL MONITORING

The NRC requires that the applicant must either:

- ◆ Provide all gauge users with personnel monitoring devices supplied by a processor that is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and exchanged at the frequency recommended by the processor.

**OR**

- ◆ Maintain documentation demonstrating gauge users are not required to be monitored, i.e., are not likely to receive a radiation dose in excess of 10% of the allowable limits.

The use of personnel monitoring devices is a good practice even when exposures are expected to be very low. Without personnel monitoring devices, it is very difficult to detect work practices or situations that may cause unnecessary exposure to personnel. In some states, personnel monitoring devices must be provided to all gauge users.

The following is a sample statement that may be included in your radiation safety program description:

“All personnel will wear a personnel monitoring device, such as a TLD badge, to measure radiation exposure when using or transporting gauges. The badges shall be exchanged at intervals not to exceed three months. Dosimetry badges shall be provided by a vendor accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).”

You may be required to give the name and address of your NVLAP-accredited dosimetry badge service provider. For example:

Troxler Radiation Monitoring Services  
3008 E. Cornwallis Rd  
Research Triangle, Park, NC 27709

### **10.2. RADIATION DETECTION INSTRUMENTS**

A licensee is required either to possess a radiation survey meter or to have access to one in the event of an incident (e.g., through arrangements with a consultant). In the event of an incident, the survey meter would be used to: (a) locate the source if it has been separated from the gauge, (b) verify that the source and shielding are intact, and (c) check for contamination of personnel and equipment. It is highly unlikely that the sealed sources in Troxler gauges will leak, even under severe accident conditions. If you choose to have a survey meter, the following is a sample response:

“We will maintain a survey meter for use in the event of an incident involving the gauge. The survey meter will be calibrated annually by the manufacturer and checked for functionality before use (e.g., with the gauge sources or a check source).”

You may be required to supply the specifications for the survey meter that you will use. For example:

Manufacturer: Troxler Electronic Laboratories, Inc.  
Model: TroxAlert  
Type: G-M survey meter  
Radiation detected: alpha, beta, gamma, and x-ray  
Sensitivity range: 0-100 mrem/hr  
Window thickness: 1.4 mg/cm<sup>2</sup>

You may be required to supply the name, address, and license number of the firm that will calibrate the survey meter. For example:

Troxler Electronic Laboratories, Inc.  
3008 E. Cornwallis Road  
Research Triangle Park, NC 27709

North Carolina License No. 032-0182-1

### **10.3. SEALED SOURCE LEAK TESTING**

All sealed sources are required to be periodically leak tested. A statement similar to the one below should be included in your radiation safety program description.

“Leak tests will be performed at intervals not to exceed 12 months using an approved kit, such as Troxler Leak Test Kit (Model 3880), in accordance with the kit supplier’s instructions. Leak test samples will be analyzed by an organization authorized by the NRC or Agreement State to provide leak test services, such as Troxler Electronic Laboratories, Inc. (North Carolina license No. 031-0182-1).”

### **10.4. MATERIAL RECEIPT AND ACCOUNTABILITY**

Radioactive materials must be tracked from “cradle to grave.” The licensee should state that:

- ◆ Records of receipt, transfer, and disposal of gauges will be maintained for at least three years.
- ◆ Physical inventories of sealed sources will be conducted at intervals not to exceed six months.

Gauge utilization and physical inventory logs are highly recommended and are required by some states. An example of each is shown in Appendix E and Appendix F, respectively.

### **10.5. PUBLIC DOSE**

Licensees must do the following:

- ◆ Ensure that gauges are used, transported, and stored in such a way that no member of the public receives a dose of more than 100 mrem in one year.
- ◆ Ensure that the dose in unrestricted areas does not exceed two mrem in any one hour.
- ◆ Control and maintain constant surveillance over gauges that are not in storage and secure gauges from unauthorized use or removal.

Members of the public include persons who live, work, or may be near locations where gauges are used or stored. This may include employees whose assigned duties do not include use of gauges, but who work in the vicinity where gauges are used or stored.

In general, gauges should be stored as far away as possible from areas occupied by members of the public. Licensees must ensure that radiation levels in areas adjacent to gauge storage locations will not exceed the dose limits for members of the public or unrestricted areas. This can be done by determining the radiation levels in areas adjacent to gauge storage areas by calculation, measurement, or a combination of both. Appendix G provides a worksheet that may be used for public dose calculations.

### **10.6. OPERATING AND EMERGENCY PROCEDURES**

Each applicant must implement and maintain operating and emergency procedures. Sample procedures are shown in Appendix H. A copy of these procedures should be distributed to gauge users before initial use of equipment and maintained at the job site.

## **10.7. MAINTENANCE**

The following statements are suggested for routine and non-routine maintenance:

“We will implement and maintain procedures for routine maintenance (cleaning and lubrication) of our gauges according to the manufacturer’s recommendations and instructions.”

**AND**

“We will send the gauge to the manufacturer to perform non-routine maintenance or repair operations that require removal of the source or source rod from the gauge.”

## **10.8. TRANSPORTATION**

Licensees must implement and maintain safety programs that ensure gauges are transported in compliance with DOT regulations. Refer to the [Troxler Transportation Guide](#) for further information on shipping gauges and DOT requirements.

## **10.9. AUDIT PROGRAM**

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

- ◆ Compliance with applicable NRC, state, and DOT regulations and the terms and conditions of the license.
- ◆ Doses to workers and members of the public are As Low As Reasonably Achievable (ALARA).

A sample checklist for performing audits may be found in Appendix I. The information in the checklist was provided by the NRC.

A statement similar to the following should be included in the radiation safety program:

“An audit of the radiation safety program content and implementation will be performed and documented annually. Records of audits will be maintained for at least three years. Corrective actions will be taken promptly to prevent recurrence of deficiencies.”

## **11. Waste Management**

The NRC does not require a response to this item during the license application process. Licensed materials must be disposed of by transfer to an authorized recipient, such as Troxler, a commercial waste disposal firm, or another licensee authorized to possess the licensed material. Some states require the applicant to specifically identify the entity that will accept the gauge for disposal and provide proof of authorization to receive the gauge.

A statement similar to the following should be included in the radiation safety program:

“Licensed material will be returned to the manufacturer for disposal.”

In general, Troxler accepts most gauges for disposal, except those containing Ra-226 sources or mixed Am-241:Be/Cs-137 sources or leaking sources. Acceptance of all gauges is conditional on current availability of disposal pathways.

Before transferring the licensed material, the licensee must verify that the recipient is authorized to receive it using one of the methods in 10 CFR 30.41. Records of the transfer must be maintained as required by 10 CFR 30.51.

## **12. License Fees**

Enter the fee category and the amount of the fee enclosed with the application.

## **13. Certification**

The individual signing the application must be authorized to make binding commitments on behalf of the applicant. When the application references commitments, those items become part of the license conditions and regulatory requirements. It is a criminal offense to make a willful false statement or representation in the application or correspondence.



# APPENDIX A

## AGREEMENT STATE AGENCIES

<p><b>ALABAMA</b></p> <p><b>Contact:</b> David Walter  <b>Phone:</b> (334) 206-5391  <b>Fax:</b> (334) 206-5387  <b>Address:</b>  Office of Radiation Control  Department of Public Health  201 Monroe Street  Montgomery, AL 36130-1701  <b>Website:</b> <a href="http://www.adph.org/radiation/">www.adph.org/radiation/</a></p>	<p><b>ARIZONA</b></p> <p><b>Contact:</b> John Wilson  <b>Phone:</b> (602) 225-4845  <b>Fax:</b> (602) 437-0705  <b>Address:</b>  Arizona Radiation Regulatory Agency  4814 South 40<sup>th</sup> Street  Phoenix, AZ 85040  <b>Website:</b> <a href="http://www.state.az.us">www.state.az.us</a></p>
<p><b>ARKANSAS</b></p> <p><b>Contact:</b> Jared Thompson  <b>Phone:</b> (501) 661-2301  <b>Fax:</b> (501) 661-2468  <b>Address:</b>  Division of Radiation Control &amp; Emergency Mgmt  Department of Health  4815 West Markham Street, Slot 30  Little Rock, AR 72205-3867  <b>Website:</b>  <a href="http://www.healthy.arkansas.gov/programsServices/hsLicensingRegulation/RadiationControl/Pages/default.aspx">www.healthy.arkansas.gov/programsServices/hsLicensingRegulation/RadiationControl/Pages/default.aspx</a></p>	<p><b>CALIFORNIA</b></p> <p><b>Contact:</b> Gerard Wong  <b>Phone:</b> (916) 323-2759  <b>Fax:</b> (916) 324-3610  <b>Address:</b>  Radiologic Health Branch  Food, Drugs, &amp; Radiation Safety Division  P.O. Box 942732  Sacramento, CA 94234-7320  <b>Website:</b> <a href="http://www.dhs.cahwnet.gov/RHB/index.htm">www.dhs.cahwnet.gov/RHB/index.htm</a></p>
<p><b>COLORADO</b></p> <p><b>Contact:</b> Steve Tarlton  <b>Phone:</b> (303) 692-3423  <b>Address:</b>  CO Department of Public Health &amp; Environment  HMWMD – 52  4300 Cherry Creek Drive South  Denver, CO 80246-1530  <b>Website:</b> <a href="http://www.cdphe.state.co.us/hm/rad/index.htm">http://www.cdphe.state.co.us/hm/rad/index.htm</a></p>	<p><b>FLORIDA</b></p> <p><b>Contact:</b> Mike Stephens  <b>Phone:</b> (850) 245-4770  <b>Fax:</b> (850) 487-0435  <b>Address:</b>  Bureau of Radiation Control  Department of Health  4052 Bald Cypress Way, Bin #C21  Tallahassee, FL 32399-1741  <b>Website:</b> <a href="http://www.myfloridaeh.com/radiation/radmat1.htm">www.myfloridaeh.com/radiation/radmat1.htm</a></p>

<p style="text-align: center;"><b>GEORGIA</b></p> <p><b>Contact:</b> Cynthia Sanders  <b>Phone:</b> (404) 362-2675  <b>Fax:</b> (404) 362-2653  <b>Address:</b>  Radioactive Materials Program  Department of Natural Resources  4200 International Parkway, Suite 100  Atlanta, GA 30354  <b>Website:</b> <a href="http://www.georgiaepd.org/Documents/pcb_radmat.html">www.georgiaepd.org/Documents/pcb_radmat.html</a></p>	<p style="text-align: center;"><b>ILLINOIS</b></p> <p><b>Contact:</b> Gibb Vinson or Ted Henry  <b>Phone:</b> (217) 785-0600  <b>Fax:</b> (217) 785-9868  <b>Address:</b>  Department of Nuclear Safety  1035 Outer Park Drive  Springfield, IL 62704  <b>Website:</b> <a href="http://www.state.il.us/idns">www.state.il.us/idns</a></p>
<p style="text-align: center;"><b>IOWA</b></p> <p><b>Contact:</b> George Johns  <b>Phone:</b> (515) 242-6280  <b>Fax:</b> (515) 725-0318  <b>Address:</b>  Bureau of Radiological Health  Iowa Department of Public Health  Lucas State Office Building  407 SW 7th Street, Suite D  Des Moines, IA 50319  <b>Website:</b> <a href="http://www.idph.state.ia.us/pa/rh.htm">www.idph.state.ia.us/pa/rh.htm</a></p>	<p style="text-align: center;"><b>KANSAS</b></p> <p><b>Contact:</b> Pam Watson  <b>Phone:</b> (785) 296-1565  <b>Fax:</b> (785) 296-0984  <b>Address:</b>  Department of Health and Environment  Bureau of Air and Radiation  Forbes Field, Building 283  Topeka, KS 66620  <b>Website:</b> <a href="http://www.kdhe.state.ks.us/radiation">www.kdhe.state.ks.us/radiation</a></p>
<p style="text-align: center;"><b>KENTUCKY</b></p> <p><b>Contact:</b> Vicki Jeffs  <b>Phone:</b> (502) 564-3700  <b>Fax:</b> (502) 564-6533  <b>Address:</b>  Radiation Health Branch  Cabinet for Health Services  275 East Main Street, Mail Stop HS 2E-D  Frankfort, KY 40621-0001  <b>Website:</b> <a href="http://chfs.ky.gov/dph/radiation.htm">chfs.ky.gov/dph/radiation.htm</a></p>	<p style="text-align: center;"><b>LOUISIANA</b></p> <p><b>Contact:</b> James Sanford  <b>Phone:</b> (225) 765-0143  <b>Fax:</b> (225) 765-0220  <b>Address:</b>  Radiation Protection Division  Office of Air Quality &amp; Radiation Protection  7220 Bluebonnet Road  Baton Rouge, LA 70810  <b>Website:</b> <a href="http://www.deq.state.la.us">www.deq.state.la.us</a></p>
<p style="text-align: center;"><b>MAINE</b></p> <p><b>Contact:</b> Wayne Malloch  <b>Phone:</b> (207) 287-5676  <b>Fax:</b> (207) 287-3059  <b>Address:</b>  Division of Health Engineering  286 Water Street, 4<sup>th</sup> Floor  11 State House Station  Augusta, ME 04333  <b>Website:</b> <a href="http://janus.state.me.us/dhs/eng/rad/rad.htm">janus.state.me.us/dhs/eng/rad/rad.htm</a></p>	<p style="text-align: center;"><b>MARYLAND</b></p> <p><b>Contact:</b> Carl Trump  <b>Phone:</b> (410) 631-3301  <b>Fax:</b> (410) 631-3198  <b>Address:</b>  Maryland Department of the Environment  Air and Radiation Management Administration  Radiological Health Program  1800 Washington Boulevard  Baltimore, MD 21230  <b>Website:</b> <a href="http://www.mde.state.md.us/arma/Programs/Radiolog/radiolog.html">www.mde.state.md.us/arma/Programs/Radiolog/radiolog.html</a></p>



<p style="text-align: center;"><b>MASSACHUSETTS</b></p> <p><b>Contact:</b> Bob Gallagher  <b>Phone:</b> (617) 727-6214  <b>Fax:</b> (617) 727-2098</p> <p><b>Address:</b>  Radiation Control Program  Department of Public Health  Schrafft Center, Suite 1M2A  529 Main Street  Charlestown, Massachusetts 02129</p> <p><b>Website:</b>  <a href="http://www.mass.gov/eohhs/gov/newsroom/dph/directions/directions-to-radiation-control-program.html">www.mass.gov/eohhs/gov/newsroom/dph/directions/directions-to-radiation-control-program.html</a></p>	<p style="text-align: center;"><b>MISSISSIPPI</b></p> <p><b>Contact:</b> B.J. Smith or Robert Nelson  <b>Phone:</b> (601) 987-6893  <b>Fax:</b> (601) 987-6887</p> <p><b>Address:</b>  Division of Radiological Health  State Department of Health  3150 Lawson Street  P.O. Box 1700  Jackson, MS 39215-1700</p> <p><b>Website:</b> <a href="http://www.msdh.state.ms.us/radiological/index.htm">www.msdh.state.ms.us/radiological/index.htm</a></p>
<p style="text-align: center;"><b>NEBRASKA</b></p> <p><b>Contact:</b> Jim BeFrain  <b>Phone:</b> (402) 471-8566  <b>Fax:</b> (402) 471-0169</p> <p><b>Address:</b>  Department of Health and Human Services  Regulation and Licensure  301 Centennial Mall South  P.O. Box 95007  Lincoln, NE 68509-5007</p> <p><b>Website:</b> <a href="http://www.hhs.state.ne.us/reg/t180.htm">www.hhs.state.ne.us/reg/t180.htm</a></p>	<p style="text-align: center;"><b>NEVADA</b></p> <p><b>Phone:</b> (775) 687-7550  <b>Fax:</b> (775) 687-7552</p> <p><b>Address:</b>  Radiation Control Program  Bureau of Health Care Quality and Compliance  727 Fairview Drive, Suite E  Carson City, NV 89701</p> <p><b>Website:</b>  <a href="http://health.nv.gov/HCOQ_Radiological_Radioactive_Licensing.htm">health.nv.gov/HCOQ_Radiological_Radioactive_Licensing.htm</a></p>
<p style="text-align: center;"><b>NEW HAMPSHIRE</b></p> <p><b>Contact:</b> Dennis O'Dowd  <b>Phone:</b> (603) 271-4585  <b>Fax:</b> (603) 225-2325</p> <p><b>Address:</b>  Radiological Health Bureau  Health and Welfare Building  6 Hazen Drive  Concord, NH 03301-6527</p> <p><b>Website:</b> <a href="http://www.dhhs.nh.gov/dphs/radiological/">www.dhhs.nh.gov/dphs/radiological/</a></p>	<p style="text-align: center;"><b>NEW JERSEY</b></p> <p><b>Contact:</b> Paul Baldauf  <b>Phone:</b> (609) 984-5636  <b>Fax:</b> (609) 633-2210</p> <p><b>Address:</b>  25 Arctic Parkway  PO Box 420 (Mail Code 25-01)  Trenton, New Jersey 08625</p> <p><b>Website:</b> <a href="http://www.nj.gov/dep/rpp/index.htm">http://www.nj.gov/dep/rpp/index.htm</a></p>

<p style="text-align: center;"><b>NEW MEXICO</b></p> <p><b>Contact:</b> Mr. Santiago Rodriguez  <b>Phone:</b> (505) 476-8600  <b>Fax:</b> (505) 476-8654  <b>Address:</b>  Radiation Control Bureau  Department of Environment  525 Camino de Los Marquez  Santa Fe, NM 87502  <b>Website:</b> <a href="http://www.nmenv.state.nm.us">www.nmenv.state.nm.us</a></p>	<p style="text-align: center;"><b>NEW YORK</b></p> <p><b>Contact:</b> Clayton Bradt or Charles Burns  <b>Phone:</b> (518) 457-1202  <b>Fax:</b> (518) 458-7406  <b>Address:</b>  Radiological Health Unit  Division of Safety and Health  NYS Department of Labor  NYS Office Campus, Building 12, Room 169  Albany, NY 12240  <b>Website:</b>  <a href="http://www.health.ny.gov/environmental/radiological/radon/radioactive_material_licensing/">www.health.ny.gov/environmental/radiological/radon/radioactive_material_licensing/</a></p>
<p style="text-align: center;"><b>NORTH CAROLINA</b></p> <p><b>Contact:</b> James Albright  <b>Phone:</b> (919) 571-4141  <b>Fax:</b> (919) 571-4148  <b>Address:</b>  Division of Radiation Protection  3825 Barrett Drive  Raleigh, NC 27609-7221  <b>Website:</b> <a href="http://ncradiation.net/rms/rms.htm">ncradiation.net/rms/rms.htm</a></p>	<p style="text-align: center;"><b>NORTH DAKOTA</b></p> <p><b>Contact:</b> Justin M. Griffin  <b>Phone:</b> (701) 328-5188  <b>Fax:</b> (701) 328-5200  <b>Address:</b>  North Dakota Department of Health  Division of Environmental Engineers  1200 Missouri Ave, Box 5520  Bismarck, ND 58506-5520  <b>Website:</b>  <a href="http://www.health.state.nd.us/ndhd/envIRON/ee/RAD/materials.htm">www.health.state.nd.us/ndhd/envIRON/ee/RAD/materials.htm</a></p>
<p style="text-align: center;"><b>OHIO</b></p> <p><b>Contact:</b> Mark Light  <b>Phone:</b> (614) 644-2727  <b>Fax:</b> (614) 466-0381  <b>Address:</b>  Bureau of Radiation Protection  Ohio Department of Health  246 North High Street  Columbus, Ohio 43215  <b>Website:</b>  <a href="http://www.odh.ohio.gov/odhPrograms/rp/radprot/radprot1.aspx">www.odh.ohio.gov/odhPrograms/rp/radprot/radprot1.aspx</a></p>	<p style="text-align: center;"><b>OKLAHOMA</b></p> <p><b>Contact:</b> H.A. Caves  <b>Phone:</b> (405) 702-5100  <b>Fax:</b> (405) 702-5101  <b>Address:</b>  Department of Environmental Quality  Radiation Management Section  P.O. Box 1677  Oklahoma City, OK 73101-1677  <b>Website:</b> <a href="http://www.deq.state.ok.us/lpdnew/radindex.html">www.deq.state.ok.us/lpdnew/radindex.html</a></p>

<p style="text-align: center;"><b>OREGON</b></p> <p><b>Contact:</b> Sylvia Martin  <b>Phone:</b> (503) 731-4014  <b>Fax:</b> (503) 731-4081  <b>Address:</b>  Radiation Protection Services  Oregon State Health Division  P.O. Box 14450  Portland, OR 97214-0450  <b>Website:</b>  <a href="http://public.health.oregon.gov/healthyenvironments/radiationprotection/pages/index.aspx">public.health.oregon.gov/healthyenvironments/radiationprotection/pages/index.aspx</a></p>	<p style="text-align: center;"><b>RHODE ISLAND</b></p> <p><b>Contact:</b> Al Cabral  <b>Phone:</b> (401) 222-2566  <b>Fax:</b> (401) 222-5901  <b>Address:</b>  Division of Occupational and Radiological Health  3 Capitol Hill, Room 206  Providence, RI 02908-5097  <b>Website:</b>  <a href="http://www.health.ri.gov/programs/radiologicalhealth/index.php">www.health.ri.gov/programs/radiologicalhealth/index.php</a></p>
<p style="text-align: center;"><b>SOUTH CAROLINA</b></p> <p><b>Contact:</b> James Peterson  <b>Phone:</b> (803) 896-4244  <b>Fax:</b> (803) 896-4242  <b>Address:</b>  Radiological Health Branch  Department of Health and Environmental Control  2600 Bull Street  Columbia, SC 29201  <b>Website:</b> <a href="http://www.scdhec.gov/health/radhlth/">www.scdhec.gov/health/radhlth/</a></p>	<p style="text-align: center;"><b>TENNESSEE</b></p> <p><b>Contact:</b> Johnny Graves  <b>Phone:</b> (615) 532-0383  <b>Fax:</b> (615) 532-7938  <b>Address:</b>  Division of Radiological Health  Land C Annex, Third Floor  401 Church Street  Nashville, TN 37243-1532  <b>Website:</b> <a href="http://www.state.tn.us/environment/state_env/access.htm">www.state.tn.us/environment/state_env/access.htm</a></p>
<p style="text-align: center;"><b>TEXAS</b></p> <p><b>Contact:</b> Pete Myers  <b>Phone:</b> (512) 834-6688  <b>Fax:</b> (512) 834-6690  <b>Address:</b>  Bureau of Radiation Control  Texas Department of Health  1100 West 49<sup>th</sup> Street  Austin, TX 78756-3189  <b>Website:</b> <a href="http://www.tdh.state.tx.us/ech/rad/pages/brc.htm">www.tdh.state.tx.us/ech/rad/pages/brc.htm</a></p>	<p style="text-align: center;"><b>UTAH</b></p> <p><b>Contact:</b> Gwyn Galloway / Ryan Johnson  <b>Phone:</b> (801) 536-4250  <b>Fax:</b> (801) 533-4097  <b>Address:</b>  Division of Radiation Control  195 North 1950 West  P.O. Box 144850  Salt Lake City, UT 84114-4850  <b>Website:</b> <a href="http://www.radiationcontrol.utah.gov/Rules/index.htm">www.radiationcontrol.utah.gov/Rules/index.htm</a></p>
<p style="text-align: center;"><b>VIRGINIA</b></p> <p><b>Contact:</b> Mike Welling  <b>Phone:</b> (804) 864-8168  <b>Fax:</b> (804) 864-8155  <b>Address:</b>  Division of Radiological Health  Virginia Department of Health  109 Governor Street, Room 730  Richmond, VA 13219  <b>Website:</b>  <a href="http://www.vdh.state.va.us/epidemiology/radiologicalhealth/materials/index.htm">www.vdh.state.va.us/epidemiology/radiologicalhealth/materials/index.htm</a></p>	<p style="text-align: center;"><b>WASHINGTON</b></p> <p><b>Contact:</b> Terry Frazee  <b>Phone:</b> (360) 236-3221  <b>Fax:</b> (360) 239-2255  <b>Address:</b>  Division of Radiation Protection  Agricultural Center Building #5  P.O. Box 47827  Olympia, WA 98504-7827  <b>Website:</b> <a href="http://www.doh.wa.gov/ehp/rp">www.doh.wa.gov/ehp/rp</a></p>

# APPENDIX B

## NRC STATES AND REGIONAL OFFICES

### Headquarters

U.S. Nuclear Regulatory Commission  
Washington, DC 50555-0001

Website: [www.nrc.gov/nrc.html](http://www.nrc.gov/nrc.html)

<p style="text-align: center;"><b><i>Region I</i></b></p> <p style="text-align: center;">475 Allendale Road King of Prussia, PA 19406-1415 610-337-5000</p> <p style="text-align: center;">Connecticut Delaware Pennsylvania Vermont</p>	<p style="text-align: center;"><b><i>Region III</i></b></p> <p style="text-align: center;">801 Warrenville Road Lisle, IL 60532-4351 630-829-9500</p> <p style="text-align: center;">Indiana <b>Michigan*</b> Minnesota Missouri Wisconsin</p>
*Currently undergoing transition to an Agreement State	
<p style="text-align: center;"><b><i>Region II</i></b></p> <p style="text-align: center;">61 Forsyth Street, SW, Suite 23T85 Atlanta, GA 30303 404-562-4400</p> <p style="text-align: center;">Puerto Rico Virgin Islands West Virginia</p>	<p style="text-align: center;"><b><i>Region IV</i></b></p> <p style="text-align: center;">1600 Lamar Boulevard Arlington, TX 76011-4511 817-860-8100</p> <p style="text-align: center;">Alaska Hawaii Idaho Montana South Dakota Wyoming</p>

## APPENDIX C

### SOURCE INFORMATION FOR TROXLER GAUGES

The following tables provide source information for current production gauges, as well as gauges that are no longer in production. The gauge registries listed under the *Registry No.* column are available at [www.hsrdrn.gov/nrc/ssdr/ssdrindx.htm](http://www.hsrdrn.gov/nrc/ssdr/ssdrindx.htm).

<b>Current Production Gauges</b>				
<b>Gauge Model</b>	<b>Radionuclide</b>	<b>Max. Activity</b>	<b>Source Drawing</b>	<b>Registry No.</b>
3216	Am-241:Be	44 mCi	A-102451	NC-646-D-126-S
3241-C 3241-D 3241-G	Am-241:Be	300 mCi or 80 mCi or 100 mCi	A-100337 or A-100608	NC-646-D-128-S
3242	Cf-252	100 $\mu$ Ci	A-105162	NC-646-D-135-B
3400 Series 3430 3440	Cs-137 Am-241:Be	9 mCi 44 mCi	A-102112 A-102451	NC-646-D-130-S
3430-M 3440-M	Cs-137 Cf-252	9 mCi 66 $\mu$ Ci	A-102112 A-105560	NC-646-D-130-S
3450	Cs-137 Am-241:Be	9 mCi 44 mCi	A-102112 A-102451	NC-646-D-138-S
4232	Cf-252	100 $\mu$ Ci	A-105162, A-105862	NC-646-D-137-S
4300 series 4301 4302 4350	Am-241:Be Cs-137	11 mCi 9 mCi	A-102700 A-102112	NC-646-D-134-S
4640 4640-B	Cs-137	9 mCi	A-102112	NC-646-D-131-S

<b>Gauges No Longer in Production</b>				
<b>Gauge Model</b>	<b>Radionuclide</b>	<b>Max. Activity</b>	<b>Source Drawing</b>	<b>Registry No.</b>
1201 (old 117 w/ S-1 Ref. Std.)	Ra-226:Be	3 mg	A-100280	NC-646-D-801-S
1205 (old 217-104A) 1207 (old 217-105A) 217	Am-241:Be	100 mCi	A-100608	NC-646-D-812-S
1226 (old AC-200)	Am-241:Be	100 mCi	MRC-N-SS-W-AMBE	NC-646-D-813-S
2226	Am-241:Be	300 mCi	A-100337	NC-646-D-814-S

<b>Gauges No Longer in Production</b>				
<b>Gauge Model</b>	<b>Radionuclide</b>	<b>Max. Activity</b>	<b>Source Drawing</b>	<b>Registry No.</b>
1255 (old 104A/S-5A) 1257 (old 105A/S-6A)	Am-241:Be	100 mCi	A-100608	NC-646-D-815-S
1351 1352	Cs-137	8 mCi	A-102112	NC-646-D-819-S
1376 (old C-10)	Cs-137	5 mCi	A-100601	NC-646-D-105-U
1378	Cs-137	5 mCi	A-100601	NC-646-D-817-S
1401 (old SCM-227)	Ra-226:Be	3 mg	A-100280	NC-646-D-802-S
1402 (old SCM-247)	Ra-226:Be	3 mg	A-100280	NC-646-D-803-S
1403 (old SCM-257)	Cs-137/Am-241:Be	10/50 mCi	A-100281	NC-646-D-804-S
1404	Ra-226:Be	3.5 mCi	A-100280	NC-646-D-805-S
1405 (old SC-109)	Cs-137	5 mCi	A-100601	NC-646-D-806-S
2101	Sr-90	5 mCi	A-100605	NC-646-D-807-S
1251 (old 104/S5 shield) 1253 (old 105/S6 shield)	Ra-226:Be	3 mg	A-100280	NC-646-D-818-S
2401	Ra-226:Be Cs-137/Am-241:Be	3 mg 10/50 mCi	A-100600 A-100281	NC-646-D-810-S
2402	Ra-226:Be Cs-137/Am-241:Be	3 mg 10/50 mCi	A-100600, A-100280 A-100281	NC-646-D-811-S
2451	Ra-226:Be Cs-137/Am-241:Be	3 mg 10/50 mCi	A-100600, A-100280 A-100281	NC-646-D-808-S
2452	Ra-226:Be Cs-137/Am-241:Be	3 mg 10/50 mCi	A-100280 A-100281	NC-646-D-809-S
3205 3215	Am-241:Be	40 mCi	A-102451	NC-646-D-820-S
3221 3222 3223	Am-241:Be	10 mCi	A-102700	NC-646-D-123-S
3565	Cs-137	8 mCi	A-102112	NC-646-D-124-S

<b>Gauges No Longer in Production</b>				
<b>Gauge Model</b>	<b>Radionuclide</b>	<b>Max. Activity</b>	<b>Source Drawing</b>	<b>Registry No.</b>
1376 2376	Cs-137	5 mCi 10 mCi 8 mCi	A-100601 A-000602 A-102112	NC-646-D-125-U
3217 3218	Am-241:Be	40 mCi	A-102451	NC-646-D-126-S
3221 3222 3223 3225 3226 3227	Am-241:Be	10 mCi	A-102700	NC-646-D-127-S
3321 3322 3323 3331 3332 3333	Am-241:Be	10 mCi	A-102700	NC-646-D-129-S
3401 3411	Cs-137 Am-241:Be	8 mCi 40 mCi	A-102112 A-102451	NC-646-D-130-S
4430	Am-241 Cf-252	11 mCi 60 $\mu$ Ci	A-106510 A-105779	NC-646-D-136-S
4440	Co-60 Cf-252	60 $\mu$ Ci 30 $\mu$ Ci	A-104240 A-104225	NC-646-D-823-S
4441	Co-60	100 $\mu$ Ci	A-105201	
4442	Co-60 Cf-252	60 $\mu$ Ci 30 $\mu$ Ci	A-104240 A-104225	
4545	Cs-137	8 mCi	A-102112	NC-646-D-824-S





## **APPENDIX D**

### **RSO RESPONSIBILITIES**

The RSO is responsible for ensuring the following:

- ◆ Licensed activities that the RSO considers unsafe are stopped.
- ◆ Possession, use, storage, and maintenance of sources and gauges are consistent with the limitations of 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 are properly secured.
- ◆ Proper authorities are notified in case of accident, damage to gauges, fire, or theft.
- ◆ Unusual occurrences involving the gauge (such as accident or damage) are investigated, root causes(s) are identified, and appropriate corrective actions are taken.
- ◆ Audits are performed and documented at least annually and corrective actions are taken.
- ◆ Licensed material is transported in accordance with all applicable DOT requirements.
- ◆ Licensed material is disposed of properly.
- ◆ Appropriate records are maintained.
- ◆ Up-to-date license is maintained and amendment and renewal requests are submitted in a timely manner.

Reference: NUREG-1556, Vol. 1











## APPENDIX G

### PUBLIC DOSE CALCULATION WORKSHEET

To demonstrate compliance, you must show that the maximum dose to any *member of the public* will be less 100 millirem in a year and that the maximum dose in any *unrestricted area* will be less than two millirem in any one hour. The typical limiting case involves the storage of gauges. Several simplifying and conservative assumptions are made in this calculation method:

- ◆ No shielding other than the shielding in the gauge is assumed to be present.
- ◆ All gauges are assumed to be at the same distance as the closest gauge.
- ◆ Sources are assumed to remain in the shielded position within the gauge.
- ◆ Each gauge is assumed to be a point source and dose rates are assumed to decrease with the inverse square of distance from the gauge.
- ◆ Gauges are assumed to be in storage all of the time.

More realistic assumptions can be made or actual measured dose rates can be used if necessary to demonstrate compliance.

Step	Instruction	Result
<b>DOSE TO MEMBER OF PUBLIC IN ONE YEAR</b>		
1	Identify the individual member of the public likely to receive the highest dose from gauges in storage. This will be the person who spends the most time in the vicinity of the stored gauges or who is closest to the gauges. This individual will be the focus of the calculation.	
2	Determine the maximum dose rate in mrem/hr at a distance of three feet (one meter) for each gauge kept in the storage location. This value may be obtained from the radiation profile in the gauge operation manual, from the manufacturer, or from Transport Index on the Yellow II label on the transport case. Calculate the sum of the dose rate values for all of the gauges that may be stored at this location and enter the result. Remember to include both gamma and neutron dose.	
3	Enter the distance in feet from the position occupied by the person identified in step 1 to the nearest gauge in the storage area.	
4	Calculate the square of the distance from step 3 and enter the result.	
5	Divide the value from step 4 by 9 and enter the result. This is a factor that accounts for the difference between the dose rate at three feet and the dose rate at the distance at which the person is located.	
6	Divide the dose rate from step 2 by the result from step 5 and enter the result.	
7	Enter the number of hours in a year that the individual will be present in the vicinity of the gauges. For example, an individual working full-time near the gauges, would be present approximately 2000 hours in a year (8 hours per day x 5 days per week x 50 weeks per year).	
8	Multiply the result from step 6 by the result from step 7 and enter the result. This is the maximum dose in mrem the individual could receive in one calendar year. If this value is less than 100 mrem, the annual dose limit is met; continue with step 9 to determine if the unrestricted area dose rate limit is met.	

<b>DOSE IN UNRESTRICTED AREAS IN ONE HOUR</b>		
9	Determine the minimum distance in feet to any unrestricted area outside the gauge storage area and record the value. This could be an area above, below, or adjacent to the storage area that is unrestricted <b>for the purpose of radiation control</b> . The area need not be occupied, just accessible to members of the public, which may include company employees.	
10	Calculate the square of the distance from step 9 and enter the result.	
11	Divide the value from step 10 by 9 and enter the result. This is a factor that accounts for the difference between the dose rate at three feet and the dose rate at the distance in step 9.	
12	Divide the dose rate (mrem/hr) from step 2 by the result from step 11 and enter the result. This is the maximum dose in mrem that could be received in one hour in the closest unrestricted area. If this value is less than two mrem, the dose limit for unrestricted areas is met.	
<b>Calculations performed by:</b>		<b>Date:</b>

If either dose limit is exceeded, you should either recalculate that dose using more realistic assumptions and data or take steps to reduce the dose received by members of the public using the principles of time, distance, and shielding.

- ◆ Limit the time personnel spend in the vicinity of the gauges.
- ◆ Increase the distance between the gauges and personnel.
- ◆ Add shielding to reduce the dose rate.

## OCCUPANCY FACTORS

The following occupancy data may be used when data for specific personnel are not available:

<b>Area</b>	<b>Occupancy Factor (T)</b>
Work areas such as offices, laboratories, shops, wards, nurses' stations; living quarters; children's play areas; and occupied space in nearby buildings.	Full Occupancy (T=1)
Corridors, rest rooms, elevators using operators, unattended parking lots.	Partial Occupancy (T=1/4)
Waiting rooms, restrooms, stairways, unattended elevators, janitor's closets, outside areas used only for pedestrians or vehicular traffic.	Occasional Occupancy (T=1/16)

**Reference:** NCRP Report No. 49, *Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energies Up to 10 MeV*, 1976

## SHIELDING HALF-VALUES\*

<b>Material</b>	<b>Cs-137 Gamma Radiation</b>	<b>Am:Be Neutron Radiation</b>
Lead	¼ in.	N/A
Concrete	2 in.	4 in.

\* The half-value is the thickness of material that will reduce the dose rate by one-half.



# **APPENDIX H**

## **OPERATING AND EMERGENCY PROCEDURES**

### **OPERATING PROCEDURES**

1. Always wear assigned personnel dosimetry devices (e.g., TLD badge) when using or transporting the gauge.
2. Never wear another person's dosimeter.
3. Never store a dosimeter near the gauge or other radiation source.
4. Before removing the gauge from its place of storage, ensure that in gauges with movable source rods, the rod is locked in the shielded position, and the transport case is locked.
5. Sign out the gauge in a logbook, stating the date(s) of use, name(s) of authorized user(s) who will be responsible for the gauge, and the temporary job site(s) where the gauge will be used.
6. Block and brace the gauge to prevent movement during transport and lock the gauge in or to the vehicle. Follow all U.S. Department of Transportation requirements when transporting the gauge.
7. Use the gauge according to the manufacturer's instructions and recommendations.
8. Do not touch the end of the source rod with your fingers, hands, or any part of your body or place any part of the body in the radiation field of the unshielded source.
9. 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 hole, keep all body parts as far from the unshielded source as possible to minimize radiation exposure.
10. After completing each measurement in which the source is unshielded, immediately return the source to the shielded position.
11. Always maintain constant surveillance and immediate control of the gauge when it is not in storage or secured in the transport vehicle. Never leave the gauge unattended. Protect the gauge and yourself from danger of moving heavy equipment.
12. Always keep unauthorized persons away from the area where the gauge is being used.
13. Perform routine cleaning and maintenance according to the manufacturer's instructions and recommendations.
14. When the gauge is not in use at a temporary job site, place the gauge in a secured storage location (e.g., locked in the trunk of a car or locked in a storage shed).
15. Prior to transporting the gauge, ensure that each gauge source is in the fully shielded position. Ensure that the source rod is locked in the shielded position and that the gauge is placed into the case and lock the case. Block and brace the gauge to prevent movement during transportation. Lock the case in or to the vehicle.
16. Return the gauge to its proper storage location at the end of the work shift.

17. Log the gauge into the daily use log when it is returned to storage.
18. If gauges are used for measurements with the unshielded source extended more than 3 feet below the surface, use piping, tubing or other casing material to line the hole from the lowest 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 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).
19. After making changes affecting the gauge storage area (e.g., changing the location of gauges within the area, removing shielding, adding gauges, changing the occupancy of adjacent areas, moving the storage area to a new location), reevaluate compliance with public dose limits and ensure proper security of gauges.

## EMERGENCY PROCEDURES

The following procedures apply when the source fails to return to the shielded position (as a result from damage or the source becomes stuck below the surface) or if any other emergency or unusual situation arises (such as the gauge is struck by a moving vehicle or is in an accident involving a vehicle):

1. 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. However, perform first aid for injured individuals and remove them from the area only when medically safe to do so.
2. If any heavy equipment is involved, detain the equipment and operator until it is determined there is no contamination present.
3. Gauge users and other potentially contaminated individuals should not leave the scene until emergency assistance arrives.
4. Visually inspect the gauge to determine the position of the source rod (exposed or shielded), and the position of the source shutter (open or closed), and the extent of damage, if any, to the source housing and/or shielding.
5. Notify the persons in the order listed below:

Name	Work Phone Number	Home Phone Number
(Radiation Safety Officer)		
(Lead Gauge User)		
(Manufacturer)		

Fill in the names and telephone numbers of appropriate personnel (e.g., the Radiation Safety Officer or other knowledgeable staff, licensee's consultant, gauge manufacturer, or regulatory agency) to be contacted in an emergency. Update list as needed.

6. Follow the directions provided by the person contacted above.
7. RSO and licensee management must:
  - a. Arrange for a radiation survey to be conducted as soon as possible by a knowledgeable person using appropriate radiation detection instrumentation (such as a survey meter). This person could be a licensee employee or a consultant. The person must be competent in use of the instrument.
  - b. Make necessary notifications to local authorities as well as the NRC or Agreement State licensing agency as appropriate.
  - c. Reports to the NRC or Agreement States must be made within the reporting timeframes specified in the regulations. Reporting requirements are found in 10 CFR 20.2201-2203 and 10 CFR 30.50 or corresponding Agreement State regulations.

### **NOTE**

Before shipping a damaged gauge to Troxler, you must do the following:

1. Send close-up photographs of the damaged gauge to Troxler.
2. Send a leak test sample to Troxler for analysis or send leak test results.
3. Obtain a Returned Goods Authorization (RGA) number from Troxler by calling 1-877-TROXLER.



# APPENDIX I

## PORTABLE GAUGE AUDIT CHECKLIST

### NOTE

Information in this checklist was provided by the U.S. Nuclear Regulatory Commission (NRC).

### 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. Were previous audits conducted yearly? [10 CFR 20.1101]
- c. Were records of previous audits maintained? [10 CFR 20.2102]
- d. Were any deficiencies identified during last two audits or two years, whichever is longer?
- e. Were 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 NRC prior consent obtained or was NRC notified?
- c. If the RSO was changed, was license amended? Does new RSO meet NRC training requirements?
- d. If the designated contact person for NRC changed, was NRC notified?
- e. Does the license authorize all of the NRC-regulated radionuclides contained in gauges possessed?
- f. Are the gauges as described in the Sealed Source and Device (SSD) Registration Certificate or Sheet? Have copies of (or access to) SSD Certificates? Have manufacturers' manuals for operation and maintenance? [10 CFR 32.210]

- 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. Were all workers who are likely to exceed 100 mrem/year instructed per [10 CFR 19.12]? Refresher training provided, as needed [10 CFR 19.12]?
- b. Did each gauge operator attend an approved course prior to using gauges?
- c. Are training records maintained for each gauge operator?
- d. Did interviews with operators reveal that they know the emergency procedures?
- e. Did this audit include observations of operators using the gauge in a field situation?
- f. Operating gauge? Performing routine cleaning and lubrication? Transporting gauge? Storing gauge?
- g. Did the operator demonstrate safe handling and security during transportation, use, and storage?
- h. 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**

- a. If the licensee possesses its own survey meter, does it meet the criteria of the NRC?
- b. If the licensee does not possess a survey meter, are specific plans made to have one available?
- c. Is the survey meter needed for non-routine maintenance calibrated as required [10 CFR 20.1501]?
- d. Are calibration records maintained [10 CFR 20.2103(a)]?

### **5. GAUGE INVENTORY**

- a. Is a record kept showing the receipt of each gauge? [10 CFR 30.51(a)(1)]
- b. Are all gauges received physically inventoried every six months?
- c. Are records of inventory results with appropriate information maintained?

### **6. PERSONNEL RADIATION PROTECTION**

- a. Are ALARA considerations incorporated into the radiation protection program? [10 CFR 20.1101(b)]
- b. Is documentation kept showing that unmonitored 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 required (user receiving >10% of limit)? In addition, is dosimetry provided to users?
  - 1. Is the dosimetry supplier NVLAP approved? *[10 CFR 20.1501(c)]*
  - 2. Are the dosimeters exchanged monthly for film badges and at industry recommended frequency for TLDs?
  - 3. Are dosimetry reports reviewed by the RSO when they are received?
  - 4. Are the records NRC Forms or equivalent? *[10 CFR 20.2104(d), 10 CFR 20.2106(c)]*
    - ◆ NRC-4 “Cumulative Occupational Exposure History” completed?
    - ◆ NRC-5 “Occupational Exposure Record for a Monitoring Period” completed?
  - 5. If a worker declared her pregnancy, did licensee comply with *[10 CFR 20.1208]*?
    - ◆ Were records kept of embryo/fetus dose per *10 CFR 20.2106(e)*?
- f. Are records of exposures, surveys, monitoring, and evaluations maintained *[10 CFR 20.2102, 10 CFR 20.2103, 10 CFR 20.2106]*

## **7. PUBLIC DOSE**

- a. Are gauges stored in a manner to keep doses below 100 mrem in a year? *[10 CFR 20.1301(a)(1)]*
- b. Has a survey or evaluation been performed per *10 CFR 20.1501(a)*? Have there been any additions or changes to the storage, security, or use of surrounding areas that would necessitate a new survey or evaluation?
- c. Do unrestricted area radiation levels exceed two mrem in any one hour? *[10 CFR 20.1301(a)(2)]*
- d. Are gauges being stored in a manner that would prevent unauthorized use or removal? *[10 CFR 20.1801]*
- e. Records maintained? *[10 CFR 20.2103, 10 CFR 20.2107]*

## **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 (telephone numbers) of the operating and emergency procedures?
- d. Does each operator have a current copy (telephone numbers) of the operating and emergency procedures?

## 9. LEAK TESTS

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

## 10. MAINTENANCE OF GAUGES

- a. Are manufacturer's procedures followed for routine cleaning and lubrication of gauge?
- b. Does the source or source rod remain attached to the gauge during cleaning?
- c. Is non-routine maintenance performed where the source or source rod is detached from the gauge? If yes, was it performed according to license requirements (e.g., extent of work, individuals performing the work, procedures, dosimetry, survey instrument, compliance with *10 CFR 20.1301* limits)?

## 11. TRANSPORTATION

- 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 two labels (such as the Yellow-II label) 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*]



## **12. AUDITOR'S INDEPENDENT SURVEY MEASUREMENTS (IF MADE)**

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

## **13. NOTIFICATION AND REPORTS**

- a. Was any radioactive material lost or stolen? Were reports made? *[10 CFR 20.2201, 10 CFR 30.50]*
- b. Did any reportable incidents occur? Were reports made? *[10 CFR 20.2202, 10 CFR 30.50]*
- c. Did any overexposures and high radiation levels occur? Reported? *[10 CFR 20.2203, 10 CFR 30.50]*
- d. If any events (as described in items *a* through *c* above) did occur, what was root cause? Were corrective actions appropriate?
- e. Is the licensee aware of telephone number for NRC Emergency Operations Center [(301) 816-5100]?

## **14. RECORD KEEPING FOR DECOMMISSIONING**

- a. Records kept of information important to decommissioning? *[10 CFR 30.35(g)]*
- b. Records include all information outlined *[10 CFR 30.35(g)]*

## **15. BULLETINS AND INFORMATION NOTICES**

- a. NRC Bulletins, NRC Information Notices, NMSS Newsletters, received?
- b. Appropriate training and action taken in response?

## **16. SPECIAL LICENSE CONDITIONS OR ISSUES**

- a. Did auditor review special license conditions or other issues (such as non-routine maintenance)?

## **17. 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.

## **18. 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?

# NOTES