Regulatory Guide 3.13

Radioactive Material Guidance for

Fixed Gauge Licenses

Nebraska Department of Health and Human Services
Office of Radiological Health
PO Box 95026
Lincoln, NE 68509
402-471-2168

Nebraska Department of Health and Human Services, Regulatory Guides

Regulatory Guides are issued to describe and make available to the public acceptable methods of implementing specific parts of 180 NAC (Nebraska Regulations for Control of Radiation-Ionizing), to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants, licensees, or registrants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the Nebraska Department of Health and Human Services, Division of Public Health, Radiological Health to make necessary determination to issue or continue a license or certificate of registration.

Comments and suggestions for improvements in these Regulatory Guides are encouraged and will be revised, as appropriate, to accommodate comments and to reflect new information or experience. Comments should be sent to Nebraska Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, PO Box 95026, Lincoln, NE 69509-5026 or dhhs.radiationprograms@nebraska.gov.

Requests for single copies of issued guides (which may be reproduced) can be made in writing to Nebraska Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, PO Box 95026, Lincoln, NE 69509-5026 or refer to www.dhhs.ne.gov/rad.

Table of Contents

Page

Abbreviations iii

Regulatory Guide Summary v

I. Introduction 1

A. General 1

B. Purpose of Guide 1

C. Management Responsibility 4

D. Applicable Regulations 5

II. Filing an Application 7

A. General 7

B. License Fees 8

III. Contents of an Application 9

1.a. Legal Name and Street Address 9

1.b. Street Address at Which Radioactive Material Will Be Used. (If Different From 1a.) 10

2. Department To Use Radioactive Material – Contact Person 11

3. License Action Type 11

4. Individual User(s) 11

4.a. ..... Training for Individual Who in the Course of Employment Are Likely to Receive Occupational Doses of Radiation in Excess of 1 mSv (100 mrem) in a Year (Occupationally Exposed Workers) and Ancillary Personnel 12

5. Radiation Safety Officer (RSO) 13

6. Radioactive Material Data 14
Financial Assurance and Record Keeping for Decommissioning 16

7. & 8. Training of Individual and Experience 17

9. Radiation Detection Instruments 18

10. Calibration of Instruments Listed in Item 9 19

11. Personnel Monitoring Devices 20

12. Facilities and Equipment 22

13. Radiation Protection Program 24
13.A. Operating and Emergency Procedures 24
13.B. Leak Tests 27
13.C. Maintenance 28
13.D. Transportation 31
13.E. Fixed Gauges Used at Temporary Job Site 32
13.F. Minimization of Contamination 37

13.G. Audit Program 38
13.H. Material Receipt and Accountability 38
13.I. Public Dose 40

14. Waste Disposal 42

15. Citizenship Attestation 43

16. Certification 43

IV. Amendments to a License 43
V. License Renewal 44
VI. License Termination 45

List of Appendices

Page
Appendix A NRH 5–Application for Radioactive Material License A-1
Appendix B Supportive Information Requested in Items 4 through 14 of NRH Form 5 ..... B-1
Appendix C Sample Fixed Gauge License C-1
Appendix D Review Checklist for Fixed Gauge application D-1
Appendix E Duties and Responsibilities of the Radiation Safety Officer E-1
Appendix F Operating and Emergency Procedures F-1
Appendix G Model Facility Diagrams G-1
Appendix H Information Needed for Change of Ownership or Control Application H-1
Appendix I Criteria for Acceptable Training Courses for Fixed gauge Users I-1
Appendix J SSD Registration Certificate J-1
Appendix K Reserved K-1
Appendix L Survey Instrument Calibration Program L-1
Appendix M Dosimetry –Related Guidance–
Part 1: Guidance for Demonstrating that Unmonitored Individuals Are Not Likely to Exceed 10 Percent of the Allowable Limits M1-1
Part 2: Guidance for Demonstrating that Individuals Members of the Public Will Not Receive Doses Exceeding the Allowable limits M2-1
Appendix N Typical Incident Notification Required for Fixed Gauge Licenses N-1
Appendix O Request to Perform Leak Testing and Sample Analysis O-1
Appendix P Information Needed to Support Applicant's Request to Perform Non-routine Operations P-1
Appendix Q Major DOT Regulations; Sample Shipping Documents, Placard, Label and Bill of Lading Q-1
Appendix R Guide to SI Units for Radiation Protection R-1
Appendix S Fixed Gauge Audit Checklist S-1
Appendix T Inventory Procedure & Inventory of Radioactive Sealed Sources & Devices T-1
Appendix U Record Retention U-1
Appendix V Transfer/Disposal V-1
Appendix W NRH-60 Certification of Dispositions of Materials W-1
Appendix X Delegation of Authority to Make Legally Binding Statement X-1

Abbreviations

ALARA	as low as is reasonably achievable
Am-241	americium-241
ANSI	American National Standards Institute
AU	authorized user
bkg	background
BPR	business process redesign
Bq	Becquerel
CaF2	calcium fluoride
Cf-252	californium-252
CDE	committed dose equivalent
CEDE	committed effective dose equivalent
CFR	Code of Federal Regulations
Ci	Curie
C/kg	coulomb per kilogram
Co-60	cobalt-60
cpm	counts per minute
Cs-137	cesium-137
d	day
DOE	United States Department of Energy
DOT	United States Department of Transportation
EDE	effective dose equivalent
FDA	United States Food and Drug Administration
ft	foot
GBq	gigabecquerel
G-M	Geiger-Mueller
hr	hour
IN	Information Notice
IP	Inspection Procedure
kg	kilogram
Kr-85	krypton-85
LiF	lithium fluoride
m	meter
mCi	millicurie
mo	month
MOU	memorandum of understanding
mR	milliroentgen
mrem	millirem

mSv	millisievert
NCRP	National Council on Radiation Protection and Measurements
NIST	National Institute of Standards and Technology
NRC	United States Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
OSP	Office of State Programs
Q	Quality Factor
R	Roentgen
Rev.	revision
RQ	reportable quantities
RSO	radiation safety officer
SDE	shallow-dose equivalent
Sr-90	strontium-90
SI	International System of Units (abbreviated SI from the French Le Systeme Internationale d'Unites)
SSD	sealed source and device
std	standard
Sv	Sievert
TEDE	total effective dose equivalent
TI	transportation index
TLD	thermoluminescent dosimeters
URL	uniform resource locator
wk	week
yr	year

Definition

Department	Nebraska Department of Health and Human Services

Contact the Department at:
Nebraska Department of Health and Human Services
Office of Radiological Health
301 Centennial Mall South
PO Box 95026
Lincoln, NE 68509
dhhs.radiationprograms@nebraska.gov
(402) 471-2168

Regulatory Guide Summary

This Regulatory Guide 3.13 has been developed to streamline the application process for a fixed gauge license for the applicant. A copy of the application NRH-5 “Application for Material License” is located in Appendix A.

“Supporting Information Requested in Items 4 through 14 of NRH Form 5” located in Appendix B is a checklist to help the applicant complete NRH-5. Appendix B should be completed and attached to the application NRH-5 when submitting it. Each section of the Appendix B’s checklist refers to a number on the application NRH-5. Part III of this guide gives detailed explanation concerning how to complete each part and an explanation.

Appendix C through X provide examples, models and additional information that can be used when completing the application. Appendix C is an example of a fixed gauge license. It contains the conditions most often found in fixed gauge device licenses. However, all licenses will not have the same conditions.

It typically takes 60-90 days for a license to be issued plus additional time if the application is not complete. Appendix D is a checklist that is used by the Department to review the applications. When submitting the application be sure to include the appropriate application fee for a fixed gauge device.

In summary the applicant will need to do the following to submit an application for a fixed gauge licenses.

- Use this regulatory guide to prepare the application NRH-5.
- Complete the application NRH-5 (Appendix A) and the checklist (Appendix B.) See Part III of this guide for additional information.
- In addition to Appendix A and B each application will need to include the following appendixes or alternative procedures:
  Appendix E “Duties of the Radiation Safety Officer”
  Appendix F “Operating and Emergency Procedures”
  Appendix G “Facility Diagram”
- Include any additional attachments.
  -All supplemental pages should be typed on 8 ½” x 11” paper.
  -Please identify all attachments with the applicant’s name and license number (if a renewal), item number which it relates to on Appendix B, page number and application date.
- Avoid submitting proprietary information unless it is absolutely necessary.
- Submit an original signed application along with attachments and if possible, an electronic copy.
- Submit the application fee.
- Retain one copy of the license application and attachments for future reference.
- 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 this office at (402) 471-2168.

Our website is located at: http://www.dhhs.ne.gov/rad/

Page intentionally left blank.

I. Introduction

A. General

Nebraska signed an agreement with the Atomic Energy Commission (now the U.S. Nuclear Regulatory Commission (NRC)) on October 1, 1966. The agreement gave Nebraska the authority to license and regulate radioactive material users in the State of Nebraska. Except for nuclear power plants and federally controlled facilities, the Nebraska Department of Health and Human Services (DHHS) or (Department), regulates the possession and use of radioactive material within the state. The NRC has signed similar agreement with other states. These states are referred to as Agreement States.

Under authority of the Nebraska Radiation Control Act (Nebraska Revised Statute (Neb. Rev. Stat.) §§ 71-3501 to 71-3520), The Department issues licenses to users of radioactive material and performs inspections to ensure compliance with Title 180 Nebraska Administrative Code (NAC) Regulations for Control of Radiation.

This document, “Regulatory Guide 3.13, "Guidance for Radioactive Material – Fixed Gauge Licenses" is intended for use by applicants, licensees, DHHS license staff reviewers. It supersedes the guidance for applicants and licensees previously found in Regulatory Guide 3.13 (Rev 5) February 2013, "Guide for the Preparation of Applications for Licenses for the use of Sealed Sources in Non-Portable Gauging Devices.”

This guide uses current information found in the U.S. Nuclear Regulatory Commissions (NRC) NUREG 1556, Vol. 4 "Consolidated Guidance about Materials Licenses: Program-Specific Guidance about Fixed Gauge Licenses" and other sources.

B. Purpose of Guide

This guide provides instructions for preparing a fixed gauge license application as well as criteria for evaluating fixed gauges license applications. It is not intended to address the research and development of fixed gauges or the commercial aspects of manufacturing, distribution, and service of such devices. Within this document, the phrases or terms, “fixed gauge,” “gauging devices,” or “gauges” are used interchangeably.

Applicants or licensees wishing to renew their licenses should submit a complete application according to this Regulatory Guide.

Regulatory Guide 3.13, "Radioactive Material - Guidance for Fixed Gauge Licenses", is also available electronically by visiting the Department’s Radioactive Materials Page. www.dhhs.ne.gov/rad.

This guide identifies the information needed to complete Form NRH 5 (Appendix A), "Application for Material License," for the use of sealed sources in fixed gauging devices.

Appendix B “Supporting Information Requested in Items 4 through 14 of NRH Form 5” should be used as an attachment to Appendix A for fixed gauge licenses. The applicant should use this Appendix B as a checklist to ensure completeness of their submittal. Each section of the checklist refers to a number on the application (Appendix A) and more detailed information about what is needed can be found in Part III of this Regulatory Guide.

If the applicant needs to provide supplemental information to Appendix B make sure that the supplemental information and attachments each have the applicants name and license number (if a renewal), item number which it relates to on Appendix B, page number and application date.

Appendixes C through X provide examples, models and additional information that will be needed to complete Appendix A and B. Appendix C is a sample fixed gauge license; it contains the conditions most often found on these licenses, although not all licenses will have all conditions.

Appendix D is a checklist that Department staff will use to review applications and applicants can use to check for completeness. It typically takes 60-90 days for a license to be issued, particularly if additional information must be requested.

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 property of the citizens of Nebraska according to the Department’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 delay completion of the application’s review and may be avoided by a thorough study of the regulations and these instructions prior to submitting the application.

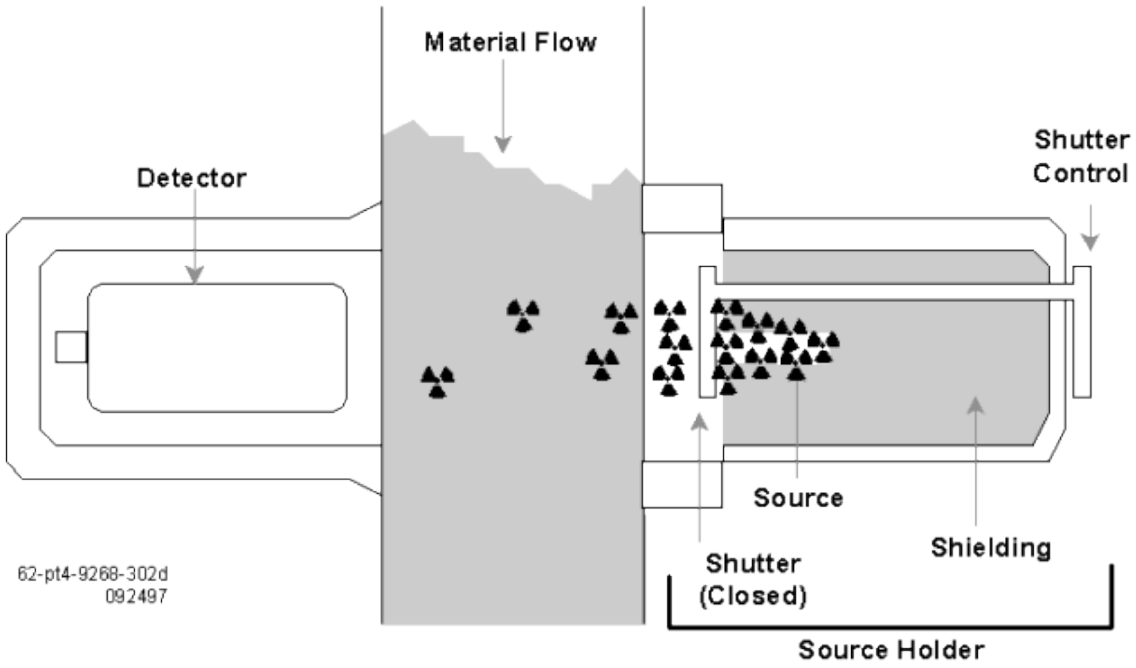


FIGURE 1 **Fixed Gauge Basic Design Features. Cutaway of a typical fixed gauge diagramming the basic design features: the source, source holder, detector, shutter, shutter control or on-off mechanism, and shielding.**

This regulatory guide addresses a variety of radiation safety issues associated with fixed gauges of many designs. Figure 1 is a cutaway diagram of a typical fixed gauge showing basic design features. Figure 2 illustrates various designs of fixed gauges based, in part, on their intended use and the location of the radioactive source within the gauges. Typically, gauges are used for process control (e.g., to measure the thickness of paper, the density of coal, the level of material in vessels and tanks, and volumetric flow rate). Because of differences in design, manufacturers provide appropriate instructions and recommendations for proper operation and maintenance. In addition, with gauges of varying designs, the sealed sources may be oriented in different locations within the devices, resulting in different radiation safety problems.

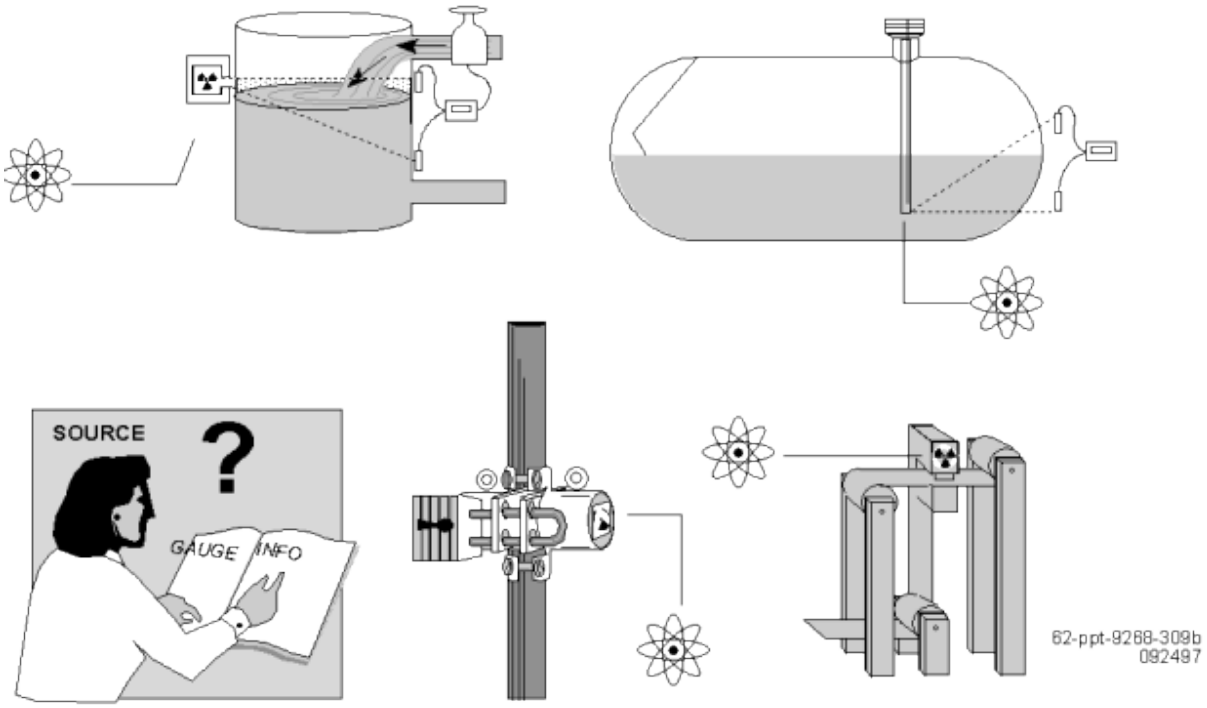


FIGURE 2 **Where is the Radioactive Source? The wide variety of fixed gauge designs results in different radiation safety considerations.**

Radioactive Material Licensees from other agreement states and NRC licensees who wish to conduct operations at temporary job sites in Nebraska should contact the Department. A licensee should request authorization well in advance of scheduled use to ensure compliance with Nebraska's reciprocity requirements.

C. Management Responsibility

The Department recognizes that effective radiation safety program management is vital to achieving safe and compliant operations. The Department also believes that consistent compliance with its regulations provides reasonable assurance that licensed activities will be conducted safely.

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

- Radiation safety, security and control of radioactive materials, and compliance with regulations;
- Completeness and accuracy of the radiation safety records and information provided;
- 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 regulations is

maintained; and
- Selecting and assigning a qualified individual to serve as the Radiation Safety Officer (RSO) for their licensed activities.

Management must be committed to the As Low As Reasonably Achievable (ALARA) philosophy of maintaining occupational and public radiation dose as low as reasonably achievable.

- All personnel using fixed gauges will be made aware of management's commitment to the ALARA philosophy and they will be instructed in the procedures necessary to keep their exposures as low as possible.
- The Radiation Safety Officer will be delegated authority to ensure adherence to ALARA principles. Management will support the RSO in stances where this authority must be asserted.
- All reasonable modifications will be made to procedures, equipment, and facilities to reduce exposures, unless the cost is considered unjustified. Management will be prepared to describe the reasons for not implementing modifications that have been recommended.

D. Applicable Regulations

The following portions of the regulations are applicable to the use of radioactive material in the form of sealed sources in fixed devices and should be used in conjunction with this guide:

- 180 NAC 1 "General Provisions"
- 180 NAC 3 "Licensing of Radioactive Material"
- 180 NAC 4 "Standards for Protection Against Radiation"
- 180 NAC 10 "Notices, Instructions and Reports to Workers: Inspections"
- 180 NAC 13 "Transportation of Radioactive Material"
- 180 NAC 15 "Training and Experience Requirements for Use of Radiation Sources"
- 180 NAC 17 "Enforcement of Radiation Control Act and Rights to Hearing Procedures for Licensees and Registrants; Penalties"
- 180 NAC 18 "Fees for Certificates of Registration, Radioactive Material(s) Licenses, Environmental Surveillance, Emergency Response and other Regulatory Services"

The Department amends the regulations periodically. Notification of changes will be provided as they occur; when applicable, the changes should be incorporated into the radiation safety program.

To request copies of Nebraska's Title 180, contact the Office of Radiological Health at (402) 471-2168, FAX (402) 471-0169, dhhs.radiationprograms@nebraska.gov, or write to the Nebraska Department of Health and Human Services, Radioactive Materials Program, PO Box 95026, Lincoln, NE 68509. A current copy of Title 180 NAC is also available on the Internet at https://dhhs.ne.gov/Pages/Title-180.aspx

To request a federal publication of the two-volume bound version of Title 10, Code of Federal Regulations, Parts 0-50 and 51-199, contact the Government Printing Office (GPO),

Superintendent of Documents, at (202) 512-1800, PO Box 371954, Pittsburgh, PA 15250-7954. They are also available on the Internet at http://www.nrc.gov/reading-rm/doc-collections/cfr/.

Copies of U.S. Department of Transportation (DOT) regulations, 49 CFR can be ordered from the GPO by calling (904) 353-0569. The DOT's regulations are also available on the Internet at https://www.ecfr.gov/current/title-49.

II. Filing an Application

A. General

An application for a specific license for use of radioactive material in the form of sealed sources in fixed devices should be submitted on NRH Form 5 (Appendix A), "Application for Radioactive Materials License" and Appendix B “Supporting Information Requested in Items 4 through 14 of NRH Form 5." Appendix D is a checklist for the applicant to ensure completeness of their submittal. Each section of the checklist refers to a number on the application (Appendix A). More detailed information about each item can be found in Part III of this guide.

The applicant should do the following:

- Be sure to use the most recent guidance in preparing an application.
- Complete Appendix A Items 1 through 3 and 15, on the form itself and items 4 through 14 should be completed on Appendix B.
- In addition to Appendix A and B each application will need to include the following Appendixes or alternative procedures:
  Appendix E “Duties and Responsibilities of the Radiation Safety Officer”
  Appendix F “Operating and Emergency Procedures”
  Appendix G “Model Facility Diagram”
- If other supplemental pages are submitted with the application, identify and key them to the item number on the application or the topic to which it refers.
- Identify each supplementary page with the applicant’s name and license number (if a renewal), item number which it relates to on Appendix B, page number and application date.
- Submit all documents, typed, on 8-1/2 x 11-inch paper.
- Avoid submitting proprietary information unless it is absolutely necessary.
- Submit an original, signed application and if possible, an electronic copy.
- Retain one copy of the license application and attachments for future reference. When issued, the license will require that radioactive material be possessed and used in accordance with statements, representations and procedures provided in the application and supporting documentation.

All license applications are public information. If it is necessary to submit proprietary information, please contact the Department for specific information. Employee personal information, i.e., home address, home telephone number, social security number, date of birth, radiation dose[1] information, should not be submitted unless specifically requested by the Department.

[1] In this document, dose or radiation dose is used as defined in 180 NAC 1-002, i.e., a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent. These latter terms are also defined in 180 NAC 1-002.

Mail the original application with all attachments to:

Nebraska Department of Health and Human Services
Office of Radiological Health
301 Centennial Mall South
PO Box 95026
Lincoln, NE 68509

B. License Fees

The following fees are assessed:

Application fee A non-refundable fee for processing the license application. The amount is dependent on the category of license the applicant is seeking. Refer to 180 NAC 18-005.05, item 31.c. the application fees. Review of the application will not begin until the proper fee is received by the department. Once technical review has begun, no fees will be refunded; application fees will be charged regardless of the Department's disposition of an application or the withdrawal of an application. An application fee is also required to process an application for a new license replacing an existing license due to a change of ownership.

Annual fee An annual fee covers department costs for administration of the materials licensing program. The amount is dependent on the license category. Refer to 180 NAC 18-005.05, item 22. Annual fees are due within 30 days of issuance of the new license; an invoice for this fee is included with the cover letter accompanying a new license.

Note: Fees are not charged for license renewals, amendment requests, routine inspections, license terminations, or requests for regulatory information (except for document copying costs).

Please make check or money order payable to:
Nebraska Department of Health and Human Services

Direct all questions about the Department's fees to the Office of Radiological Health.

III. Contents of an Application

1.a. Legal Name and Street Address

List the legal name and mailing address 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 applicant corporation or other legal entity must be specified by legal name as registered with the Nebraska's Secretary of State (402) 471-4079 or http://www.sos.ne.gov/business/corp_serv/index.html. 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.

Response from Applicant:
Provide the mailing address where correspondence should be sent. This may or may not be the same as the address at which the material will be used as specified in Item 1.b.

Note: The Department 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

Regulations: 180 NAC 3-017.02

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

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

- Radioactive materials are possessed, used, or controlled only by persons who have valid Department 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 the gauge(s); and
- Public health and safety are not compromised by the use of such materials.

Response from applicant: None from an applicant for a new license; Appendix H identifies the information to be provided about changes of ownership or control.

Notification of Bankruptcy Proceedings

Regulation: 180 NAC 3-017.05

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

Response from applicant. None at time of application for a new license.

1.b. Street Address at Which Radioactive Material Will Be Used. (If Different From 1A.)

Response from Applicant:

Specify by the actual location(s) where the radioactive material in sealed sources, source holder, gauges, etc will be possessed, stored and/or used. other than described in Item 1.a. Do not list an address by post office box as this will not be sufficient for Department inspector to find the facility's location.

A Department approved license amendment is required before locating a gauge at an address not already listed on the license, whether that gauge is an additional unit or a relocation of an existing unit.

For information on conducting operations at temporary job sites (i.e., locations where work is conducted for limited periods of time, refer to the section in this guide called "Fixed Gauges Used at Temporary Job Sites." That section offers examples of operations where fixed gauges might be used at temporary job sites and gives information which should be provided to the Department to support a request for these operations.

Applicants need to provide diagrams and/or sketches identifying the specific locations of the fixed gauges within the facility.

Note: As discussed later under "Financial Assurance and Record keeping for Decommissioning," licensees need to maintain permanent records on where licensed material is used or stored while the license was in force. This is important for making future determinations about the release of these locations for unrestricted use (e.g., before the license is terminated). For fixed gauge licensees, acceptable records are sketch or written descriptions of the specific locations where each gauge was used or stored and any information relevant to the damaged devices or leaking radioactive sources.

2. Department to Use Radioactive Material – Contact Person

Response from Applicant:
Identify the individual who can answer questions about the application and include his or her telephone number. This is typically the radiation safety officer unless the applicant has named a different person as the contact. The Department will contact this individual if there are questions about the application.

Notify the Department if the contact person or his or her telephone number changes so that the Department 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.

3. License Action Type

Response from Applicant:
Mark the appropriate choice; if submitting an amendment request or a renewal application, indicate the applicable radioactive materials license number.

Note: Items 4-14 may be addressed by completing Appendix B "Supporting Information Requested in Items 4 through 14 of NRH Form 5."

4. Individual User(s)

Regulations: 180 NAC 15-027

Criteria: *The Authorized User (AU) must be able to demonstrate competency in use, maintenance and transfer of a device by satisfactory completion of an eight-hour course provided by the manufacturer of the device or a Department approved course.*

A fixed gauge licensee does not have to list the name of each authorized users (AU) in the application. Radioactive material shall only be used by, or under the supervision and in the physical presence of, individuals who have successfully completed a manufacturer or Department approved training program for gauge users. Authorized users need to be approved in writing by the Radiation Safety Office

Maintaining documentation of training (including valid training certificates) for each user on file for inspection purposes is required to demonstrate that personnel are adequately trained.

The training program must provide that all AUs will complete either:

A manufacturer's training course consisting of 8 hours;

Or

A Department approved course. To approve a training course, the Department will need a description of the training, including the topics covered in the training, the time to be spent on each topic, and the name and qualifications of the instructor. The training should be equivalent to that provided in the device manufacturer's training program. An instructor should have training in radiation safety and hands on experience. See Appendix I.

Response from Applicant:
Provide this statement: "The radiation safety officer will maintain documentation of training for authorized users and his/her approval of the authorized user."

4.A. Training for Individual Who in the Course of Employment Are Likely to Receive Occupational Doses of Radiation in Excess of 1 mSv (100 mrem) in a Year (Occupationally Exposed Workers) and Ancillary Personnel

Regulations: 180 NAC 10-002 through 10-004, 180 NAC 4-031 and 180 NAC 3-011

Criteria: *Individuals who in the course of employment are likely to receive occupational doses of radiation in excess of 1 mSv (100 mrem) in a year must receive training according to 180 NAC 10-003. The extent of this training must be commensurate with potential radiological health protection problems present in the workplace*.

Licensees need to perform a prospective evaluation to determine radiation doses likely to be received by different individuals or groups. AUs, and individuals performing installations, relocations, non-routine maintenance, or repairs would be most likely to receive doses in excess of 1 mSv (100 mrem) in a year. See the previous section for a discussion of training and experience for Individual User(s). Licensee personnel who work in the vicinity of a fixed gauge but do not use gauges (ancillary staff) are not required to have radiation safety training if they are not likely to receive 1 mSv (100 mrem) in a year. However, to minimize potential radiation exposure when ancillary staff are working in the vicinity of a fixed gauge, it is prudent for them to work under the supervision and in the physical presence of an AU or to be provided some basic radiation safety training. Such ancillary staff should be informed of the nature and location of the gauge and the meaning of the radiation symbol and should be instructed not to touch the gauge and to keep away from it as much as their work permits.

Some ancillary staff, although not likely to receive doses over 1 mSv (100 mrem), should receive training to ensure adequate security and control of licensed material. Licensees may provide these individuals with training commensurate with their assignments in the vicinity of the gauge, to ensure the control and security of licensed material.

Response from Applicant: The applicant's training program, for individuals who in the course of employment are likely to receive occupational doses of radiation in excess of 1 mSv (100 mrem) in a year (occupationally exposed workers) and ancillary personnel, will be examined during inspections, but should not be submitted in the license application.

5. Radiation Safety Officer (RSO)

Regulations: 180 NAC 3-011.01, 180 NAC 15-027

Criteria: *RSO's must have adequate training and experience. Have fixed gauge manufacturer's course for RSO's or equivalent course that meets Appendix I criteria.*

All licensees must have an RSO designated by and responsible to the corporation's management for the coordination of the radiation protection program and for ensuring compliance with the applicable regulations and license provision. As a minimum, the RSO shall have sufficient training and experience to be an Authorized User of the requested radioactive materials, unless otherwise specified in the license.

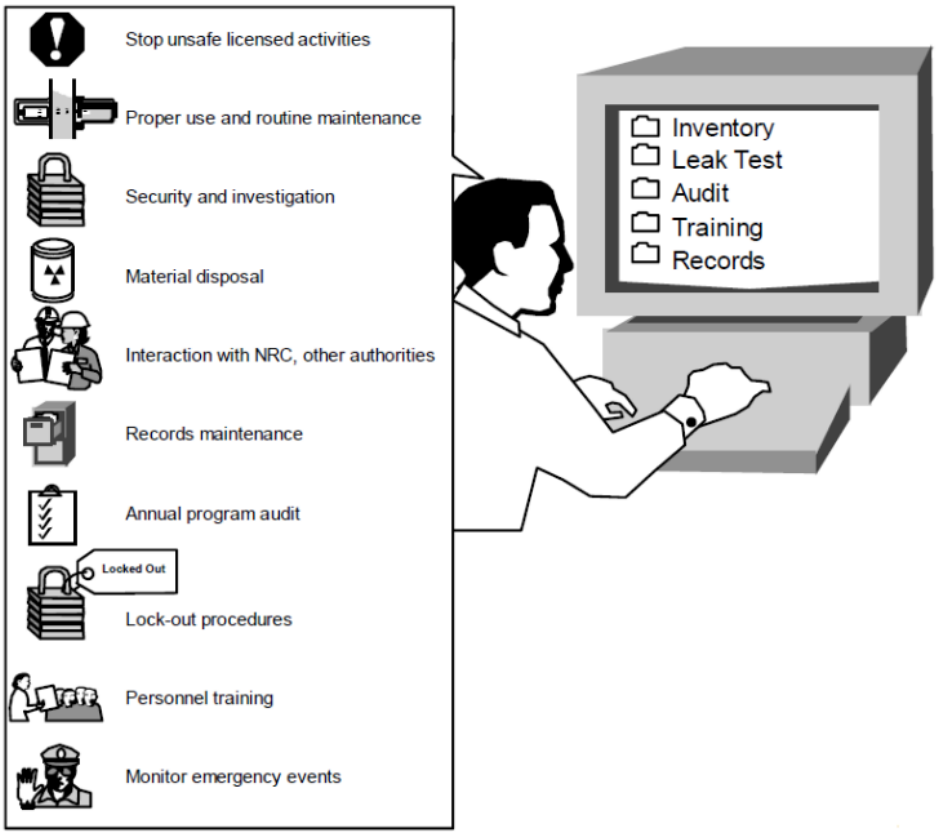


FIGURE 3 **RSO Responsibilities. Typical duties and responsibilities of RSO's.**

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. See Appendix E for duties and responsibilities of the RSO.

The Department requires the name of the RSO on the license to ensure that the licensee management has identified a responsible, qualified person and that the named individual knows of his or her designation as RSO.

Response from Applicant: Provide either of the following:

- List name of the RSO and telephone number

AND

- A statement that: “The documentation for the training of the RSO are attached.”

AND

- A statement that “The RSO will perform the duties and responsibilities of a RSO per Appendix E of Regulatory Guide 3.13, ‘Radioactive Material –Guidance for Fixed Gauge Licenses.”

OR

- A statement: “Will provide alternate list of duties and responsibilities of the RSO per the criteria of Appendix E.”

Note:

- It is important to request an amendment to the license as soon as possible for changes in the designation of the RSO.

6. Radioactive Material Data

Regulation: 180 NAC 3-014

Criteria: *Applicants must provide the manufacturer or distributor’s name and model number for each requested sealed source and device. Licensees will only be authorized for sealed sources and devices registered by an Agreement State or the NRC*.

Agreement States and the NRC perform safety evaluations of gauges before authorizing a manufacturers or distributor to distribute the gauges to specific licensees. The safety evaluation is documented in a Sealed Source and Device (SSD) Registration Certificate. Before the SSD registration process was formalized, some older gauges may not have been evaluated in a separate document but were specifically approved on a license. Licensees can continue to use these gauges that are specifically listed on their licenses. Some examples of fixed gauges are shown in Figure 4.

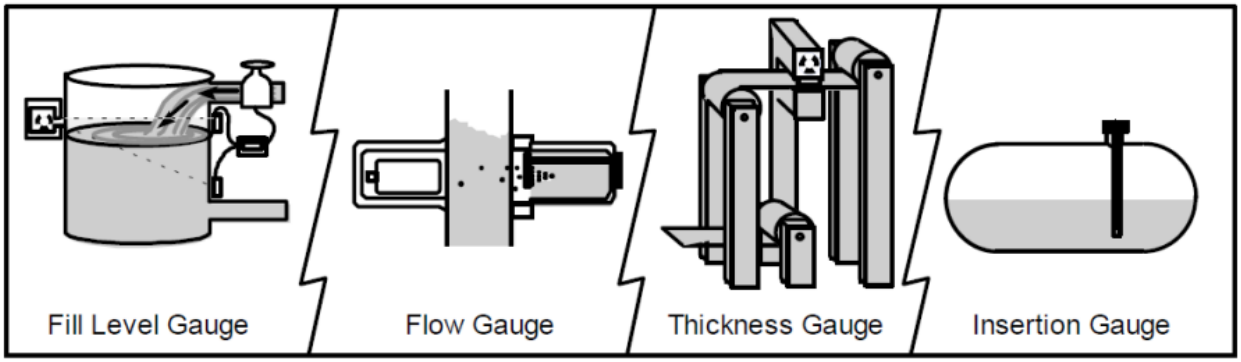


FIGURE 4 **Examples of Several Different Types of Fixed Gauges**

Consult with the proposed manufacturer or distributor to ensure that requested sources and devices are compatible and conform to the sealed source and device designations registered

with 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 the Department's prior permission in a license amendment.

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 the Department, 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. See Appendix J for an example of a fixed gauge SSD Registration Certificate.

Response from applicant:

- **Item 6.a:** Identify each radionuclide that will be used in each source in the gauging device(s).
- **Item 6.b:** Identify the manufacturer and model number (not the serial number) of each sealed source that will be used in the fixed gauging device. Confirm that each sealed source, device, and source/device combination is registered as an approved sealed source or device in the Sealed Source and Device regulation issued by NRC or an Agreement State.
- **Item 6.c:** Specify the maximum amount of radioactive material that will be in each sealed source. Confirm that the activity per source will not exceed the maximum activity listed on the approved Sealed Source and Device registration issued by NRC or an Agreement State.
- **Item 6.d:** Specify the purpose for use of the gauging device (For example, a fixed gauge is normally used for measuring levels or densities of material)
  AND identify the manufacturer and model number of the gauging device in which the sealed sources will be used.

Note: The NRC maintains the National Sealed Source and Device Registry (NSSDR). The Registry is a collection of registration certificates for sealed sources and devices which contain sealed sources. The registration certificates contain detailed information on the sources and devices, such as how they are permitted to be distributed and possessed (specific license, general license, or exempt), design and function, radiation safety, and limitations on use.

Financial Assurance and Record Keeping for Decommissioning

Regulations: 180 NAC 3-017.02, 180 NAC 3-018.

Criteria: *Fixed gauge licensees authorized to possess sealed sources containing radioactive material in excess of the limits specified in 180 NAC 3-018.02 and 3-018.04 must provide evidence of financial assurance for decommissioning*.

Even if no financial assurance is required, licensees are required to maintain, in an identified location, decommissioning records related to structures and equipment where gauges are used or stored and to leaking sources. Pursuant to 180 NAC 3-018.07, licensees must transfer these records important to decommissioning to the new licensee.

The requirements for financial assurance are specific to the types and quantities of byproduct material authorized on a license. Most fixed gauge applicants and licensees do not need to comply with the financial assurance requirements because the thresholds for sealed sources do not exceed the threshold in 180 NAC 3-018.02 and 3-018.04. The threshold for typical radionuclides used for fixed gauge sealed sources are shown in Table 1.

Table 1 Examples of Minimum Inventory Quantities Requiring Financial Assurance

Radionuclide (Sealed Sources)	**Activity in Gigabecquerels**	**Activity in Curies**
Co-60	3.7×10^5	10,000
Kr-85	3.7×10^7	1,000,000
Sr-90	3.7×10^4	1,000
Cs-137	3.7×10^6	100,000
Am-241	3.7×10^3	100
Cf-252	3.7×10^3	100

A licensee would need to possess hundreds of gauges before the financial assurance requirements would apply. Since the standard fixed gauge license does not specify the maximum number of gauges that the licensee may possess (allowing the licensee flexibility in obtaining gauges as needed without amending its license), it contains a condition requiring the licensee to limit its possession of gauges to quantities not requiring financial assurance for decommissioning. Applicants and licensees desiring to possess gauges exceeding the threshold amounts must submit evidence of financial assurance.

Applicants requesting more than one radionuclide may determine whether financial assurance for decommissioning is required by calculating, for each radionuclide possessed, the ratio between the activity possessed, in curies, and the radionuclide's threshold activity requiring financial assurance, in curies. If the sum of such ratios for all the radionuclides possessed exceeds "1" (i.e., "unity"), then applicants must submit evidence of financial assurance for decommissioning.

The same regulation also requires that licensees maintain records important to decommissioning in an identified location. All fixed gauge licensees need to maintain records of structures and equipment where each gauge was used or stored. As-built drawings with modifications of structures and equipment shown as appropriate fulfill this requirement. If drawings are not available, licensees shall substitute appropriate records (e.g., a sketch of the room or building or a narrative description of the area) concerning the specific areas and locations. If no records exist regarding structures and equipment where gauges were used or stored, licensees shall make all reasonable efforts to create such records based upon historical information (e.g., employee recollections). In addition, if fixed 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.

Response from Applicant: No response is needed from most applicants. If financial assurance is required, submit the documentation required under Title 180 NAC 3-018.

Note: Licensees must transfer records important to decommissioning to the new licensee before licensed activities are transferred or assigned in accordance with Title 180 NAC 3-017.02. For fixed gauge licensees whose sources have never leaked, acceptable records important to decommissioning are sketches or written descriptions of the specific locations where each gauge was used or stored.

7. & 8. Training of Individual and Experience

Regulations: 180 NAC 10-002, 180 NAC 3-011, 180 NAC 15-027

Criteria: *Authorized users must have adequate training and experience. See item "4. Individual User(s)" and item "5. Radiation Safety Officer."*

Response from Applicant: Provide the following:

- A statement that: "Authorized users and the radiation safety officer will demonstrate competency in use, maintenance, and transfer of the device(s) by satisfactory completion of eight (8) hour course provided by the manufacturer of the gauge

OR

- Submit a course to be approved by the Department. See Appendix I for course criteria.

Note: The licensee will need to maintain training records on file for each authorized user and will maintain records showing the approval by the RSO of the authorized users. This will be reviewed at the time of inspection.

9. Radiation Detection Instruments

Regulations: 180 NAC 4-021.01, 4-048.01, 3-011

Criteria: *Licensees must possess, or have access to, radiation monitoring instruments which are necessary to protect health and minimize danger to life or property. Instruments used for quantitative radiation measurements must be calibrated periodically for the radiation measured*.

Usually, it is not necessary for fixed gauge licensees to possess a survey meter. However, surveys according to 180 NAC 4-021 will be required if an applicant plans to conduct non-routine operations. This includes installation, initial radiation surveys, relocation, removal from service, dismantling, alignment, replacement, disposal of the sealed source, and non-routine maintenance and repair of components related to the radiological safety of the gauge. Because some of these operations may increase the risk of radiation exposure, individuals performing these operations should be carefully monitored with a survey meter. Such survey meters should be properly calibrated.

Licensees who perform surveys pursuant to 180 NAC 4-021 must possess a survey meter that:

- Measures at least 0.3 through 1 through 200 mR per hour (50 microcoulombs per kilogram)
- Is capable of measuring the radiation being emitted from the gauges sealed source
- Is checked for functionality with a source of radiation at the beginning of each day of use (e.g., with the gauge or a check source)
- Is calibrated:
  - -At intervals not to exceed 12 months
  - -Using a source of radiation similar to those found in the gauges
  - -To ensure that exposure rates indicated by the meter do not vary from the actual exposure rates by more than ± 20% on each scale
  - -After any servicing or repair (other than a simple battery exchange)
  - -By the instrument manufacturer or person specifically authorized by the Department, an Agreement State or NRC

Since many fixed gauge licensees are not required to possess a survey meter, applicants should preplan how they will obtain assistance in performing a radiation survey in the event of an emergency (e.g., obtain a survey instrument from hospitals, universities, other Department, Agreement State or NRC licensees, or local emergency response organization). It is important to determine as soon as possible after an incident, using a radiation survey meter, whether the shielding and source are intact.

For those licensees using gauges containing only beta, neutron or alpha-emitting radionuclides, specialized survey instruments may be required.

Response from Applicant: Provide one of the following:

- A statement that: “We will possess and use survey instruments that meet the Criteria in the section entitled “Radiation Detection Instruments” of “Radioactive Material Guidance for Fixed Gauge Licenses,” Regulatory Guide 3.13, in the event of an incident.”

OR

- A statement that: “We have access to a radiation survey meter that meets the criteria in the section entitled 'Radiation Detection Instruments’ of “Radioactive Material Guidance for Fixed Gauge Licenses,” Regulatory Guide 3.13, in the event of an incident.”

AND

- Attach a plan of how an instrument will be obtained.

Notes:

- Applicants who plan to perform non-routine maintenance that requires the source from the gauge will need to possess and use a radiation survey meter that meets more stringent criteria. Refer to Appendix P for more information.
- Alternative responses will be reviewed against the criteria listed above.

Appendix R “Guide to SI Units for Radiation Protection” may be helpful to you.

10. Calibration of Instruments Listed in Item 9

If radiation detection instruments will be used, mark the appropriate box to indicate how calibrations will be performed. Calibrations should be sensitive enough to detect all types of radiation emitted from the gauge sources, and should meet all requirements identified in Appendix L.

Notes:

- The Department license will state that survey meter calibrations will be performed by the instrument manufacturer, or a person specifically authorized by the Department, an Agreement State, or the NRC, unless the applicant specifically requests this authorization. Applicants seeking authorization to perform survey meter calibrations must submit additional information for review. See Appendix L for more information.
- Regardless of whether an applicant is authorized to calibrate survey meters or contracts an authorized firm to perform calibrations, the licensee must retain calibration records for at least 3 years.

Response from Applicant: Provide one of the following:

Calibration by Service Company

- A statement that: "We will possess a survey meter and will have the instrument calibrated annually. The calibration service company's, name, address, license number and the state or federal Department that issued the company's license is provided below."

Name _____

Address _____

_____

_____

License number _____

Issuing Agency _____

OR

Calibration By Applicant

- A statement that: "We will calibrate the survey instruments in-house annually. We have submitted detailed information describing the facilities, equipment, personnel, and procedures to be used to perform the calibrations."

AND

- Provide an in-house calibration procedure for Department approval.

Note: Appendix L "Model Survey Instrument Calibration Program" contains calibration procedures acceptable to the Department.

OR

- A statement that: "We plan to have access to a survey meter." And list where access will be obtained from.

11. Personnel Monitoring Devices

Regulations: 180 NAC 4-005, 180 NAC 4-006, 180 NAC 4-011, 180 NAC 4-012, 180 NAC 4-022.

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 the Department, 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. Annual Dose limits for radiation workers 180 NAC 4-005:*

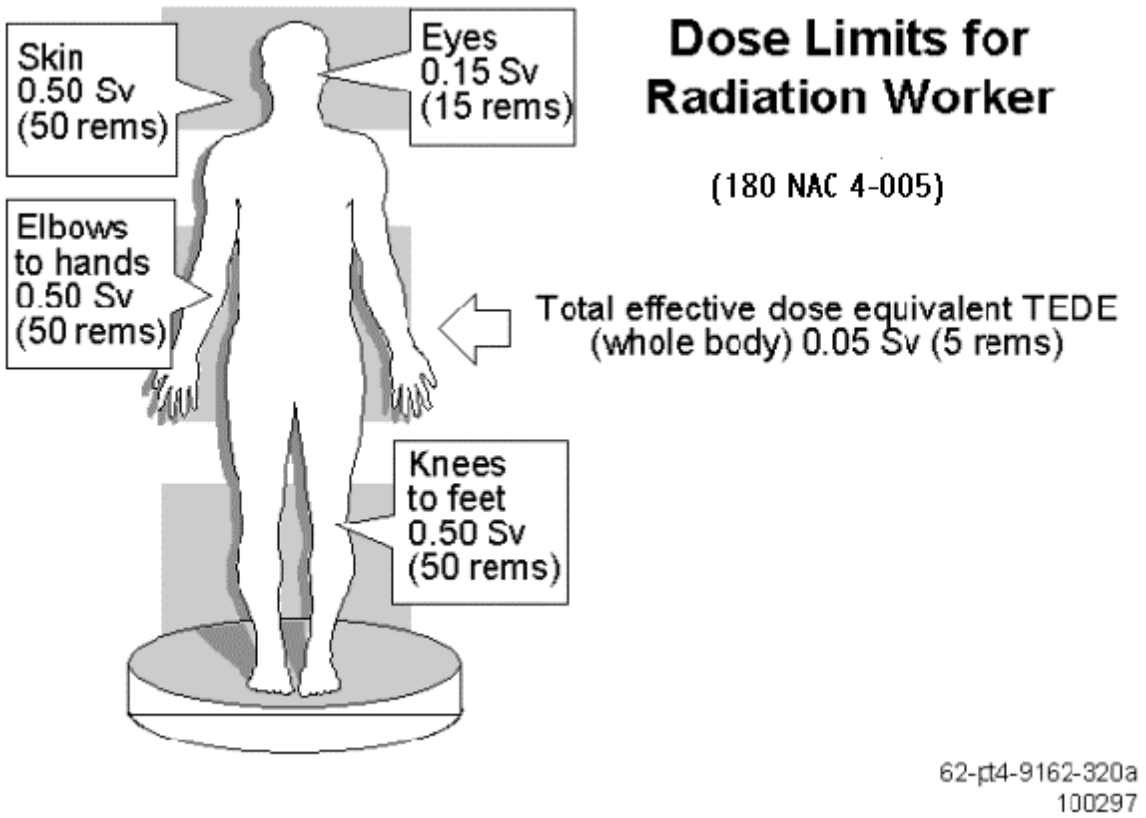


FIGURE 5 **Annual Dose Limits for Occupationally Exposed Adults.**

Under conditions of routine use, the typical fixed gauge user does not require a personnel monitoring device (dosimetry). A gauge user also does not require dosimetry when proper emergency procedures are used. Appendix M provides guidance on performing a prospective evaluation demonstrating that fixed gauge users are not likely to exceed 10% of the limits as shown in Figure 5 and thus, are not required to have personnel dosimetry.

Individuals who perform non-routine operations such as installation, initial radiation survey, repair, and maintenance of components related to the radiological safety of the gauge, gauge relocation, replacement, and disposal of sealed sources, alignment, or removal of a gauge from service are more likely to exceed 10% of the limits as shown in Figure 5. Applicants may be required to provide dosimetry (whole body and perhaps extremity monitors) to individuals performing such services or must perform a prospective evaluation demonstrating that unmonitored individuals performing such non-routine operations are not likely to receive, in one year, a radiation dose in excess of 10% of the allowable limits as shown in Figure 5.

Part 1 of Appendix M provides guidance on preparing a written evaluation demonstrating that users are not likely to exceed 10 percent of the applicable limits and thus, are not required to have personnel dosimetry.

When personnel monitoring is needed, most licensees use either film badges, optically stimulated luminance dosimeters (OSLD) or thermoluminescent dosimeters (TLDs) that are supplied by a NVLAP-approved processor. The exchange frequency for film badges is usually

monthly due to technical concerns about film fading. The exchange frequency for TLDs and OSLDs 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. A list of NVLAP accredited dosimetry vendors is available on the Internet at https://www.nist.gov/nvlap/ionizing-radiation-dosimetry-lap.

Each order of badges includes a control badge for measuring the amount of background radiation the badges receive each monitoring period and radiation received during shipping. This enables the control badge's reading to be subtracted from the total reading to provide an accurate record of each worker's occupational exposure. When not in use, personnel monitoring badges should be stored with the control badge to ensure accurate dosimetry records. **The control badge should be stored in a radiation free area**. The control badge must be returned with the other personnel monitoring badges each monitoring period.

Response from Applicant: Provide either of the following:

- "We will provide dosimetry processed and evaluated by a NVLAP approved processor that is exchanged at a frequency recommended by the processor.

  We will be using the following type:
  ☐ Film Badge ☐ TLD ☐ OSLD ☐ Other (Specify)_____
  The supplier is: _____
  The exchange frequency is:
  ☐ Monthly ☐ Quarterly ☐ Other (Specify)"

Or

- "We will maintain, for inspection by the Department, 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 of 180 NAC 4."

  Note: See Appendix M for guidance on demonstrating that unmonitored individuals are not likely to exceed 10 percent of the allowable limits.

12. Facilities and Equipment

Regulations: 180 NAC 3-011, item 2

Criteria: *Facilities and equipment must be adequate to protect health and to minimize danger to life or property. This may be demonstrated by the following:*

- *The location of the gauge is compatible with the "Conditions of Normal Use" and "Limitations and/or Other Considerations of Use" on the SSD Registration Certificate*
- *The fixed gauge is secured to prevent unauthorized removal or access (e.g., located in a locked room, permanently mounted, or chained and locked to a storage rack).*

Discussion: Fixed gauges incorporate many engineering features to protect the user from unnecessary radiation exposure in a wide variety of environments. Fixed gauges may be located in harsh environments involving variables such as pressure, vibration, mounting height/method, temperature, humidity, air quality, corrosive atmospheres, corrosive chemicals

including process materials and cleaning agents, possible impact or puncture conditions, and fire, explosion, and flooding potentials. Applicants need to consult the sections on the SSD Registration Certificate entitled, "Conditions of Normal Use" and "Limitations and/or Other Considerations of Use" to determine the appropriate gauge for a location. In those instances when a proposed location is not consistent with the SSD Registration Certificate, the applicant may ask the source or device manufacturer or distributor to request an amendment to modify the SSD Registration Certificate to include the new conditions. If the manufacturer or distributor does not request an amendment, the applicant must provide the Department with specific information demonstrating that the proposed new conditions will not impact the safety or integrity of the source or device.

Fixed gauges must be stored and used in such a manner as to prevent unauthorized removal or unauthorized use. Submit diagrams of all areas in which radioactive material will be permanently stored or used. Diagrams and additional information should include:

- Diagram scale
- Indicate the direction
- Mark and identify all areas adjacent. Specify the distance of the closes occupied workstation to the radioactive material storage/use area. Areas where gauges are stored pending installation or disposal should also be included
- Specify the building, floor, room number and principal use of each room or area.
- Indicate all lockable doors and storage containers for all storage/use location for radioactive material.

(See Appendix G for sample facility diagrams.)

Response from Applicant: Provide one of the following:

- “A diagram of the facility showing the location of each fixed gauge is attached. We will ensure that the location of each fixed gauge meets the criteria in the section entitled “Facilities and Equipment' Instruments” in “Radioactive Material Guidance for Fixed Gauge Licenses,” Regulatory Guide 3.13.”

OR

- “A diagram of the facility showing the location of each fixed gauge is attached.” Confirm that the fixed gauge is secured to prevent unauthorized removal or access; and submit specific information demonstrating that the proposed conditions will not impact the safety or integrity of the source or device. Address any instances where the proposed conditions exceed any conditions listed in the SSD Registration Certificate.

Note:

- Any deviations from an SSD Registration Certificate will require specific Department approval.
- Alternative responses will be evaluated using the criteria listed above.

13. Radiation Protection Program

13A. Operating and Emergency Procedures

Regulations: 180 NAC 1-011, 180 NAC 3-016.02, 180 NAC 3-026, 180 NAC 4-004, 180 NAC 4-031, 180 NAC 4-046 thru 4-048 and 180 NAC 10.

Criteria: *Each applicant must do the following:*

- *Develop, implement, and maintain operating and emergency procedures which ensure compliance with 180 NAC 10 "Notices and Instructions and Reports to Worker, Inspections" and 180 NAC 4 "Standards for Protection Against Radiation" containing the following elements:*
  - *Instructions for operating the gauge*
  - *Instructions for performing routine cleaning and maintenance (e.g., calibration and lubrication) according to the manufacturer or distributors recommendations and instructions*
  - *Instructions for testing each gauge for the proper operation of the on-off mechanism (shutter) and indicator, if any, at intervals not to exceed 6 months or as specified in the SSD certificate*
  - *Instructions for lock-out procedures, if applicable, that are adequate to assure that no individual or portion of an individual's body can enter the radiation beam*
  - *Instructions to prevent unauthorized access, removal, or use of fixed gauges*
  - *Steps to take to keep radiation exposures ALARA*
  - *Steps to maintain accountability (i.e., inventory)*
  - *Instructions to ensure that non-routine operations such as installation, initial radiation survey, repair and maintenance of components related to the radiological safety of the gauge, gauge relocation, replacement and disposal of sealed sources, alignment, or removal of a gauge from service are performed by the manufacturer, distributor or person specifically authorized by the Department, NRC or an Agreement State*
  - *Steps to ensure that radiation warning signs are visible and legible*
- *Develop, implement, and maintain emergency procedures for gauge malfunction or damage containing the following elements for each type of fixed gauge:*
  - *Stop use of the gauge*
  - *Restrict access to the area*
  - *Contact responsible individuals (Telephone number for the RSO, AU's the gauge manufacturer or distributor and fire department. Include the HHS R & L emergency response phone numbers which includes the Nebraska State Patrol's 24-hour emergency number.)*
  - *Do not attempt repair or authorize others to attempt repair of the gauge except as specifically authorized in a license issued by the Department, an Agreement State or NRC*
  - *Require timely reporting to Department pursuant to 180 NAC 4-046 – 4-048, and 180 NAC 3-026*
  - *Take additional steps, dependent on the specific situations*
- *Provide copies of operating and emergency procedures to all gauge users.*
- *Post copies of operating and emergency procedures at each location of use or if posting procedures is not practicable, post a notice which briefly describes the procedures and states where they may be examined*

Operating and emergency procedures should be developed, maintained, and implemented to ensure that gauges are used only as they were designed to be used, control and accountability are maintained, and radiation doses received by occupational workers and members of the public are ALARA. Copies of operating and emergency procedures should be provided to all gauge users. In addition, licensees must post current copies of operating and emergency procedures applicable to licensed activities at each site. If posting of procedures is not practicable, the licensee may post a notice which describes the documents and states where they may be examined.

Improper operation could lead to the damage or malfunction of a gauge and elevated exposure rates in the gauge's immediate vicinity. See Appendix F for an example of operating and emergency procedures. Figure 6 illustrates proper response to fire involving a fixed gauge. Emergency procedures should be developed to address a spectrum of incidents (e.g., fire, explosion, mechanical damage, flood, or earthquake).

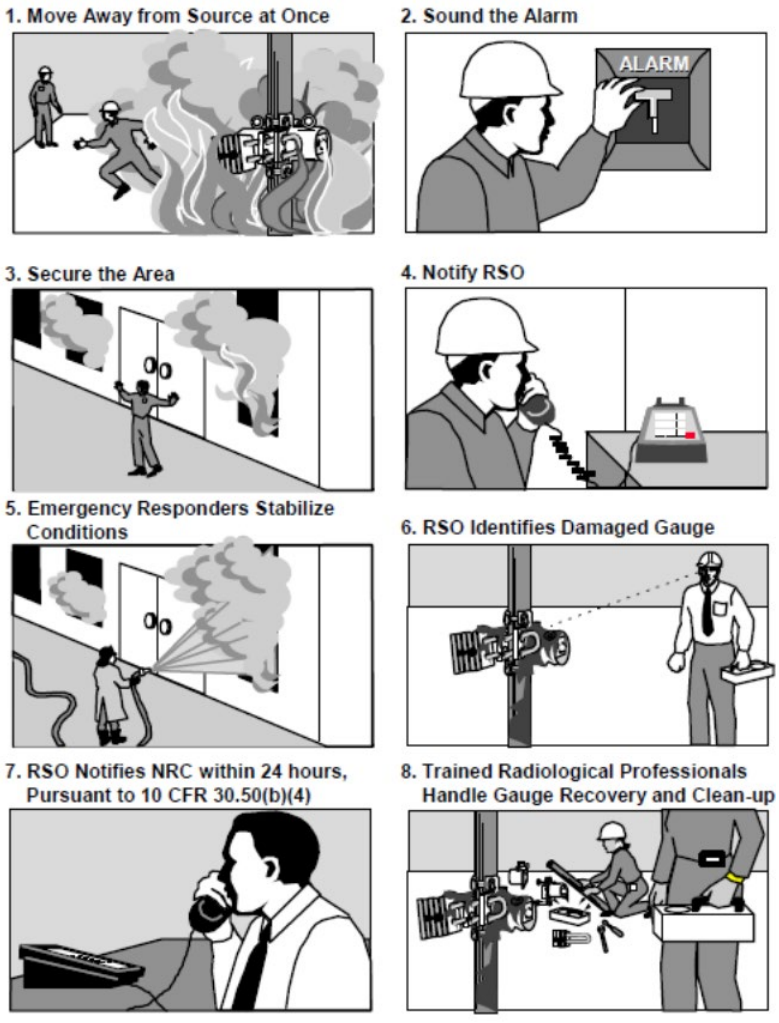


FIGURE 6 **Proper Handling of Incident. Licensee personnel implement emergency procedures when a fire melts the lead shielding of a gauge producing the potential for elevated exposure levels.**

The Department considers security of licensed material extremely important, and lack of security is a significant violation for which licensees may be fined. Although most fixed gauges are difficult to move, the licensee must prevent unauthorized access, removal, or use of the gauge. Licensees are responsible for ensuring that gauges are secure and accounted for at all times (e.g., during plant modifications, change in ownership, staffing changes, or after termination of activities at a particular location).

The Department must be notified when gauges are lost, stolen, or certain other conditions occur. The RSO must be proactive in evaluating whether Department notification is required. Refer to Appendix N and the regulations (180 NAC 4-046 thru 4-048, and 180 NAC 3-026) for a description of when and where notifications are required.

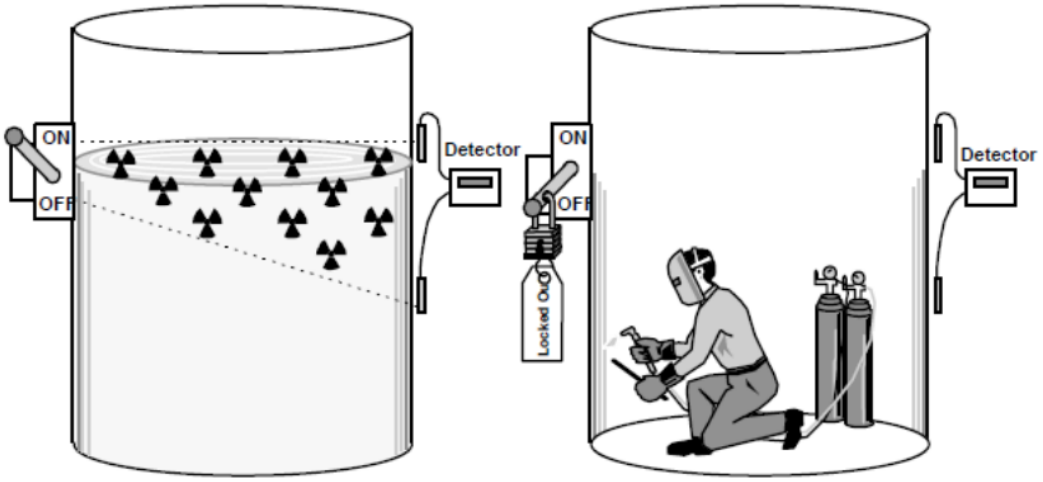


FIGURE 7 **Lock-out Procedures. Typical lock-out procedures include locking the shutter into the "off" position and tagging the shutter control mechanism to indicate the gauge is locked-out.**

When the distance or air gap between the source and detector permits entry of all or a portion of a person's body into the primary radiation beam, as seen in Figure 7, licensees must develop lock out procedures. Lock-out procedures encompass locking the on-off or shutter mechanism into the off position or otherwise controlling the radiation beam or using any other means of preventing an individual or a portion of an individual's body from entering the radiation beam during maintenance, repairs, or work in, on, or around the process line (e.g., bin, tank, hopper, pipe, or conveyor belt) where the device is mounted. The on-off or shutter control mechanism should be tagged to indicate that the gauge is locked out. A warning sign should be posted at each entryway to an area where it is possible to be exposed to the primary beam. In addition to providing a warning, the sign should give safety instructions, e.g., "contact the RSO before entering this vessel." Lock-out procedures should specify who is responsible for performing them.

Response from Applicant: Provide one of the following:

- A statement that: “We have implemented and will maintain the operating and emergency procedures of Appendix F, Regulatory Guide 3.13 ‘Radioactive Material Guidance for Fixed Gauges Licenses.’ We will also provide “lock-out” procedures. Copies of these procedures will be provided to all authorized users and at each job site.”
  (Note: The licensee will copy these Operating and Emergency Procedures from Regulatory Guide 3.14. The licensee will add the information needed to individualize the procedure will be completed along with any additional procedures indicated.)

OR

- A statement that: “We have implemented and will maintain operating and emergency procedures submitted with this application. They meet the criteria of section titled ‘Radiation Protection Program – Operating and Emergency Procedures in Regulatory Guide 3.13 Radioactive Material Guidance for Fixed Gauges Licenses.’ Copies of these procedures will be provided to all authorized users and at each job site.”

13B. Leak Tests

Regulations: 180 NAC 1-006, 180 NAC 1-011, 180 NAC 4-021 and 180 NAC 4-048

Criteria: *The Department requires licensee to perform a leak test to determine whether there is any leakage from the radioactive source in the device. Records of the test results must be maintained.*

The leak test will be performed at intervals approved by the Department, an Agreement State or by the NRC and specified in the Sealed Source and Device Registration Certificate. The measurement of the leak-test ample is a quantitative analysis requiring that instrumentation used to analyze the sample be capable of detecting 185 becquerels (0.005 microcurie) of radioactivity.

Manufacturers, distributors, consultants, and other organizations may be authorized by the Department, an Agreement State, or the NRC to 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 fixed gauge manufacturer's and the kit supplier's instructions and return it to the kit supplier for evaluation and reporting results. Leak test samples should be collected at the most accessible area where contamination would accumulate if the sealed source were leaking. Licensees may also be authorized to conduct the entire leak test sequence themselves. Appendix O contains information to support a request to perform leak testing and sample analysis.

Response from Applicant: Provide one of the following:

- A statement: “Leak tests will be performed at intervals approved by the Department, an Agreement State or by the NRC and specified in the Sealed Source and Device Registration Certificate and records maintained.”

AND

- A statement: “Leak tests will be performed by an organization authorized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission to provide leak testing services for other licensees.”

OR

- A statement: “Leak test kit will be supplied by an organization authorized by the Department, an Agreement State or U.S. Nuclear Regulatory Commission to provide leak test kits to other licensees and according to the kit supplier's instructions. Records for leak test results will be maintained.”

Provide the name of licensee and license # performing maintenance:

_____

And/Or

Supplier of leak test kit _____

Model number of kit _____

Suppliers Address _____

_____

_____

OR

- Provide in house leak testing procedure for Department approval.

Note: Appendix O in Regulatory Guide 3.13 “Radioactive Material Guidance for Fixed Gauge Licenses,” indicates the criteria and procedure for in house leak testing. Instrument used must be identified.

13C. Maintenance

Regulations: 180 NAC 4-004, 180 NAC 3-016.02.

Criteria: *Licensees must routinely clean and maintain gauges according to the manufacturer's recommendations and instructions. Individuals performing routine maintenance must have adequate training and experience. Radiation safety procedures for routine cleaning and maintenance (e.g., removal of exterior residues from the gauge housing, external lubrication of shutter mechanism, calibration, and electronic repairs) must consider ALARA and ensure that the gauge functions as designed, and source integrity is not compromised.*

Non-routine maintenance or repair (beyond routine cleaning, lubrication, calibration, and electronic repairs) means any maintenance or repair that involves or potentially affects components, including electronics, related to the radiological safety of the gauge (e.g., the source, source holder, source drive mechanism, shutter, shutter control or shielding) and any other activities during which personnel could receive radiation doses exceeding the Department limits.

Non-routine repair or maintenance must be performed by the fixed gauge manufacturer or distributor, or a person specifically authorized by the Department, an Agreement State, or the NRC. Information to support requests for specific authorization to perform non-routine maintenance or repair is addressed in Appendix P.

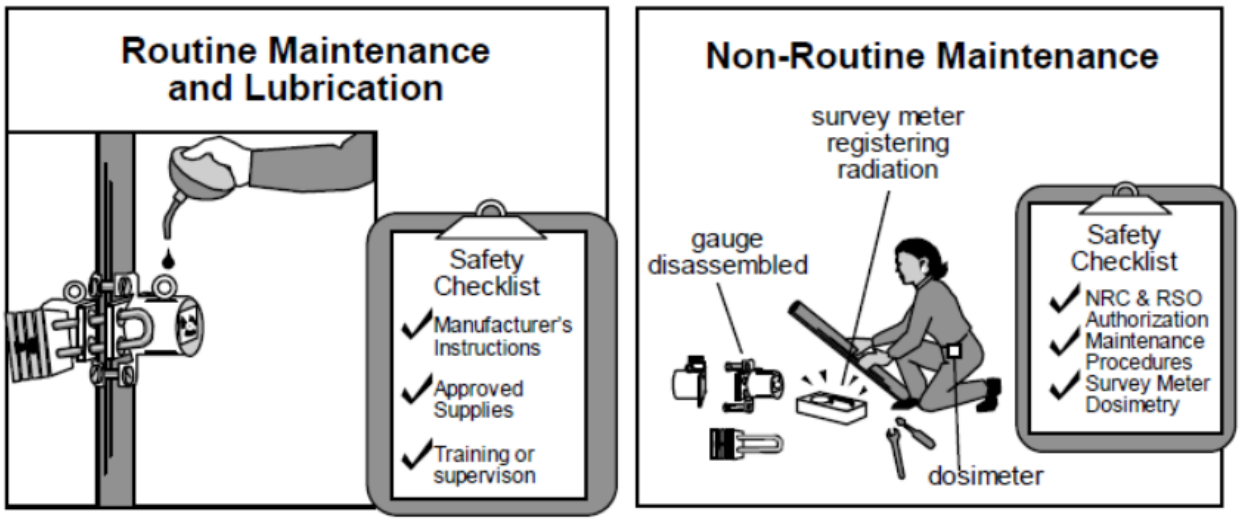


FIGURE 9 **Maintenance. Licensees need to perform routine maintenance to ensure proper operation of the fixed gauge. For non-routine maintenance, most licensees rely on the gauge manufacturer, distributor, or other service companies.**

Discussion: The Department permits fixed gauge licensees to perform routine maintenance of the gauges if they follow the gauge manufacturers or distributors written recommendations and instructions. Generally, before any maintenance or repair work is done, licensees need to determine (and assure themselves of the adequacy of) the following:

- The tasks to be performed
- The protocol or procedures to be followed
- The radiation safety procedures including possible need for compensatory measures (e.g., steps taken to compensate for lack of or reduced shielding)
- ALARA considerations
- Training and experience of personnel performing the work

- The qualification of parts, components, other materials to be used in the gauge
  - The tests (to be performed before the gauge is returned to routine use) to ensure that it functions as designed.

Although manufacturers or distributors may use different terms, "routine maintenance" includes, but is not limited to, cleaning, lubrication, calibration, and electronic repairs.

Routine maintenance does ***not*** include any activities that involve:

- Components, including electronics, related to the radiological safety of the gauge (e.g., the source, source holder, source drive mechanism, shutter, shutter control or shielding)
- Installation, relocation, or alignment of the gauge
- Initial radiation surveys
- Replacement and disposal of sealed sources
- Removal of a gauge from service
- A potential for any portion of the body to come into contact with the primary radiation beam
- Any other activity during which personnel could receive radiation doses exceeding the Department limits

Mounting a gauge is unpacking or uncrating the gauge, and fastening, hanging, or affixing the gauge into position before using. Mounting does not include electrical connection, activation, or operation of the gauge. Installing a gauge includes mounting, electrical connection, activation, and first use of the device. Specific Department, Agreement State or NRC authorization is required to install a gauge. However, a licensee may initially mount a gauge, without specific Department, Agreement State or NRC authorization, if the gauge's SSD Certificate explicitly permits it and under the following guidelines:

- The gauge must be mounted according to written instructions provided by the manufacturer or distributor
- The gauge must be mounted in a location compatible with the "Conditions of Normal Use" and "Limitations and/or Other Considerations of Use" in the certificate of registration issued by the Department, NRC, or an Agreement State
- The on-off mechanism (shutter) must be locked in the off position, if applicable, or the source must be otherwise fully shielded
- The gauge must be received in good condition (package was not damaged)
- The gauge must not require any modification to fit in the proposed location.

The source must remain fully shielded and the gauge may not be used until it is installed and made operational by a person specifically licensed by the Department, NRC, or an Agreement State to perform such operations.

A condition in the Department license will state that operations such as installation, initial radiation survey, repair, and maintenance of components related to the radiological safety of the gauge, gauge relocation, replacement, and disposal of sealed sources, alignment, or removal of

a gauge from service shall be performed only by the manufacturer, distributor or other persons specifically licensed by the Department, NRC, or an Agreement State to perform such services. Most licensees do not perform non-routine operations. Rather, these licensees rely upon persons specifically licensed by the Department, NRC or an Agreement State who have the specialized equipment and technical expertise needed to perform these activities. Applicants seeking authorization to perform non-routine operations must submit specific procedures for review. See Appendix P for more information.

Response from applicant:

Routine cleaning and lubrication: Submit either of the following:

- A statement that: "We will implement and maintain procedures for routine maintenance of our gauges according to each manufacturer's recommendations and instructions."

OR

- Alternative procedures for the Department's review.

And

Non-routine maintenance or repair operations that require detaching the source or source rod from the gauge: Submit either of the following:

- A statement that: "The gauge manufacturer, distributor or other person authorized by the Department, the U.S. Nuclear Regulatory Commission or other Agreement State will perform non-routine operations such as installation, initial radiation survey, repair, and maintenance of components related to the radiological safety of the gauge, gauge relocation, replacement, and disposal of sealed sources, alignment, or removal of a gauge from service.

OR

- A statement that: "We will provide needed information to support request to perform non-routine maintenance per Appendix P of Regulatory Guide 3.13 "Radioactive material Guidance for Fixed Gauge Licenses." **And** submit non-routine maintenance procedures for the Department's review. See Appendix P for the criteria to be used.

13D. Transportation

Regulations: 180 NAC 4-004, 180 NAC 13-005, 49 CFR Parts 171-178.

Criteria: *Applicants must either:*
Arrange for transportation of gauge by the manufacturer, distributor or other person specifically licensed to transport gauges by the Department, NRC or Agreement State.

OR

Develop, implement, and maintain safety programs for off site transport of radioactive material to ensure compliance with U.S. Department of Transportation (DOT) regulations.

Some fixed gauge licensees have the manufacturer, distributor or other person specifically

licensed to transport gauges by the Department, NRC or Agreement State arrange for preparing and shipping licensed material. If licensees decide to transport their own gauges, they are responsible for compliance with DOT regulations which require, in part, specific labeling and surveying of the package before shipping. To appropriately survey the package the surveyor must use instruments that can measure radiation exposure rates around the package and detect contamination on the package. Appendix Q lists major DOT regulations and provides an example of a shipping paper. During an inspection, the Department uses the provisions of 180 NAC 13 to examine and enforce transportation requirements applicable to gauge licensees.

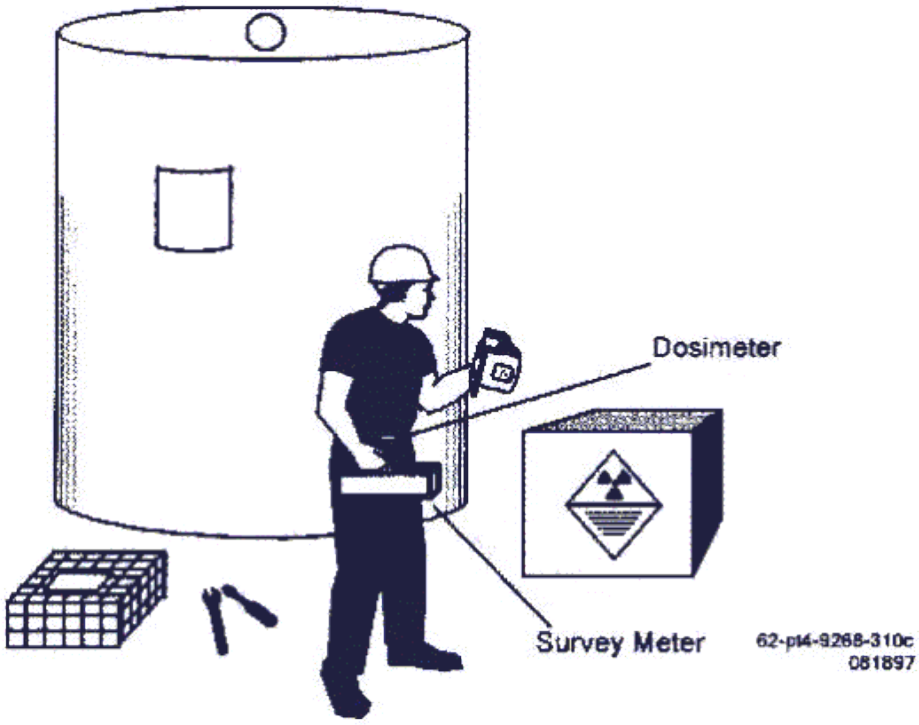


FIGURE 10 **Transportation. Illustration of a fixed gauge being disassembled and packaged for transport.**

Appendix R “Guide to SI Units for Radiation Protection” may be helpful to you if filling out shipping papers.

Response from Applicant: No response is needed from applicants during the licensing process; this issue will be reviewed during inspection.

13E. Fixed Gauges Used at Temporary Job Site

Regulations: 180 NAC 3-016.02, 180 NAC.4-004, 180 NAC 4-031, 180 NAC 4-057 through 4-059, 180 NAC 3-026

Criteria: *Each applicant requesting authorization to perform work with fixed gauges at temporary job sites should do the following:*

Develop, implement, maintain, and distribute operating and emergency procedures containing

the following elements:

- *Instructions for transporting radioactive material to ensure compliance with DOT regulations*
- *Instructions for using gauges at temporary job sites and performing routine maintenance according to the manufacturers or distributor's recommendations and instructions*
- *Instructions for maintaining security during storage and transportation*
- *Instructions to keep gauges under control and immediate surveillance or secured to prevent unauthorized use or access*
- *Steps to take to keep radiation exposures ALARA*
- *Steps to maintain accountability during use*
- *Steps to control access to a potentially damaged gauge (See Figure 11)*
- *Steps to take, and who to contact, when a gauge has been lost or damaged (e.g., local officials, RSO, etc.) (See Figure 11)*
- *If gauges are to be installed at temporary job sites, the operating and emergency procedures should contain instructions on using personal dosimetry and survey instruments and conducting surveys*
- *Provide copies of operating and emergency procedures to all gauge users and at each job site.*

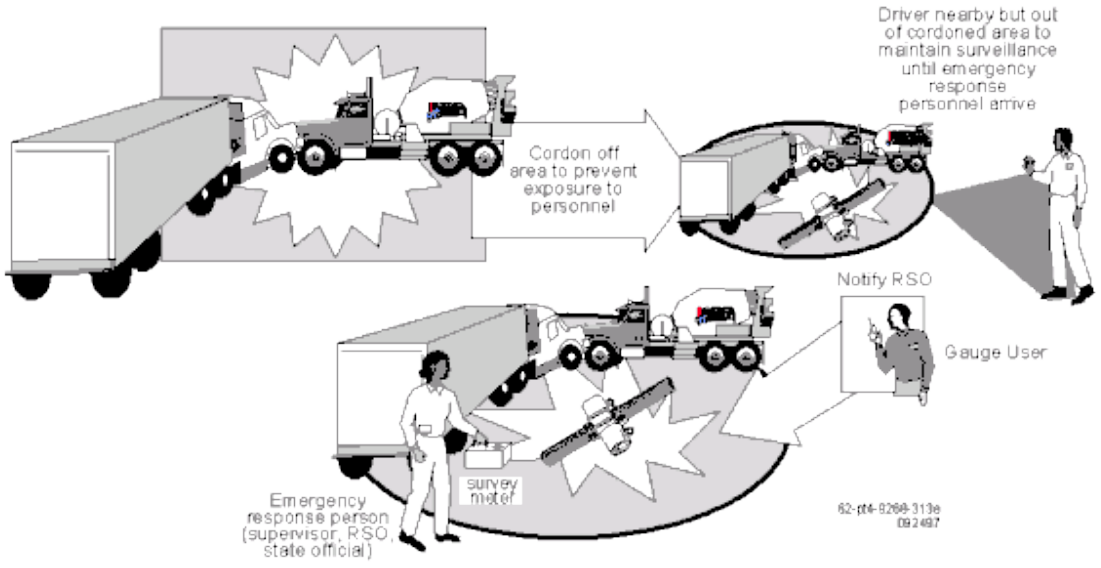


FIGURE 11 **Proper Handling of Incident. Licensee personnel implement emergency procedures when a traffic accident results in a damaged gauge and potentially elevated exposure levels.**

A temporary job site is a location where work with licensed materials is conducted for a limited period of time. Temporary job sites are not specifically listed on a license. A gauge user may be dispatched to work at several temporary job sites in one day. A location is not considered a temporary job site if it is used to store *and* dispatch licensed material. The Department considers such a location to be a field office. Licensees must apply for and receive a license amendment specifically listing each field office location.

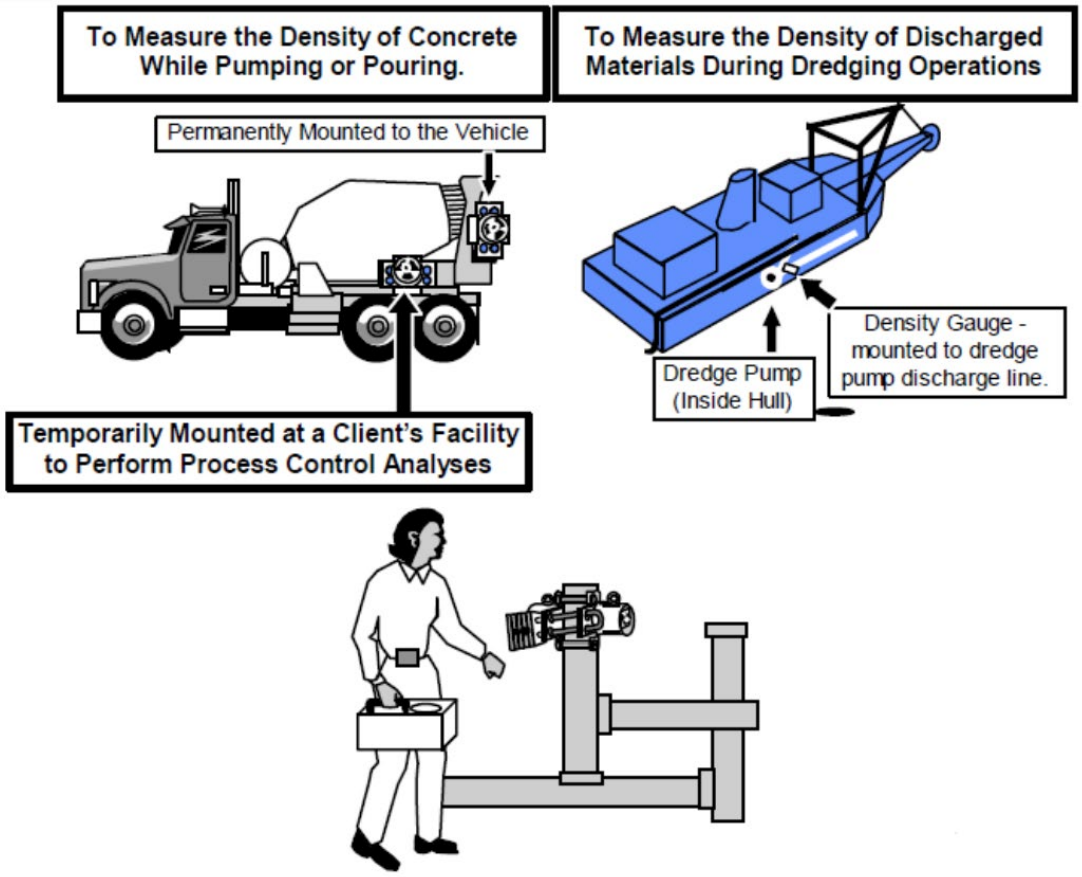


FIGURE 12 **Examples of Uses for Fixed Gauges at Temporary Job Sites.**

There are two categories of fixed gauges used at temporary job sites: Gauges that are permanently mounted to vehicles or trailers, and gauges that are transported to plants or refineries and temporarily installed on process equipment to conduct short-term QA/QC studies. See Figure 12.

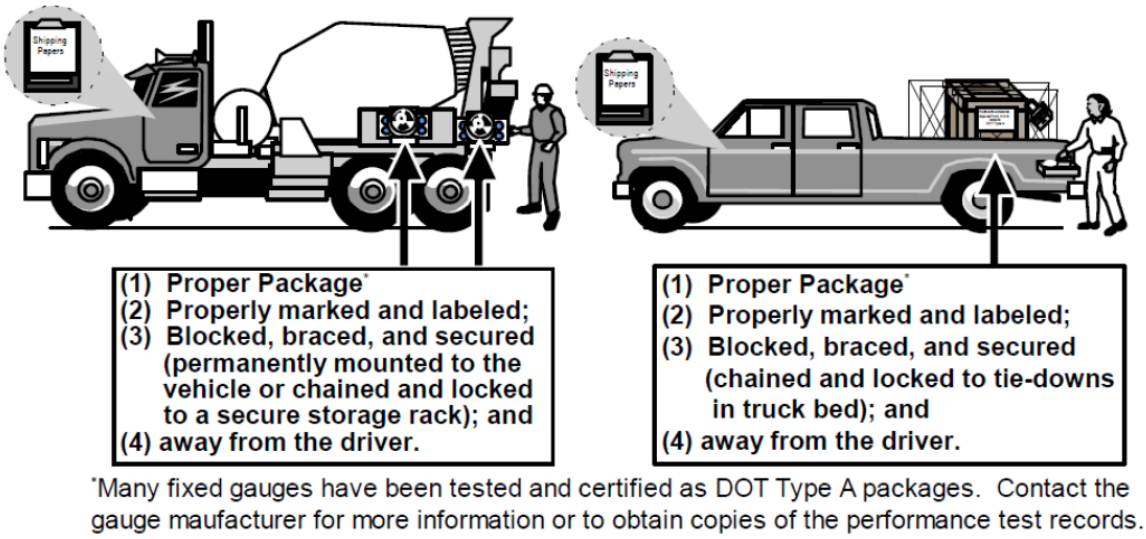


FIGURE 13 **DOT Transportation Requirements.**

Applicants must develop, implement, and maintain safety procedures for off-site transport of radioactive material to ensure compliance with DOT regulations. Figure 13 illustrates some important DOT requirements for gauge licensees. During an inspection, Department uses the provisions of 180 NAC 13-005 (which reference the DOT regulations) to examine and enforce transportation requirements applicable to fixed gauge licensees. Appendix Q lists major DOT regulations and provides examples of shipping documents, placards, and labels.

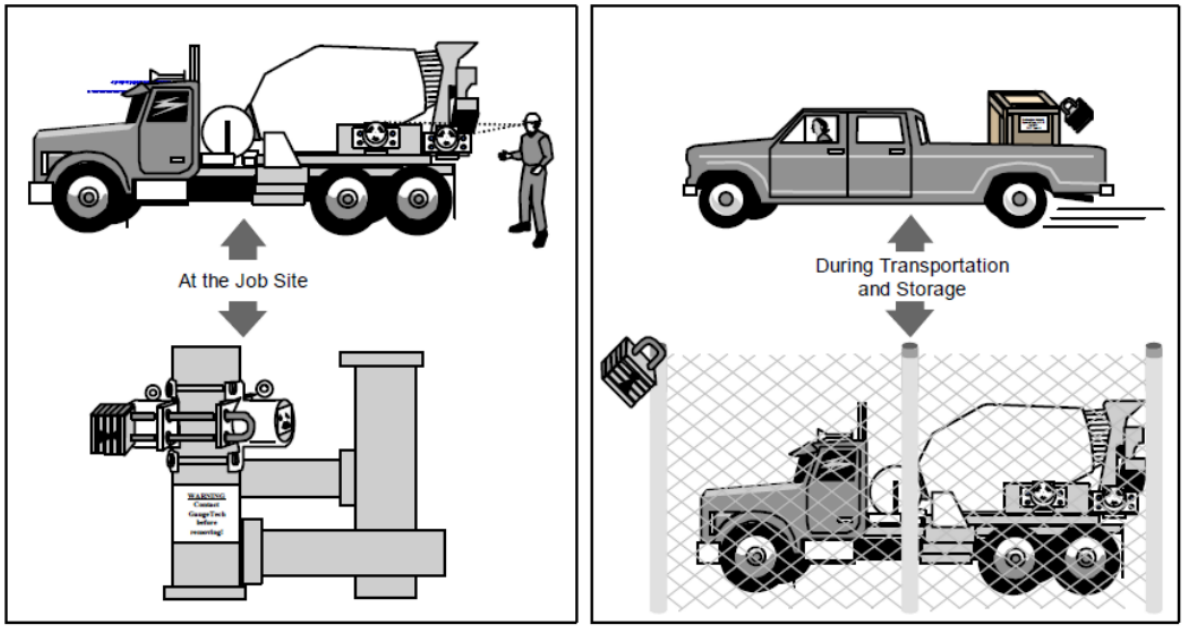


FIGURE 14 **Security. Examples of Methods used to Secure Fixed Gauges at Temporary Job Sites.**

When working at a temporary job site, licensees generally must follow the rules and procedures of the organization that owns or controls the site. Thus, licensees may not be able restrict access to areas in the same manner that they could at their own facilities. Furthermore, non-licensee personnel may not be familiar with fixed gauges or radioactive material. Therefore, to avoid lost or stolen gauges and to prevent unnecessary radiation exposures to members of the public, licensees must keep gauges under constant surveillance, or secured against unauthorized use or removal. See Figure 14.

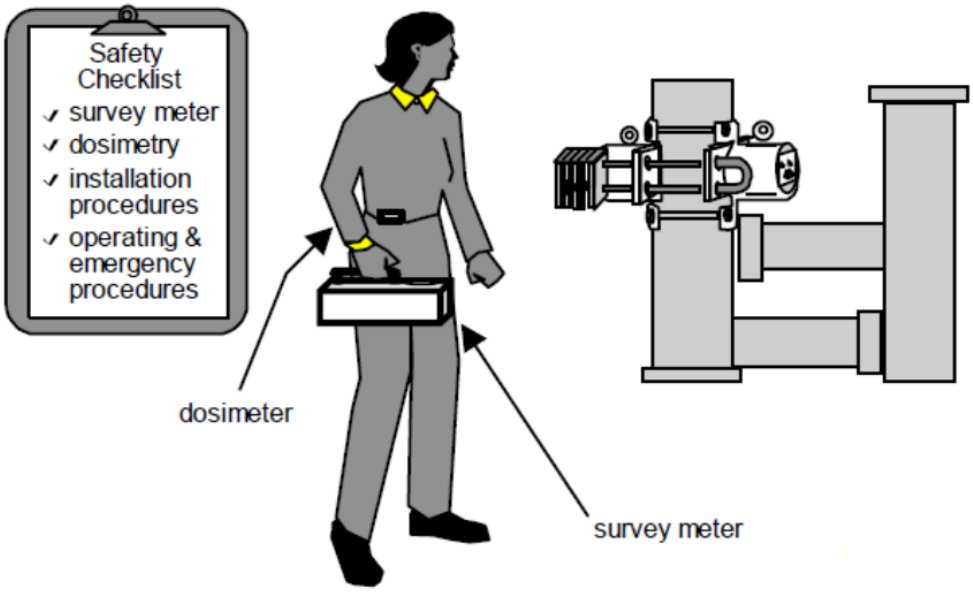


FIGURE 15 **Installation of Fixed Gauges at Temporary Job Sites. Examples of the Additional Precautions Needed when Installing Fixed Gauges at Temporary Job Sites.**

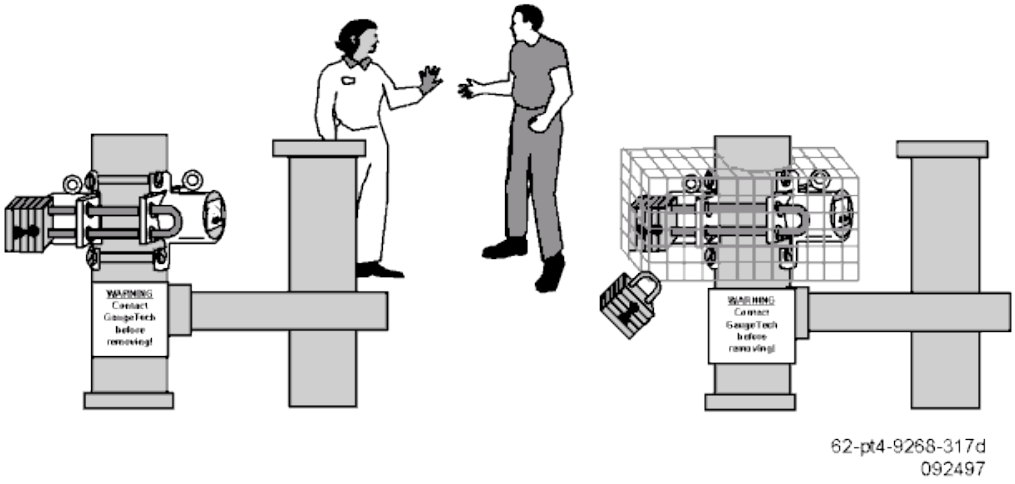


FIGURE 16 **Security. Additional Security Measures following Installation of Fixed Gauges at a Temporary Job Site.**

Response from Applicant: Submit one of the following three alternatives:

- A statement that: "We will not use fixed gauges at temporary job sites."

OR

- A statement that: "Procedures for use of fixed gauges at temporary job sites have been developed, implemented, maintained, and distributed and will meet the Criteria in the section entitled 'Fixed Gauges Used at Temporary Job Sites,' in Regulatory Guide 3.14, 'Radioactive Material Guidance for Fixed Gauge Licenses" and copies of these procedures will be provided to all gauge users."

OR

- Alternative procedures for use of fixed gauges at temporary job sites.

Note: Alternative procedures will be evaluated using the criteria listed above.

13F. Minimization of Contamination

Regulations: 180 NAC 4-020

Criteria: *Applicants for new licenses must describe how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste*.

All applicants for new licenses need to consider the importance of designing and operating their facilities to minimize the amount of radioactive contamination generated at the site during its operating lifetime and to minimize the generation of radioactive waste during decontamination. In the case of fixed gauge applicants, these issues usually do not need to be addressed as a separate item, as they are included in responses to other items of the application.

Sealed sources and devices that are approved by the Department, NRC or an Agreement State and located and used according to the respective SS&D Registration Certificate usually pose little risk of contamination. Leak tests performed at the frequency specified in the SS&D Registration Certificate should identify defective sources. Leaking sources must be immediately withdrawn from use and decontaminated, repaired, or disposed of according to Department requirements. These steps minimize the spread of contamination and reduce radioactive waste associated with decontamination efforts. Other efforts to minimize radioactive waste do not apply to programs using only sealed sources and devices that have not leaked.

Response from Applicant: The applicant does not need to provide a response to this item under the following condition. Department will consider that the above criteria have been met if the applicant's responses meet the criteria for the following sections: Radioactive Material - Data, Facilities and Equipment, Radiation Program - Operating and Emergency Procedures, Radiation Safety Program - Leak Testing, and Waste Disposal.

13G. Audit Program

Regulations: 180 NAC 4-004, 180 NAC 4-047.

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

- *Compliance with the Department 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) (180 NAC 4-004); and*
- *Records of audits and other reviews of program content are maintained for 3 years.*

Appendix S contains a suggested audit program that is specific to the use of fixed gauges and is acceptable to Department. All areas indicated in Appendix S may not be applicable to every licensee and may not need to be addressed during each audit. For example, licensees do not

need to address areas which do not apply to their activities, and activities which have not occurred since the last audit need not be reviewed at the next audit.

Currently the Department'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.

The RSO needs to ensure that the annual audits are conducted but does not necessarily need to do it himself/herself. In fact, if the RSO is one of the authorized gauge users, it may be beneficial for a qualified individual (e.g., radiation safety consultant, the corporate radiation safety office) who is not associated with day-to-day operations to conduct the audit. Specify who will perform this function.

It is essential that once identified, problems be corrected comprehensively and in a timely manner. The Department 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, the Department can exercise discretion and may elect not to cite a violation. The Department's goal is to encourage prompt identification and prompt, comprehensive correction of violations and deficiencies.

With regard to audit records, 180 NAC 4-047.01 requires licensees to maintain records of "... audits and other reviews of program content and implementation." The Department 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:

- A statement that: "We will have an audit program."

Note: See Appendix S for a sample audit program. Audit programs need not be submitted with the application. The annual audit will be reviewed during an inspection.

13H. Material Receipt and Accountability

Regulations: 180 NAC 3-016.02, 180 NAC 3-025, 180 NAC 3-030, 180 NAC 1-004, 180 NAC 4-031, 180 NAC 4-057.

Criteria: *Licensees must do the following:*

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

As illustrated in Figure 17, licensed materials must be tracked from "cradle to grave" in order to ensure gauge accountability, identify when gauges could be lost, stolen, or misplaced, and ensure that, possession limits listed on the license are not exceeded. Significant problems can arise from failure to ensure the accountability of gauges.

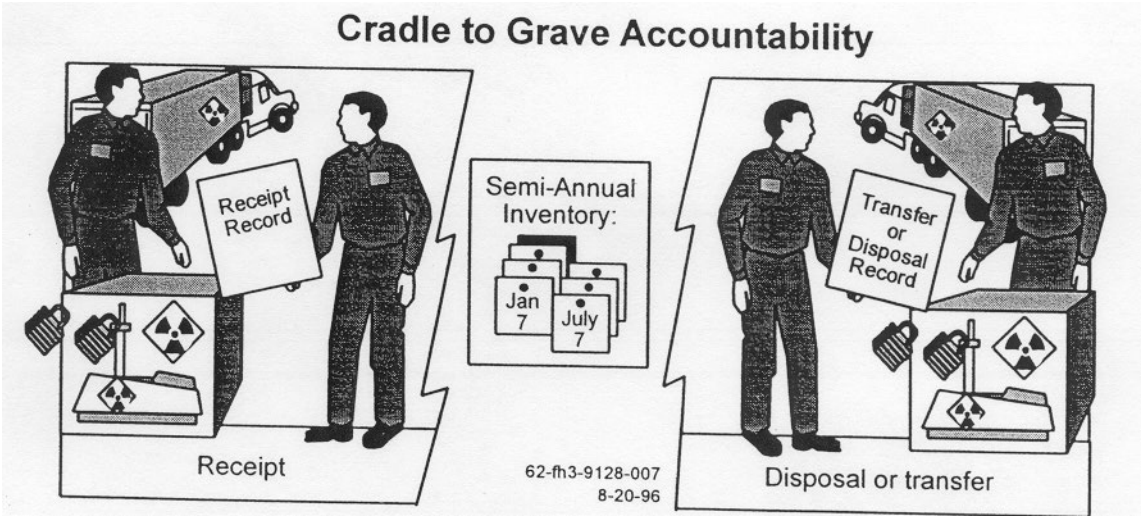


Figure 17 **Material Receipt and Accountability. Licensees must maintain records of receipt and disposal and conduct semiannual inventories.**

Receipt, transfer, and disposal records must be maintained for the times specified in Table 2. Typically, these records contain the following types of information:

- Radionuclide and activity (in units of becquerels or curies) of byproduct material in each sealed source
- Manufacturer's or distributor's name, model number, and serial number (if appropriate) of each device containing byproduct material
- Location of each sealed source and device
- For materials transferred or disposed of, the date of the transfer or disposal, name and license number of the recipient, description of the affected radioactive material (e.g., radionuclide, activity, manufacturer's or distributor's name and model number, serial number).

Table 2 Record Maintenance

Type of Record	How Long Record Must be Maintained
Receipt	For as long as the material is possessed until 5 years after transfer or disposal
Transfer	For 5 years after transfer
Disposal	Until the Department terminates the license
Important to Decommissioning*	Until the site is released for unrestricted use

* See the section entitled "Financial Assurance and Recordkeeping for Decommissioning."

Response from Applicant: Provide either of the following:

- A statement that: "Physical inventories will be conducted at least every 6 months or at other intervals approved by the Department, to account for all sealed sources and devices received and possessed under the license."

OR

- A description of the procedures for ensuring that no fixed gauge has been lost, stolen, or misplaced and how often they will be conducted.

Note:

- Alternative responses will be evaluated using 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 byproduct material in each sealed source
  - Manufacturers or distributor's name, model number, and serial number (if appropriate) of each device containing byproduct material
  - Location of each sealed source and device
  - Date of the inventory
  - Signature of the individual conducting the inventory.

See Appendix T for a sample inventory procedure and inventory form.

13I. Public Dose

Regulations: 180 NAC 4-013, 180 NAC 4-014, 180 NAC 1-002, 180 NAC 4-031, 4-032, 180 NAC 4-053.

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 (1 mSv) [100 millirem (100 mrem)] in one year, and the dose in any unrestricted area will not exceed 0.02 millisievert (mSv) [2 mrem (millirem)] in any one hour, from licensed operations.*
- *Prevent unauthorized access, removal, or use of fixed gauges.*

Public dose is defined in 180 NAC 1-002 as "the dose received by a member of the public from exposure to radiation and/or radioactive material released by a licensee, or to any other source of radiation under the control of a licensee." Public dose excludes doses received from background radiation and from medical procedures. Whether the dose to an individual is an occupational dose or a public dose depends on the individual's assigned duties. It does not depend on the area (restricted, controlled, or unrestricted) the individual is in when the dose is received.

In the case of fixed gauges, members of the public include persons who live, work, or may be near locations where fixed gauges 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 are used or stored. Since a fixed gauge presents a radiation field, the applicant must use methods to limit the public dose such that the radiation level in an unrestricted area (e.g., a nearby walkway or area near the gauge that requires frequent maintenance) does not exceed 1 mSv (100 mrem) in a year or 0.02 mSv (2 mrem) in any one hour.

Because fixed gauges are generally permanently mounted (e.g., chained and locked to a storage rack), they may not need to be in a locked area to prevent loss, theft, or unauthorized removal. Operating and emergency procedures regarding security and lock-out procedures specified in this document should be sufficient to limit the exposure to the public during use or storage and after accidents.

Public dose is also affected by the location of the gauge. Use the concepts of time, distance, and shielding when developing a method to limit public dose. Decreasing the time spent near a gauge, increasing the distance from the gauge, and using shielding will reduce the radiation exposure. The most effective way to limit public dose is to prevent members of the public from entering areas where gauges are used or stored. This may be accomplished by administrative or engineering controls.

Administrative controls include training and warning signs. In cases where gauges are located in hostile environments (e.g., high temperatures, caustic chemicals, etc.), warning signs may be difficult to maintain so mandatory training programs may be necessary to caution employees.

Engineering controls reduce radiation levels in areas that are accessible to the public. Shielding the gauge with a protective barrier (e.g., using brick, concrete, lead, or other solid walls) or placing the gauge within an enclosure to prevent access to higher radiation levels are examples of engineering controls. See Figure18.

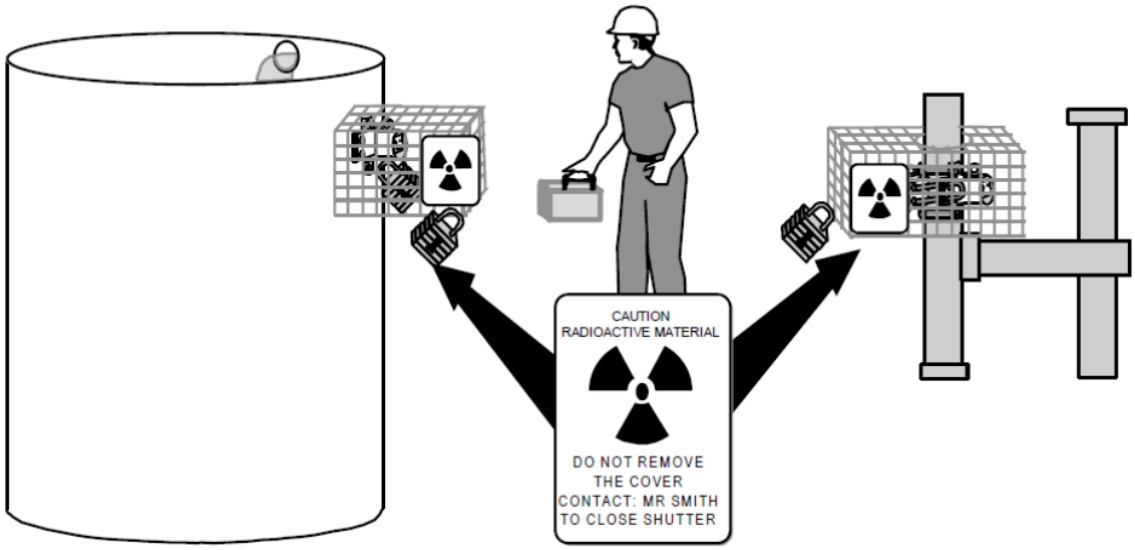


Figure 18 **Limiting Public Dose. When dose rates in an area are high enough that a member of the public could receive a dose in excess of 0.02 mSv (2 mrem) in any one hour or 1 mSv (100 mrem) in a year, licensees must take additional measures to prevent public access to these higher dose rates, such as building enclosures around the gauges.**

Public dose can be estimated in areas near the gauge by using radiation levels determined during initial surveys and applying the "inverse square" law to evaluate the effect of distance on radiation levels and occupancy factors to account for the actual presence of members of the public. See Appendix M for an example.

If, after making a public dose estimate, the conditions used to make the evaluation change (e.g., changes the location of gauges, changes the type or frequency of gauge use, adds gauges, changes the occupancy of adjacent areas), then the licensee must perform a new evaluation to ensure that the public dose limits are not exceeded and take corrective action, as needed.

During inspections, licensees must be able to provide documentation demonstrating, by

measurement or calculation, that the TEDE to the individual likely to receive the highest dose from the licensed operation does not exceed the annual limit for individual members of the public. See Appendix M for examples of methods to demonstrate compliance.

Response from Applicant:
Provide a statement that: “We will maintain documentation (calculations and/or measurements) to show that any member of the public does not exceed a radiation dose of 100 mrem per year and do not exceed 2 mrem in any one hour in an unrestricted area.” The applicant is not required to submit a response to the public dose section during the licensing phase. This matter will be examined during an inspection. See Appendix M for more detailed instructions on how to make a public does evaluation and document the evaluation.

14. Waste Disposal

Regulations: 180 NAC 4-039, 180 NAC 3-025, 180 NAC 3-030, 180 NAC 3-019 180 NAC 1-004.

Criteria: *Radioactive materials must be disposed of in accordance with Department requirements by transfer to an authorized recipient. Appropriate records must be maintained.*

When disposing of fixed gauges, licensees must transfer them to an authorized recipient. Authorized recipients are the original manufacturer or distributor of the device, a commercial firm licensed by the Department, NRC or an Agreement State to accept radioactive waste from other persons, or another specific licensee authorized to possess the licensed material (i.e., its license specifically authorizes the same radionuclide, form, and 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 180 NAC 3-025. In addition, all packages containing radioactive sources must be prepared and shipped in accordance with Department and DOT regulations. Records of the transfer must be maintained as required by 180 NAC 3-030.

Response from Applicant: Provide a statement that: “Disposal will be by transfer of the radioactive material to a licensee specifically authorized to possess it.” The licensee should establish and include waste disposal procedures in its radiation safety program.

Because of the difficulties and costs associated with disposal of sealed sources, applicants should preplan the disposal. Applicants may want to consider contractual arrangements with the source supplier as part of a purchase agreement. Significant problems can arise from improper gauge transfer or failure to dispose of gauges in a proper and timely manner.

Item 15: Citizenship Attestation

Item 15 must be completed by all applicants.
Check the first box if the application is for a corporation or other separate legal entity (Continue to Item 15), otherwise check the second box. If the second box is check, continue to the next section under the “United State Citizenship Attestation Form.”
Check the appropriate box and sign. Continue to item 15.

180 NAC 7	Applicability
7-041	√
7-044	√
7-048	√
7-055	√
7-065	√
7-067	√
7-085	√

16: Certification

Item 15 must be completed on the form itself.

Individuals acting in a private capacity are required to date and sign NRH Form 5. Otherwise, representatives of the corporation or legal entity filing the application should date and sign NRH Form 5. Representatives signing an application must be authorized to make binding commitments and to sign official documents on behalf of the applicant such as the president, vice president, chief executive officer or principal/owner. As discussed previously in "Management Responsibility," signing the application acknowledges management's commitment and responsibilities for the radiation protection program. The Department will return all unsigned applications for proper signature.

See Appendix X for a sample of a delegation of authority form that must be completed and signed and attached to the application, if someone other than a corporate officer wants to correspond with the department as a certifying official.

Note:

- It is a severity level I violation to make a willful false statement or representation on applications or correspondence. (180 NAC 17, Appendix 17A)

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

IV. Amendments to a License

After you are issued a license, you must conduct your program in accordance with (1) the statement, representation, and procedures contained in your application, (2) the terms and conditions of the license, and (3) Title 180.

It is the licensee’s obligation to keep their license current. The license must be amended if any changes in the facilities, equipment, procedures, RSO or radioactive material used are planned. The license should anticipate the need for a license amendment insofar as possible. If any of the information provided in the application is to be modified or changed, submit an application for a license amendment. Submittal of an amendment request does not allow immediate

implementation of proposed changes. Until the license has been amended to approve the change(s), the licensee must comply with the original terms and conditions of the license.

An application for a license amendment may be prepared either on the application Form NRH-5 or in letter form and should be submitted to the Department. The application should identify the license by number and should clearly describe the exact nature of the changes, additions, or deletions. Reference to previously submitted information and documents should be clear and specific and should identify the pertinent information by date, page and paragraph. The licensee must maintain a copy of the submitted and referenced documentation on file for inspection.

For amendment requests applicants must do the following:

- Be sure to use the most recent guidance in preparing an amendment request.
- Submit one original copy of the application on a Form NRH-5 and one electronic copy if possible. The licensee should maintain a copy of the submitted and referenced documentation on file.
- Provide the license number.
- Ensure that a person in a management position signs the amendment or a delegation of authority has been submitted.

Note: Delegation of authority is a statement signed by management stating the specified person or persons the authority to sign license amendments and make statements that affect the license document.

V. License Renewal

Regulations: 180 NAC 3-20

Absent any actions by the department or the licensee, a license remains in effect for five years. An application for license renewal must be received by the department at least 30 days prior to the expiration date to avoid a new application fee. If the licensee files the application for license renewal at least 30 days before the expiration date of the license, the present license will automatically remain in effect until the Department takes final action on the renewal application. However, if the licensee files an application less than 30 days before the expiration date and the Department cannot process it before that date, the licensee will be without a valid license when the license expires.

Renewals require submittal of an entire new application, completed as if it were an application for a new license. Renewal applications should be submitted without reference to documentation and information submitted previously.

For renewal and amendment requests applicants must do the following:

- Be sure to use the most recent guidance in preparing an amendment request.
- Provide the license number.
- For renewals submit an entire new application on Form NRH-5 and Appendix B of this guide, completed as if it were an application for a new license, with appropriately supplemented, complete, and up-to-date information about the applicant's radiation

protection program, demonstrating compliance with all licensing and regulatory requirements in effect at the time of renewal.
- Submit one original copy of the application on a Form NRH-5 and if possible one electronic copy. The licensee should maintain a copy of the submitted and referenced documentation on file.

VI. License Termination

Regulations: 180 NAC 3-017.02, 180 NAC 3-018.07, 180 NAC 3-019.04, 3-019.10, 180 NAC 1-004.

Prior to license termination, the licensee must properly dispose of all licensed radioactive material possessed. The licensee will need to send a notification of disposition of the materials with a request for license termination before the expiration date. (See 180 NAC 3-019) NRH Form 60 “Certificate of Disposition of Materials will need to be submitted.

If the licensee can not dispose of all the licensed radioactive material in possession before the expiration date, the licensee will need to submit a license renewal for storage only of the radioactive material. The renewal is necessary to avoid violating Department regulations that do not allow the licensee to possess licensable material without a valid license.

The licensee must do the following:

- Notify the Department, in writing, when a decision is made to permanently cease licensed activities.
- Certify the disposition of radioactive materials by submission of NRH Form 60, "Certificate of Disposition of Materials," (See Appendix W).
- Before a license is terminated, send the records important to decommissioning (as required by 180 NAC 3-018.07) to the Department. If licensed activities are transferred or assigned in accordance with 180 NAC 3-017.02, transfer records important to decommissioning to the new licensee

.

Appendix A

NRH–5 Application for Radioactive Material License

Nebraska's Department or Health and Human Services

Radioactive Material Program

NEBRASKA
Good Life. Great Mission.
DEPT. OF HEALTH AND HUMAN SERVICES

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH - RADIOACTIVE MATERIALS PROGRAM

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE

INSTRUCTIONS - (Use additional sheets where necessary.)
New or Renewal Application - Complete Items 1. through 15.
Amendment to License - Complete Items1.a, 3., and 15. And indicate other changes as appropriate.
Retain one copy for your files and submit original application to: Department of Health and Human Services, Division of Public Health, Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, NE 68509-5026.
Upon approval of this application, the applicant will receive a Radioactive Material License, issued in accordance with the requirements contained in Title 180, Regulations for the Control of Radiation and the Nebraska Radiation Control Act.

1.a Legal Name and Street address of Applicant (Institution, Firm, Person, etc.)

Applicant Name: _____

Address: _____

_____

City, State Zip +4: _____

Telephone #: _____

FAX #: _____

E-Mail Address:

1.b Street address(es) at which Radioactive Material will be used. (If different than 1.a)

(1) Permanent Address: _____

_____

City, State Zip+4: _____

(2) Temporary Job Sites Throughout Nebraska? ☐ Yes ☐ No

2. Department to Use Radioactive Material

_____

Person to Contact: _____

Telephone #: _____

3. This is an application for:

☐ New License

☐ Amendment to License No. _____

☐ Renewal of License No. _____

4. Individual User(s)

☐ Individual users approved by the Licensee's radiation safety committee.

☐ Individual users approved by the Licensee's radiation safety officer.

☐ Individual users satisfy the requirements of 180 NAC 3-013

OR

☐ Name and Title of individual(s) who will use or directly supervise use of, Radioactive Materials. Give training and experience in Items 7. And 8.

First Name + Middle Initial | Last Name | Title

5. Radiation Safety Officer (RSO)
(Name and Title of Individual designated as Radiation Safety Officer.

_____

Telephone #: _____

Attach documentation of his/her training and experience as in Items 7. and 8.

Department Use Only

Date Received Stamp

6. Radioactive Material Data

☐ Type B Broad Scope, 180 NAC 3-013.01(B)

☐ Type C Broad Scope, 180 NAC 3-013.01(C)

☐ Specific License, Radioactive Material Listed below:

6.a. Element and Mass Number	6.b. Chemical or Physical Form (Make and Model if sealed source)	6.c. Maximum Activity Requested (Expressed as Curies, Millicuries or Microcuries)	6.d. Use of Each Form (If sealed source, also give Make and Model Number of the storage and/or device in which sealed source will be stored and/or used)

7. Training of Individuals in Items 4. and 5.

Name of Individual:

	Formal Course Title	Location and Date(s) of Training	Clock Hours in Lecture or Laboratory
7.a. Radiation Physics and Instrumentation			
7.b. Radiation Protection			
7.c. Mathematics Pertaining to the Use and Measurement of Radioactivity			
7.d. Biological Effects of Radiation			

8. Experience with Radiation of Individuals in Items 4. and 5.

(Actual use of Radioisotopes or Equivalent Experience)

Name of Individual:

Isotope	Maximum Activity	Where Experience Was Gained	Months/Years	Type of Use

9. Radiation Detection Instruments

Type of Instrument	Manufacturers Name	Model Number	Number Available	Radiation Detected	Sensitivity Range

10. Calibration of Instruments Listed in Item 9.

☐ **a. Calibrated by Service Company**	☐ **b. Calibrated by Applicant**
Name and Address of Service Company and Frequency of Calibration	

11. Personnel Monitoring Devices

(Check and/or complete as appropriate)

Type	Supplier (Service Company)	Exchange Frequency
☐ Film Badge ☐ TLD ☐ DOSL ☐ Other (Specify) ☐_____		☐ Monthly ☐ Quarterly ☐ Other (specify) _____

Information to be Submitted on Additional Sheets

12. Facilities and Equipment

Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Attach an explanatory sketch of the facility.

13. Radiation Protection Program

Describe the radiation protection program as appropriate for the material to be used, including: the duties and responsibilities of the Radiation Safety Officer (RSO); control measures; bioassay procedures (if needed); day-to-day general safety instructions to be followed; etc. If the application is for sealed sources also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

14. Waste Disposal

If a commercial waste disposal service is employed, specify the name and address of the company. Otherwise, submit a detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. If the application is for sealed sources and devices and they will be returned to the manufacturer, so state.

15. **CITIZENSHIP ATTESTATION**

☐ It is not necessary to complete the Attestation part of this application below if the application is for a corporation or other separate legal entity. **Explain why:** (For example: This application is for a corporation, partnership, etc.) _____

OR

☐ **If the entity is owned by an individual, complete the United States Citizenship Attestation Form below.**

UNITED STATES CITIZENSHIP ATTESTATION FORM

For the purpose of complying with Neb. Rev Stat. §§ 4-108 through 4-114, I attest as follows:

☐ I am a citizen of the United States OR

☐ I am a qualified alien under the Federal Immigration and Nationality Act, my Immigration status and alien number are as follows and I am providing a copy of my USCIS documentation.

I hereby attest that my response and the information provided on this form and any related application for public benefits are true, complete and accurate and I understand that this information may be used to verify my lawful presence in the United States.

Name (Type or print first, middle, last)	Signature	Date

16. CERTIFICATION
(This item must be completed by applicant.)

The applicant and any official executing this document on behalf of the applicant named in Item 1.a., certify that this application is prepared in conformity with the Nebraska Department of Health and Human Services , Title 180, Regulations for the Control of Radiation and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief. . I am authorized to make binding commitments and to sign official documents on the behalf of the applicant.

_____
Applicant Name from Item 1.a.

By: _____ *Date:* _____
Signature

_____
Print Name and Title of certifying official authorized to act on behalf of the applicant

Appendix B

Supportive Information Requested in Items 4 through 14 of NRH FORM 5

Appendix B
Supportive Information Requested in Items 4 through 14 of NRH FORM 5

For the convenience of applicants and for streamline handling of fixed gauge applications this appendix should be used to provide supporting information. It is attached to Form NRH – 5.

Please refer to "Regulatory Guide 3.13, "Guidance for Radioactive Material - Fixed Gauge Licenses") for more detail concerning each item and other options available.

- Complete item 1 thru 3 and 15 on NRH-5. Use this Appendix B to complete items 4-14. Please indicate the following on the NRH-5 **"See attachment for items 4-14".**

- Please check the appropriate box(es) below and submit a detailed description of all the requested information. For additional information begin each item on a separate sheet, identifying the item number and the date of the application on each page.

Item #4 & 5

ITEM NO. AND TITLE	RESPONSE	YES (need to check one item per box)	ATTACHMENTS AND/OR ALTERNATIVE PROCEDURES ATTACHED (If item to left is checked, then check and attach item requested in this column.)
4. Individual User(s)	"The radiation safety officer will maintain documentation of training for authorized users and his/her approval of the authorized user."	[ ]	
4. Training for Individual who in the Course of Employment Are Likely to Receive Occupational Doses of Radiation in Excess of 1 mSv (100 mrem) in a year (Occupationally Exposed workers) and Ancillary Personnel	"Will have a training program for individuals who in the course of employment are likely to receive occupational doses of radiation in excess of 1 mSv (100 mrem) in a year (occupationally exposed workers) and Ancillary personnel.	[ ]	Need not be submitted with application. Will be examined during inspections.
5. Radiation Safety Officer (RSO)	Radiation Safety Officer. Name _____ Telephone #_____	[ ]	
	"The documentation for the training of the RSO are attached."	[ ]	[ ]Training Records of RSO
	"The RSO will perform the duties and responsibilities of a RSO per Appendix E of Regulatory Guide 3.13, 'Radioactive Material –Guidance for Fixed Gauges Licenses." **Or** "Will provide alternate list of duties and responsibilities of the RSO per the criteria of Appendix E."	[ ] **Or** [ ] **and**	[ ]Alternate List of duties and responsibilities of the RSO

ITEM NO. AND TITLE	RESPONSE	YES (need to check one item per box)	ATTACHMENTS AND/OR ALTERNATIVE PROCEDURES ATTACHED (If item to left is checked, then check and attach item requested in this column.)
6. Radioactive Material **6.a. Element and Mass Number**	List each radioisotope that will be used in each source in the gauging device(s).	Complete item 6 below [ ]	
6.b. Chemical and/or physical form	Identify the manufacturer and model number of each sealed source that will be used in the fixed gauging device. Confirm that each sealed source, device and source/device combination is registered as an approved sealed source or device in the Sealed Source and Device regulation issued by NRC or an Agreement State.		
6.c. Maximum amount to be possessed at any one time	Specify the maximum amount of radioactive material that will be in each sealed source. Confirm that the activity per source will not exceed the maximum activity listed on the approved Sealed Source and Device regulation issued by NRC or an Agreement State.		
6.d. Authorized use AND Manufacturer and model number of the gauging device	Specify the purpose for the use of the gauging device. **And** Identify the manufacturer and model number of the gauging device in which the sealed sources will be used.		

Please enter the necessary information for item 6 below. If additional space is needed, please add an attachment

6.a. Element and Mass Number	6.b. Chemical or Physical Form (Make and Model if sealed source)	6.c. Maximum Activity Requested (Expressed as Curies, Millicuries or Microcuries)	6.d. Use of Each Form (If sealed source, also give Make and Model Number of the storage and/or device in which sealed source will be stored and/or used

7. Training of Individuals in Item 4. And 5. **8. Experience with Radiation of Individuals in Item 4. And 5.**	"Authorized users and the radiation safety officer will demonstrate competency in use, maintenance and transfer of the device(s) by satisfactory completion of an eight(8) hour course -provided by the manufacturer of the gauge **Or** -Department approved course." **Note**: See Appendix I for course criteria **Note:** The licensee will need to maintain training records on file for each authorized user and will maintain records showing the approval by the RSO of the authorized users. This will be reviewed at the time of inspection. See Appendix S for a sample record retention schedule.	[ ] **Or** [ ] **and**	[ ] Course for Department approval
9. Radiation Detection Instruments	"We will possess and use a radiation survey meter that meets the criteria in the section entitled 'Radiation Detection Instruments' in Regulatory Guide 3.13, 'Radioactive Material –Guidance for Fixed Gauges Licenses' in the event of an incident " **Or** "We have access to a radiation survey meter that meets the criteria in the section entitled 'Radiation Detection Instruments' in Regulatory Guide 3.13, 'Radioactive Material –Guidance for Fixed Gauges Licenses' in the event of an incident "	[ ] **Or** [ ] **and**	[ ] A plan of how an instrument will be obtained.
10. Calibration of Instruments Listed in Item **10a.Calibrated by Service Company** **10b.Calibrated by Applicant**	"We will possess a survey meter and will have the instrument calibrated annually. The calibration service company's, name, address, license number and the state or federal Department that issued the company's license is provided below." Name_____ Address_____ _____ _____ License number_____ Issuing Agency_____ **Or** "We will calibrate the survey instruments in-house annually. We have submit detailed information describing the facilities, equipment, personnel, and procedures to be used to perform the calibrations." **Note:** Contact the Department for criteria for in house calibrations. **Or** NA if you plan to access a survey meter.	[ ] **Or** [ ] **and** **Or** [ ]	[ ] In house calibration procedure for Department approval.

11 Personnel Monitoring Devices	"We will provide dosimetry processed and evaluated by a NVLAP approved processor that is exchanged at a frequency recommended by the processor." "We will be using the following type: ❒ Film Badge ❒ TLD ❒ OSL ❒ Other (Specify) _____ The supplier is: _____ The exchange frequency is: ❒ Monthly ❒ Quarterly ❒ Other (Specify) _____" **Or** "We will maintain, for inspection by the Department, 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 of 180 NAC 4" **Note**: See Appendix M for guidance on demonstrating that unmonitored individuals are not likely to exceed 10 percent of the allowable limits.	[ ] **Or** [ ]	
12. Facilities and Equipment	"A diagram of the facility showing the location of each fixed gauge is attached. We will ensure that the location of each fixed gauge meets the criteria in the section entitled "Facilities and Equipment" in "Radioactive Material Guidance for Fixed Gauge Licenses, Regulatory Guide 3.13." Address any instances where the proposed conditions exceed any conditions listed in the SSD Registration Certificate." **Or** "A diagram of the facility showing the location of each fixed gauge is attached. Confirm that the fixed gauge is secured to prevent unauthorized removal or access; and submit specific information demonstrating that the proposed conditions will not impact the safety or integrity of the source or device. Address any instances where the proposed conditions exceed any conditions listed in the SSD Registration Certificate." **Note:** • Any deviations from an SSD Registration Certificate will require specific Department approval. • Alternative responses will be evaluated using the criteria listed above. A diagram of the permanent gauge storage facility is attached."	[ ] **Or** [ ]	
13. Radiation Protection Program **13a. Operating and Emergency Procedures**	"We have implemented and will maintain operating and emergency procedures in Appendix F Regulatory Guide 3.13 "Radioactive Material Guidance for Fixed Gauges Licenses." "Copies of these procedures will be provided to all authorized users and at each job site." (A copy of these Operating and Emergency Procedures will be copied from Regulatory Guide 3.13. The information to individualize the procedure will be completed.) **Or** "We have implemented and will maintain operating and emergency procedures submitted with this application. They meet the criteria of section titled Radiation Protection Program – Operating and Emergency Procedures in Regulatory Guide 3.4 "Radioactive Material Guidance for Fixed Gauges Licenses.". Copies of these procedures will be provided to all authorized users and at each job site."	[ ] **Or** [ ] **and**	[ ] In house operating and emergency procedures for Department approval.

13. Radiation Protection Program **13b.Leak Tests**	"Leak tests will be performed at 6 month intervals or approved by the Department, an Agreement State, or the U.S. Nuclear Regulatory Commission and specified in the Sealed Source and Device Registration Sheet and the records maintained."	[ ]	
	" Leak tests will be performed by an organization authorized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission to provide leak testing services for other licensees. **And** Leak test kit supplied by an organization authorized by the Department, an Agreement State or U.S. Nuclear Regulatory Commission to provide leak test kits to other licensees and according to the kit supplier's instructions. Name of licensee and license radioactive material license number performing maintenance: _____ **And/Or** Supplier of leak test kit:_____ Model number of kit_____ Suppliers Address_____ _____ _____ **Or** "In house leak testing procedure approved by the Department." **Note:** Appendix O in Regulatory Guide 3.13 "Radioactive Material Guidance for Fixed Gauges Licenses" indicates the criteria and procedure for in house leak testing. Instrument used must be identified.	[ ] **And** [ ] **And/Or** **Or** [ ]	[ ] In house leak testing procedure for Department approval.
13. Radiation Protection Program **13c. Maintenance**	ROUTINE CLEANING & LUBRICATION "We will implement and maintain procedures for routine maintenance of our gauges according to each manufacturer's recommendations and instructions." **Or** Alternative procedures for the Department's review.	[ ] **Or** [ ] **and**	[ ] Alternative procedure attached for Department review.
	NON-ROUTINE MAINTENANCE • "The gauge manufacturer, distributor or other person authorized by the Department, the U.S. Nuclear Regulatory Commission or other Agreement State will perform non-routine operations such as installation, initial radiation survey, repair, and maintenance of components related to the radiological safety of the gauge, gauge relocation, replacement, and disposal of sealed sources, alignment or removal of a gauge from service." **Or** • "We will provide needed information to support request to perform non-routine maintenance per Appendix P of Regulatory Guide 3.13 "Radioactive material Guidance for Fixed Gauge Licenses."	[ ] **Or** [ ] **and**	[ ] Submit non-routine maintenance procedure for Department approval. See Appendix P for the criteria to be used.
13. Radiation Protection Program **13d. Transportation**	No response is needed from applicants during the licensing process; this issue will be reviewed during inspection.	Need Not Be Submitted With Application. See Appendix Q for DOT regulations and sample bill of lading and form.	

13. Radiation Protection Program **13e. Fixed Gauges Used at Temporary Job Site**	We will not use fixed gauges at temporary job sites." **Or** "Procedures for use of fixed gauges at temporary job sites have been developed, implemented, maintained, and distributed and will meet the Criteria in the section entitled 'Fixed Gauges Used at Temporary Job Sites,' in Regulatory Guide 3.14, 'Radioactive Material Guidance for Fixed Gauge Licenses" and copies of these procedures will be provided to all gauge users." **Or** Alternative procedures for use of fixed gauges at temporary job sites. ***Note:*** Alternative procedures will be evaluated using the criteria listed above.	[ ] **Or** [ ] **Or** [ ]**And**	[ ] Alternative procedures
13. Radiation Protection Program **13f. Audit Program**	"We will have an audit program." **Note:** See Appendix S for a sample audit program. The audit program will be reviewed during an inspection.	[ ]	Need not be submitted with application.
13. Radiation Protection Program **13g. Material Receipt and Accountability**	"Physical inventories will be conducted at least every 6 months or at other intervals approved by the Department, to account for all sealed sources and devices received and possessed under the license." **Or** A description of the procedures for ensuring that no fixed gauge has been lost, stolen, or misplaced and how often they will be conducted. **Note:** See Appendix T for a sample inventory procedure and inventory form.	[ ] **Or** [ ]**And**	[ ]Alternative procedure
13. Radiation ProtectionProgram **13h. Public Dose**	"We will maintain documentation (calculations and/or measurements) to show that any member of the public does not exceed a radiation dose of 100 mrem per year and do not exceed 2 mrem in any one hour in an unrestricted area." **Note:** The applicant is not required to submit a response to the public dose section during the licensing phase. This matter will be examined during an inspection. See appendix M for a example.	[ ]	Need Not be Submitted with Application**.**
14. Waste Disposal	"Disposal will be by transfer of the radioactive material to a licensee specifically authorized to possess it in accordance with Appendix V." **Note:** Due to difficulties and costs associated with disposal of sealed neutron sources, applicants should preplan the disposal	[ ]	
15. Citizenship Attestation	Check the appropriate box(s), provide information that maybe requested and sign if required.		
16. Certification	Signed by management representative authorized to make binding commitments.	**Item 15 needs to be signed on NRH-5.**	

Appendix C

Sample Fixed Gauge License

STATE OF NEBRASKA

DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
RADIOACTIVE MATERIALS PROGRAM

RADIOACTIVE MATERIAL LICENSE

Pursuant to the Radiation Control Act, 1963, and Title 180, Regulations for the Control of Radiation, Chapter 3 and in reliance on statements and representations heretofore made by the licensee designated below, a license is hereby issued authorizing such licensee to transfer, receive, possess and use the radioactive material(s) designated below; and to use such radioactive materials for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations and orders now or hereafter in effect of the Nebraska Department of Health and Human Services and to any conditions specified below.

1. Licensee **XYZ Company**

2. Address **123 North 12t Street**
Anytown, NE 68000

3. License Number **00-00-00**

4. Amendment Number **1**

License Amended In Its Entirety To Read As Follows:

5. Expiration Date **January 31, 20XX**

6. Radioactive Material	7. Chemical And/Or Physical Form	8. Maximum Quantity Licensee May Possess At Any One Time Under This License	9. Authorized Use
A. Cesium-137	**Sealed source (Ohmart Corporation Model A-2100, A-2102 or Texas Nuclear Model**	**500 millicuries per source**	**Used in an Ohmart Corp. Model SR-1, SHD, SR-A, SH-F1 or a Texas Nuclear Model 5197 source holder for measuring levels or densities**
D. **Radium-226**	**Sealed source (Radium Chemical Company Model RAS-7; Gammatron Inc. Model GT-GHP, GT-G; or Amersham**	**10 millicuries per source**	**Used in a Stock Equipment Company Model D14400 source holder for measuring densities**

CONDITIONS

10. Licensed Material shall only be used by, or under the supervision of, John Jones, Jane Doe and Fred Smith.

11. The Radiation Safety Officer for this license is Jane Doe, RSO.

12. Licensed material shall be used only at the licensee's facility located at 1000 Main Street, Anytown, Nebraska 60000.

13. The licensee is authorized to transport licensed material only in accordance with the provisions of 180 NAC 13.

14. Notwithstanding the requirements of 180 NAC 1-011.02, item 6, no sealed source shall be stored for a period of more than 3 years without being tested for leakage or contamination.

15. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license. The records of the inventories shall be maintained for six (6) years from the date of the inventory for inspection by the Department and shall include the quantities and kinds of licensed material, location of the sealed sources and/or devices, and the date of the inventory.

16. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source

STATE OF NEBRASKA

DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH ASSURANCE DIVISION
RADIOACTIVE MATERIALS PROGRAM

License Number: **00-00-00**

Amendment Number: **1**

RADIOACTIVE MATERIAL LICENSE
supplemental sheet

17. Installation, initial radiation surveys, relocation, removal from service, dismantling, alignment, replacement, disposal of the sealed source and non-routine maintenance or repair of components related to the radiological safety of the gauge (i.e., the sealed source, the source holder, source device mechanism, on-off mechanism (shutter), shutter control, shielding) shall be performed only by persons specifically licensed by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.

18. Prior to initial use and after installation, relocation, dismantling, alignment, or any other activity involving the source or removal of the shielding, the licensee shall assure that a radiological survey is performed to determine radiation levels in accessible areas around, above, and below the gauge with the shutter open. This survey shall be performed only by persons authorized to perform such services by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State.

19. Each gauge shall be tested for the proper operation of the on-off mechanism and indicator, if any, at no longer than 6 month intervals or at such longer intervals as specified by the manufacturer and approved by the Department.

20. The Licensee shall assure that the shutter mechanism is locked in the closed position during periods when a portion of an individual's body may be subject to the direct radiation beam. The licensee shall review and modify as appropriate its 'lock-out' procedures whenever a new gauge is obtained to incorporate the device manufacturer's recommendations.

21. The Licensee shall operate each gauge within the manufacturer's specified temperature and/or environmental limits such that the shielding and shutter mechanism of the source holder are not compromised.

22. In addition to the possession limits in Item 8., the licensee shall further restrict the possession of licensed material to quantities below the minimum limit specified in 180 NAC 3-018.04 for establishing financial assurance for decommissioning.

23. Non-routine maintenance or repair of components related to the radiological safety of the gauge as described in license condition 17; shall only be performed by, or under the supervision and in the physical presence of, individuals who have received the training described in the application dated May 2, 20xx and have been approved in writing by the Radiation Safety Officer. The licensee shall maintain records of individuals designated as performers of those tasks and such records will indicate which of those tasks these individuals are authorized to perform. Such records shall be maintained for 3 years following the last use of licensed material by that individual.

24. Except as specifically provided otherwise by this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. Title 180 shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Application with attachments dated June 1, 20XX, signed by John Doe, President.

B. Facsimile containing leak test procedures dated September 26, 20XX, signed by John Doe.

Date: May 08, 20XX

FOR THE NEBRASKA DEPARTMENT OF HEALTH & HUMAN SERVICES
Division of Public Health

_____
xxxxxx Manager
Radioactive Materials Program

Appendix D

Review Checklist for Fixed Gauge Application

Appendix D

Review Checklist for

Fixed Gauge Application

This checklist can be used by the Department staff to review applications and the applicant can use it to check for completeness.

1.a.

1.a Legal Name and Street address of Applicant (Institution, Firm, Person, etc.)

Applicant Name: _____

Address: _____

_____

City, State Zip +4: _____

Telephone #: _____

FAX #: _____

eMail Address:

1.b.

1.b Street address(es) at which Radioactive Material will be used. (If different than 1.a)

(1) Permanent Address: _____

_____ _____

City, State Zip+4: _____

(2) Temporary Job Sites Throughout Nebraska? ❒ Yes ❒ No

2.

2. Department to Use Radioactive Material

_____

Person to Contact:_____

Telephone #:_____

3.

3. This is an application for:

❒ New License

❒ Amendment to License No._____

❒ Renewal of License No._____

Item Number and Title	Suggested Response	YES	NO	OTHER	
				YES	NO
4. Individual User(s)	"The radiation safety officer will maintain documentation of training for authorized users and his/her approval of the authorized user."				
4.1 Training for Individual who in the Course of Employment Are Likely to Receive Occupational Doses of Radiation in Excess of 1 mSv (100 mrem) in a year (Occupationally Exposed workers) and Ancillary Personnel	"Will have a training program for individuals who in the course of employment are likely to receive occupational doses of radiation in excess of 1 mSv (100 mrem) in a year (occupationally exposed workers) and Ancillary personnel."		.		
5. Radiation Safety Officer (RSO)	Radiation Safety Officer : _____ Name and Telephone Number _____				
	"The documentation for the training of the RSO are attached."				
	"The RSO will perform the duties and responsibilities of a RSO per Appendix E of Regulatory Guide 3.13 'Radioactive Material-Guidance for Fixed Gauges Licenses." **Or** "Will provide alternate list of duties and responsibilities of the RSO per the criteria of Appendix E. **And** List is attached.				
6. Radioactive Material **6.a. Element and Mass Number** **6b. Chemical and/or physical form**	List each radioisotope that will be used in each source in the gauging device(s). Identify the manufacturer and model number of each sealed source that will be used in the fixed gauging device. Confirm that each sealed source, device and source/device combination is registered as an approved sealed source or device in the Sealed Source and Device regulation issued by NRC or an Agreement State.				
6c. Maximum amount to be possessed at any one time	Specify the maximum amount of radioactive material that will be in each sealed source. Confirm that the activity per source will not exceed the maximum activity listed on the approved Sealed Source and Device regulation issued by NRC or an Agreement State.				
6d. Authorized use **AND** **Manufacturer and model number of the gauging device**	Specify the purpose for the use of the gauging device. **And** Identify the manufacturer and model number of the gauging device in which the sealed sources will be used.				

6.a. Element and Mass Number	6.b. Chemical or Physical form (Make and Model if sealed source)	6.c. Maximum Activity Requested (Expressed as Curies, Millicuries or Microcuries)	6.d. Use of Each Form (If sealed source, also give Make and Model Number of the storage and/or device in which sealed source will be stored and/or used)	Specify other uses not listed on SSD Certificate	YES	NO
Cobalt-60	Sealed sources manufacturer or distributor and model number: _____ Device manufacturer or distributor and model number: _____	Not to exceed maximum activity per source as specified in Sealed Source and Device Registration Sheet	Specific description of gauge in use:	[ ]Not applicable [ ] Uses are:		
Krypton-85	Sealed sources manufacturer or distributor and model number: _____ Device manufacturer or distributor and model number: _____	Not to exceed maximum activity per source as specified in Sealed Source and Device Registration Sheet	Specific description of gauge in use:	Specific description of gauge in use:		
Strontium-90	Sealed sources manufacturer or distributor and model number: _____ Device manufacturer or distributor and model number: _____	Not to exceed maximum activity per source as specified in Sealed Source and Device Registration Sheet	Specific description of gauge in use:	Specific description of gauge in use:		
Cesium-137	Sealed sources manufacturer or distributor and model number: _____ Device manufacturer or distributor and model number: _____	Not to exceed maximum activity per source as specified in Sealed Source and Device Registration Sheet	Specific description of gauge in use:	Specific description of gauge in use:		
Americium-241	Sealed sources manufacturer or distributor and model number: _____ Device manufacturer or distributor and model number: _____	Not to exceed maximum activity per source as specified in Sealed Source and Device Registration Sheet	Specific description of gauge in use:	Specific description of gauge in use:		
Other Isotope (Specify)	Sealed sources manufacturer or distributor and model number: _____ Device manufacturer or distributor and model number: _____	Not to exceed maximum activity per source as specified in Sealed Source and Device Registration Sheet	Specific description of gauge in use:	Specific description of gauge in use:		
FINANCIAL ASSURANCE REQUIRED AND EVIDENCE OF FINANCIAL ASSURANCE PROVIDED						

Item Number and Title	Suggested Response	APPLICANT'S RESPONSE			
		YES	NO	OTHER	
				YES	NO
7. Training of Individuals in Item 4. And 5. **8. Experience with Radiation of Individuals in Item 4. And 5.**	"Authorized users and the radiation safety officer will demonstrated competency in use, maintenance and transfer of the device(s) by satisfactory completion eight(8) hour course -provided by the manufacturer of the gauge **Or** -Department approved course." **Note**: See Appendix I for course criteria **Note:** The licensee will need to maintain training records on file for each authorized user and will maintain records showing the approval by the RSO of the authorized users. This will be reviewed at the time of inspection. See Appendix S for sample record retention schedule.				
9. Radiation Detection Instruments	"We will possess and use a radiation survey meter that meets the criteria in the section entitled 'Radiation Detection Instruments' in Regulatory Guide 3.13, 'Radioactive Material – Guidance for Fixed Gauges Licenses' in the event of an incident " **Or** "We have access to a radiation survey meter that meets the criteria in the section entitled 'Radiation Detection Instruments' in Regulatory Guide 3.13, 'Radioactive Material –Guidance for Fixed Gauges' in the event of an incident" Have a plan of how an instrument will be obtained.				
10. Calibration of Instruments Listed in Item **10 a. Calibrated by Service Company**	"We will possess a survey meter and will have the instrument calibrated annually. The calibration service company's, name, address, license number and the state or federal Department that issued the company's license is provided below." Name_____ Address_____ _____ _____ License number_____ Issuing Department_____ **Or**				

Item Number and Title	Suggested Response	APPLICANT'S RESPONSE			
		YES	NO	OTHER	
				YES	NO
10.. Calibration of Instruments Listed in Item 10 b. Calibrated by Applicant	"We will calibrate the survey instruments in-house annually. We have submitted detailed information describing the facilities, equipment, personnel, and procedures to be used to perform the calibrations." **Note:** Contact the Department for criteria for in house calibrations. **Or** NA if you plan to access a survey meter.				
11. Personnel Monitoring Devices	" We will provide dosimetry processed and evaluated by a NVLAP approved processor that is exchanged at a frequency recommended by the processor." "We will be using the following type: ❒ Film Badge ❒ TLD ❒ OSL ❒ Other (Specify) _____ The supplier is: _____ The exchange frequency is: ❒ Monthly ❒ Quarterly ❒ Other (Specify) _____" **Or** "We will maintain, for inspection by the Department, 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 of 180 NAC 4" **Note**: See Appendix M for guidance on demonstrating that unmonitored individuals are not likely to exceed 10 percent of the allowable limits.				

Item Number and Title	Suggested Response	APPLICANT'S RESPONSE			
		YES	NO	OTHER	
				YES	NO
12. Facilities and Equipment	• "A diagram of the facility showing the location of each fixed gauge is attached. We will ensure that the location of each fixed gauge meets the criteria in the section entitled 'Facilities and Equipment' Instruments' in "Radioactive Material Guidance for Fixed Gauge Licenses," Regulatory Guide 3.13 (Rev.2), **Or** • "A diagram of the facility showing the location of each fixed gauge is attached." Confirm that the fixed gauge is secured to prevent unauthorized removal or access; and submit specific information demonstrating that the proposed conditions will not impact the safety or integrity of the source or device. Address any instances where the proposed conditions exceed any conditions listed in the SSD Registration Certificate. **Note:** • Any deviations from an SSD Registration Certificate will require specific Department approval. • Alternative responses will be evaluated using the criteria listed above.				
13. Radiation Protection Program **13.a. Operating and Emergency Procedures**	"We have implemented and will maintain operating and emergency procedures in Appendix F Regulatory Guide 3.13 "Radioactive Material Guidance for Fixed Gauges Licenses." "Copies of these procedures will be provided to all authorized users and at each job site." (A copy of these Operating and Emergency Procedures will be copied from Regulatory Guide 3.4. The information to individualize the procedure will be completed.) **Or** "We have implemented and will maintain operating and emergency procedures submitted with this application. They met the criteria of section titled Radiation Protection Program – Operating and Emergency Procedures in Regulatory Guide 3.13 "Radioactive Material Guidance for Fixed Gauges Licenses.". Copies of these procedures will be provided to all authorized users and at each job site."				

13. Radiation Protection Program **13.b. Leak Tests**	"Leak tests will be performed at intervals approved by the Department, an Agreement State, or the U.S. Nuclear Regulatory Commission and specified in the Sealed Source and Device Registration Sheet." _____ "Leak tests will be performed by an organization authorized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission to provide leak testing services for other licensees and/or using a leak test kit supplied by an organization authorized by the Department, an Agreement State or U.S. Nuclear Regulatory Commission to provide leak test kits to other licensees and according to the kit supplier's instructions." Name of licensee and license number performing maintenance: _____ **And/Or** Supplier of leak test kit, model number of kit, and supplier's address. **Or** "The licensee may be authorized to conduct the leak test and analysis by the Department." The licensee will be required to provide the following to support a request to conduct the leak test and analysis. • Identify the individual who will make the analysis and provide his or her qualifications to make quantitative measurements of radioactivity. • Commit to performing leak testing at the frequency specified in the appropriate SSD Registration Certificate. • Specify how and where test samples will be taken on the gauge. Describe materials used and methods of handling samples to prevent or minimize exposure to personnel. • Specify the type of instrument(s) that will be used for measurement, the counting efficiency, and minimum levels of detection for each radionuclide to be measured. ***Note:*** An instrument capable of making quantitative measurements should be used; hand-held survey meters will not normally be considered adequate for measurements. • Specify the standard sources used to calibrate the instrument; for each, specify the radionuclide, quantity, accuracy, and traceability to primary radiation standards. ***Note:*** Accuracy of standards should be within ±5% of the stated value and traceable to a primary radiation standard such as those maintained by the National Institutes of Standards and Technology (NIST).				

13.Radiation Protection Program **13c. Maintenance**	ROUTINE CLEANING & LUBRICATION "We will implement and maintain procedures for routine maintenance of our gauges according to each manufacturer's recommendations and instructions."				
	NON-ROUTINE MAINTENANCE "We will send the gauge to the manufacturer or other person authorized by the NRC or an Agreement State to perform non-routine maintenance or repair operations that require the removal of the source or source rod from the gauge." **Or** "We will provide needed information to support request to perform non-routine maintenance per Appendix P of Regulatory Guide 3.13 "Radioactive Material Guidance for Fixed Gauges Licenses."				
13. Radiation Protection Program **13d. Transportation**	The applicant is not required to submit a response to the public dose section during the licensing phase. This matter will be examined during an inspection.	Need not be submitted with application			
13.Radiation Protection Program **13.e. Fixed Gauges Used at Temporary Job Site**	We will not use fixed gauges at temporary job sites." **Or** "Procedures for use of fixed gauges at temporary job sites have been developed, implemented, maintained, and distributed and will meet the Criteria in the section entitled 'Fixed Gauges Used at Temporary Job Sites,' in Regulatory Guide 3.14, 'Radioactive Material Guidance for Fixed Gauge Licenses" and copies of these procedures will be provided to all gauge users." **Or** Alternative procedures for use of fixed gauges at temporary job sites. ***Note:*** Alternative procedures will be evaluated using the criteria listed above.				
13.Radiation Protection Program **13.f. Audit Program**	"We will have an audit program." **Note:** See Appendix S for a sample audit program. The audit program will be reviewed during an inspection ***Note:*** Alternative procedures will be evaluated using the criteria listed above.				

13.Radiation Protection Program 13.g. Material Receipt and Accountability	"Physical inventories will be conducted at intervals not to exceed 6 months, to account for all sealed sources and devices received and possessed under the license." **Note:** See Appendix T for a inventory procedure and sample inventory form. These items will be reviewed during an inspection. **Or** A description of the frequency and procedures for ensuring that no gauge has been lost, stolen, or misplaced and that, if the licensee possesses gauges exceeding threshold amounts, the licensee complies with financial assurance requirements in 180 NAC 3-018.				
13. Radiation Protection Program 13h. Public Dose	The applicant is not required to submit a response to the public dose section during the licensing phase. This matter will be examined during an inspection.	Need not be submitted with application.			
14. Waste Disposal	State that disposal will be by transfer of the radioactive material to a licensee specifically authorized to possess it.	Need not be submitted with application			
15. Citizenship Attestation	Appropriate box(es) checked, submit documents if required and signed if required.				
16. Certification	Signed by representative authorized to make binding commitments.	Item 15 needs to be signed on NRH 5.			

Appendix E

Duties and Responsibilities of the Radiation Safety Officer

Appendix E
Duties and Responsibilities of the Radiation Safety Officer

The RSO's duties and responsibilities include ensuring radiological safety and compliance with both Department regulations and the conditions of the license. Typically, the RSO's duties and responsibilities include ensuring the following:

- Activities involving licensed material that the RSO considers unsafe are stopped
- Radiation exposures are ALARA
- Development, maintenance, distribution, and implementation of up-to-date operating and emergency procedures
- Individuals that use fixed gauges are properly trained
- Possession, installation, relocation, use, storage, routine maintenance, and non-routine operations of fixed gauges are consistent with the limitations in the license, the SSD Registration Certificate(s), manufacturers or distributor's recommendations and instructions
- Safety consequences of non-routine operations are analyzed before conducting any such activities that have not been previously analyzed
- Non-routine operations are performed by the manufacturer, distributor or person specifically authorized by the Department, NRC, or an Agreement State
- Prospective evaluations are performed demonstrating that unmonitored individuals are not likely to receive, in one year, a radiation dose in excess of 10% of the allowable limits or personnel monitoring devices are provided
- Personnel monitoring devices, if required, are used, and exchanged at the proper intervals, and records of the results of such monitoring are maintained
- 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 180 NRC 4-013
- Fixed gauges are properly secured
- Notification of proper authorities of incidents such as damage to or malfunction of fixed gauges, fire, loss, or theft
- Investigation of unusual occurrences involving the fixed gauge (e.g., malfunctions or damage), identification of cause(s), implement of appropriate and timely corrective action(s)
- Radiation safety program audits are performed at intervals not to exceed 12 months and development, implement, and documentation of timely corrective actions
- When the licensee identifies violations of regulations or license conditions or program weaknesses, corrective actions are developed, implemented, and documented
- Licensed material is transported according to all applicable DOT requirements
- Licensed material is disposed of properly
- Appropriate records are maintained
- An up-to-date license is maintained, and amendment and renewal requests are submitted in a timely manner

- Posting of documents required by 180 NRH 10-002
- Provide written notifications of annual radiation exposures to all monitored personnel as required by 180 NAC 10-004
- 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
- Radioactive material is transported in accordance with all applicable DOT requirements
- Review dosimetry reports for all monitored personnel to determine if unnecessary exposures are being received.

Appendix F

Operating and Emergency Procedures

Name of Licensee_____

Operating Procedures

Training
Prior to handling and operating fixed gauges , authorized users will complete either a eight hour training course by the manufacturer of the device or Department approved course.

Personnel Dosimetry
- If personnel dosimetry is provided:
  - Always wear your assigned thermoluminescent dosimeter (TLD) or film badge whenever handing, transporting or operating a nuclear gauge.
  - Never wear another person's TLD or film badge.
    Personnel dosimetry will be worn at the chest or waist level. Badges will not be worn during non-occupational radiation exposures (e.g. medical or dental x-rays, etc.)
    Never store your TLD or film badge near the gauge.
  - The RSP will be immediately notified if personnel dosimetry is lost or damaged.

Availability of Procedures
- A complete and current copy of the operating and emergency procedures must be posted or if posting procedures is not practicable, a notice which briefly describes the procedures and states where they may be examined may be posed instead.

- Copies of the manufacturer's operation manual are maintained on file by the RSO for ready reference.

ALARA Philosopy
- All personnel involved with fixed gauges will commit to practice the ALARA philosophy – keep radiation exposure As Low As Reasonably Achievable. The objective is to reduce occupational and public exposures as far below regulatory limits as possible by means of good work practices.
- The following methods will be used to reduce dose:
  - Minimize the **TIME** spent in close proximity to the gauge (the shorter the time, the lower the dose). Work quickly. Return the gauge to storage when not needed.
  - Maximize the **DISTANCE** from the gauge (do not get closer than necessary.) Transport the gauge away from the driver.
  - Make use of available **SHIELDING** to reduce radiation

Security
- Post a radiation warning sign at each entryway to an area where it is possible to be exposed to the beam.

- Develop lock out procedures to prevent employees from entering the radiation beam during maintenance, repairs, or work in, on, or around the bin, tank, or hopper on which the device is mounted. These procedures should specify who will be responsible for ensuring that the lock-out procedures are followed. **Attach a copy of these "lock-out" procedures**.

- Always keep unauthorized persons away from the gauge.

- Prevent unauthorized access, removal, or use of the gauge.

- Reevaluate compliance with public dose limits and ensure proper security of gauges, after making changes affecting the gauge (e.g., changing the location of gauges, removing shielding, adding gauges, changing the occupancy of adjacent area,).

Transportation

- The fixed gauges will be transported per DOT regulations, which require specific labeling and surveying of the packages before transport. Refer to "Transportation" in "Material Guidance for Fixed Gauges Licenses" for additional transportation information.

Refer to Appendix Q – "Major DOT Regulations; Sample Shipping Documents, Placecards, Labels and Sample Bill of Lading" of Regulatory Guide 3.13 Radioactive, "Material Guidance for Fixed Gauges Licenses" for additional transportation information.

General Rules of Use

- Use the gauge 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.

- Test each gauge for proper operation of the on-off mechanism (shutter) and indicator, if any, at intervals not to exceed 6 months or as specified in the SSD certificate.

- Reevaluate compliance with public dose limits and ensure proper security of gauges, after making changes affecting the gauge (e.g., changing the location of gauges, 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 gauge.

Routine Maintenance

- Perform routine cleaning and maintenance according to the manufacturer's instructions and recommendations. A copy of the appropriate manufacturer's operation manual will be on hand and the maintenance instructions will be strictly followed.

- Non-routine maintenance or repair that requires the removal of the source is prohibited. Such operations will only be performed by the manufacturer or other specifically authorized persons.

Radiation Surveys

If damage is suspected, immediately notify the RSO, who will make arrangements to have the gauge surveyed as soon as possible. Refer to the emergency procedures for further instructions.

Emergency Procedures

In the event of a stolen, lost, or missing gauge, authorized users will immediately notify the Radiation Safety Office (RSO), who will contact the Department.

If the gauge becomes damaged or if any other emergency or unusual situation arises:

- Stop use of the gauge.
- Immediately secure the area and keep people away from the gauge until the situation is assessed and radiation levels are known. However, perform first aid for any injured individuals and remove them from the area only when medically safe to do so.
- If any equipment is involved, isolate the equipment 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 listed below of the situation:

  ***Radiation Safety Officer: _____**

  ***RSO Phone: (w)_____ (H)_____**

  Nebraska Health and Human Services Office of Radiological Health
  (402) 471-2168 (Monday-Friday 8AM – 5PM)

  Off Hours: Nebraska State Patrol (402) 479-4921
  (Ask to speak to the NEMA Duty Officer to report an incident involving radioactive materials.)

  *Fill in with (and update, as needed) the names and telephone numbers.

- Follow the directions provided by the person contacted above.

If damage should occur during transport:
At the earliest practical moment, the U.S. Dept. of Transportation will be notified of an accident that occurs during transport in which fire, breakage, spillage, or suspected contamination occurs involving shipment of radioactive materials, in accordance with 49 CFR 171.15. U.S. Department of Transportation Notification Number: (800) 424-8802.

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.
- Make necessary notifications to local authorities as well as the Department as required. (Even if not required to do so, you may report ANY incident to Department at (402) 471-2168) Department notification is required when gauges containing radioactive material are lost or stolen, when gauges are damaged or involved in incidents that result in doses in excess of 180 NAC 4-059 limits.
- Reports to the Department must be made within the reporting timeframes specified by the regulations.

Reporting requirements are found in 180 NAC 4-057 through 059 and 180 NAC 3-026.

Note: Copies of operating and emergency procedures must be posted at each location of use or if posting procedures is not practicable, a notice which briefly describes the procedures and states where they may be examined may be posted instead.

Copies of operating and emergency procedures should be provided to all gauge users.

Fixed Gauge Emergency Response Information

POTENTIAL HAZARDS

1) IMMEDIATE HAZARDS TO HEALTH

- External radiation hazard from unshielded radioactive material.
- Low-level radioactive material; little personal radiation hazard when shielded.
- Materials in special form are not expected to cause contamination in accidents.
- Some radioactive materials cannot be detected by commonly available instruments.
- Potential internal radiation hazard from inhalation, ingestion, or breaks in skin, only if special form capsule is breached.

2) FIRE OR EXPLOSION

- No risk of fire or explosion.
- Radioactivity does not change flammability or other properties of the materials.

EMERGENCY PROCEDURES

3) IMMEDIATE PRECAUTIONS

- Isolate hazard area and restrict access.
- Emergency response actions may be performed prior to any measurement of radiation; limit entry to shortest time possible.
- Notify local authorities and Nebraska's Health and Human Services Regulation and Licensure, Radiological Health Division of accident conditions.
- Detain uninjured persons, isolate equipment with suspected contamination, and delay cleanup until receiving instruction from Nebraska's Health and Human Services Regulation and Licensure, Radiological Health Division.

4) FIRE

- Do not move damaged containers; move undamaged containers out of fire zone.
- Small Fires: Dry Chemical, CO_2, water spray, or regular foam.
- Large Fires: Water spray, fog (flooding amounts).

5) SPILL OR LEAK

- Do not touch damaged containers or exposed contents.
- Damage to outer container may not affect primary inner container.
- Special form capsules are not expected to leak as a result of an accident or fire.

6) FIRST AID

- Use first aid treatment according to the nature of the injury.
- Advise medical personnel that victim may be contaminated with low-level radioactive material.
  Except for the injured, detain persons exposed to radioactive material until arrival or instruction of Nebraska's Health and Human Services Regulation and Licensure, Radioactive Materials Division.

CALL THE FOLLOWING FOR EMERGENCY ASSISTANCE:

RADIATION SAFETY OFFICER:

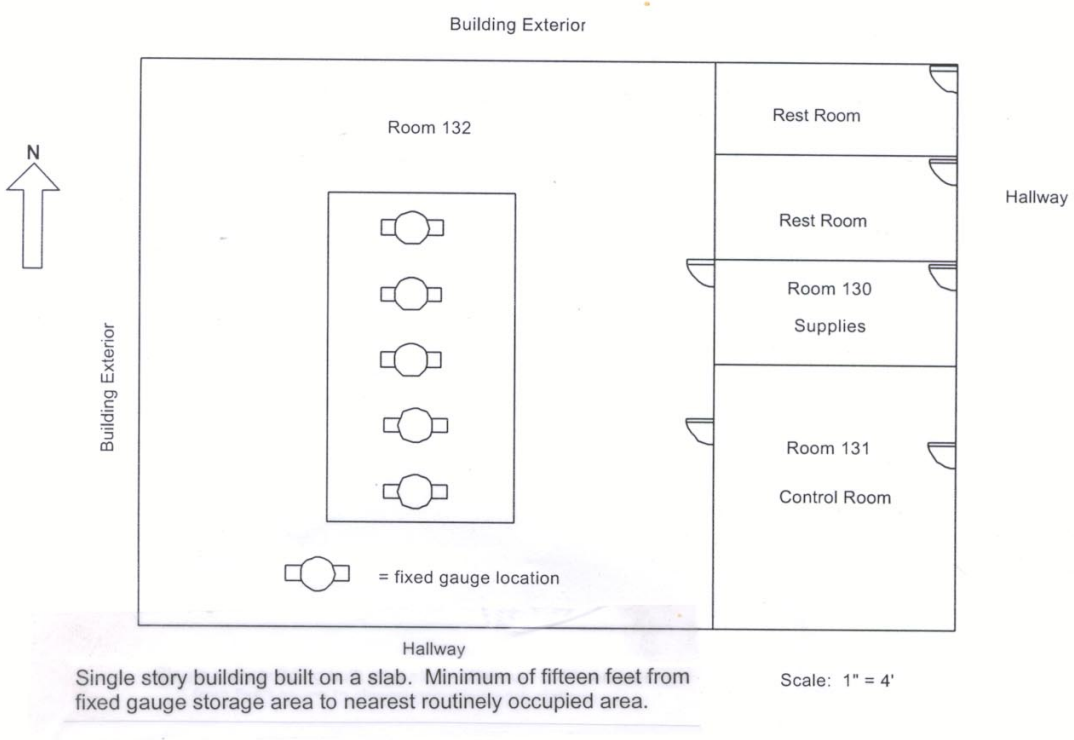
RSO TELEPHONE #:

Nebraska's DHHS, Radiological Health .....(402) 471-2168 (M-F 8AM to 5PM)
After hours- Nebraska State Patrol.....(402) 479-4921
(Ask to speak to the NEMA Duty Officer as you have an incident to report involving radioactive materials.)

Appendix G

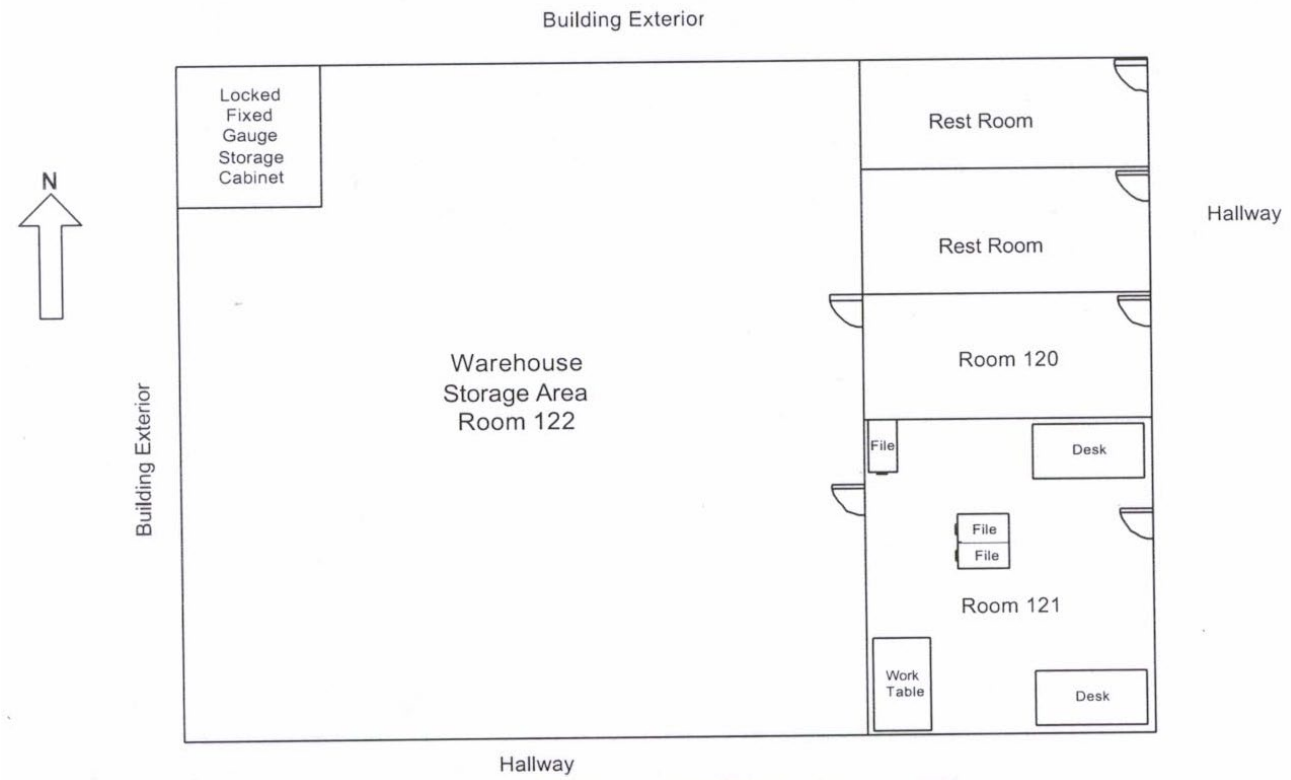
Model Facility Diagrams

EXAMPLE OF A FACILITY DIAGRAM FOR FIXED GAUGE USE



Note: Above graphic was not printed per scale.

EXAMPLE OF A FACILITY DIAGRAM FOR FIXED GAUGE STORAGE

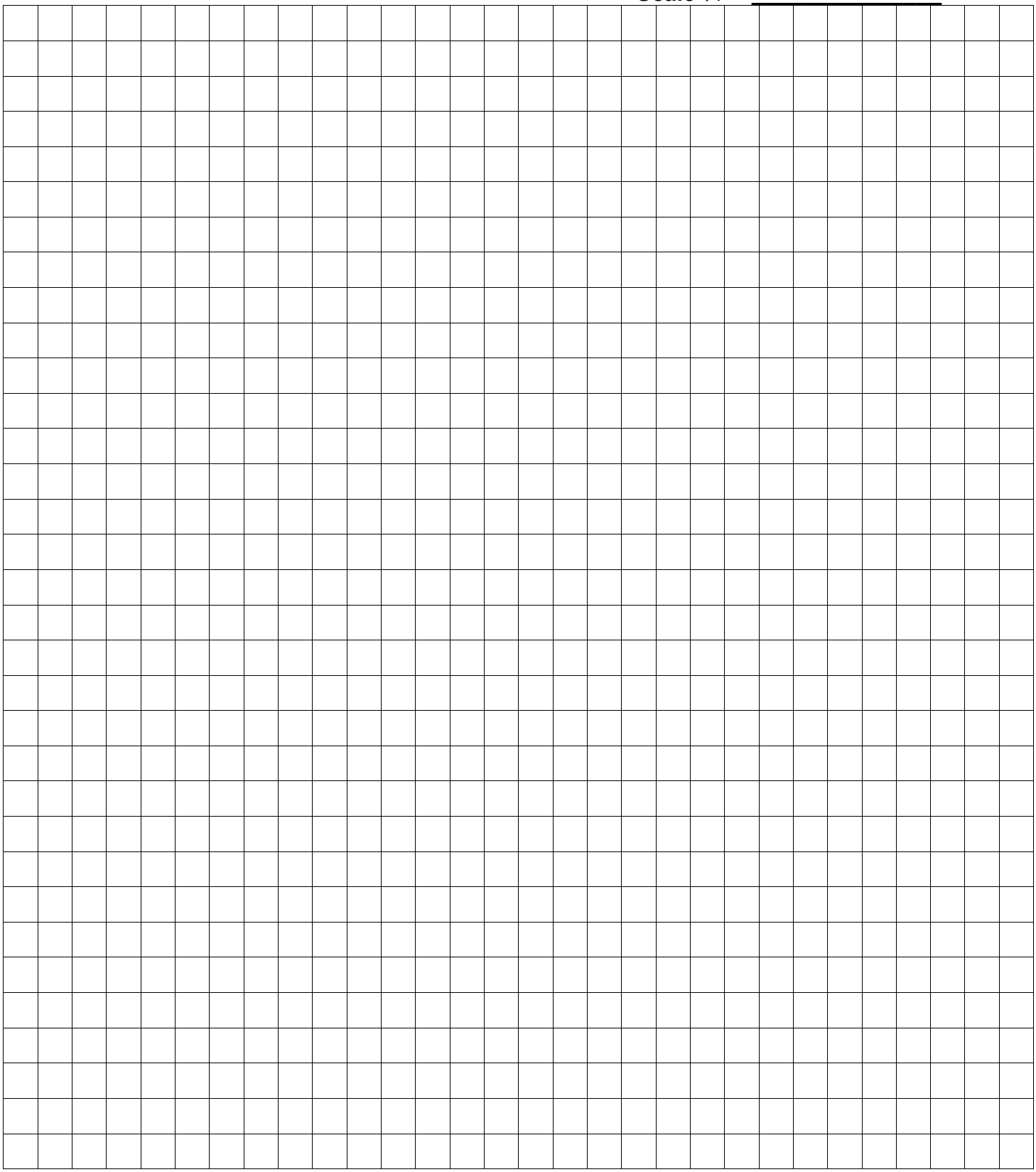


Single story building built on a slab. Minimum of fifteen feet from fixed gauge storage area to nearest routinely occupied area.

N

Facility Diagram

Scale ¼" =_____



Appendix H

Information Needed for Change of Ownership or Control Application

Appendix H

Information Needed for Change of Ownership or Control Application

The Department needs to be notified at least sixty days in advance of change of ownership or control. Licensees must provide full information and obtain the Department's prior written consent before transferring ownership or control of the license; some licensees refer to this as "transferring the license." The Department will review the responses to the information below and will then be able to determine if the licensee can submit a request for an amendment to the current license or if the licensee will need to submit a new application. This will be determined by the Department on a case-by-case basis. Provide the following information concerning changes of ownership or control by the applicant (transferor and/or transferee, as appropriate). If any items are not applicable, so state.

1. The new name of the licensed organization. If there is no change, the licensee should so state.

2. The new licensee contact and telephone number(s) to facilitate communications.

3. Any changes in personnel having control over licensed activities (e.g., officers of a corporation) and any changes in personnel named in the license such as radiation safety officer, authorized users, or any other persons identified in previous license applications as responsible for radiation safety or use of radioactive material. The licensee should include information concerning the qualifications, training, and responsibilities of new individuals.

4. An indication of whether the transferor will remain in non-licensed business without the license.

5. A complete, clear description of the transaction, including any transfer of stocks or assets, mergers, etc., so that legal counsel is able, when necessary, to differentiate between name changes and changes of ownership.

6. A complete description of any planned changes in organization, location, facility, equipment, or procedures (i.e., changes in operating or emergency procedures).

7. A detailed description of any changes in the use, possession, location, or storage of the radioactive materials.

8. Any changes in organization, location, facilities, equipment, procedures, or personnel that would require a license amendment even without the change of ownership.

9. An indication of whether all surveillance items and records (e.g., calibrations, leak tests, surveys, inventories, and accountability requirements) will be current at the time of transfer. Provide a description of the status of all surveillance requirements and records.

10. Confirmation that all records concerning the safe and effective decommissioning of the facility, pursuant to 180 NAC 3-018.07; public dose; and waste disposal by release to sewers, incineration, radioactive material spills, and on-site burials, have been transferred to the new licensee, if licensed activities will continue at the same location, or to the Department for license terminations.

11. A description of the status of the facility. Specifically, the presence or absence of contamination should be documented. If contamination is present, will decontamination occur before transfer? If not, does the successor company agree to assume full liability for the decontamination of the facility or site?

12. A description of any decontamination plans, including financial assurance arrangements of the transferee, as specified in 180 NAC 3-018. Include information about how the transferee and transferor propose to divide the transferor's assets, and responsibility for any cleanup needed at the time of transfer.

13. Confirmation that the transferee agrees to abide by all commitments and representations previously made to Department by the transferor. These include, but are not limited to: maintaining decommissioning records required by 180 NAC 3-018.07; implementing decontamination activities and decommissioning of the site; and completing corrective actions for open inspection items and enforcement actions.

    With regard to contamination of facilities and equipment, the transferee should confirm, in writing, that it accepts full liability for the site, and should provide evidence of adequate resources to fund decommissioning; or the transferor should provide a commitment to decontaminate the facility before change of control or ownership.

    With regard to open inspection items, etc., the transferee should confirm, in writing, that it accepts full responsibility for open inspection items and/or any resulting enforcement actions; or the transferee proposes alternative measures for meeting the requirements; or the transferor provides a commitment to close out all such actions with the Department before license transfer.

14. Documentation that the transferor and transferee agree to the change in ownership or control of the radioactive material and activity, and the conditions of transfer; and the transferee is made aware of all open inspection items and its responsibility for possible resulting enforcement actions.

15. A commitment by the transferee to abide by all constraints, conditions, requirements, representations, and commitments identified in the existing license. If not, the transferee must provide a description of its program, to ensure compliance with the license and regulations.

Appendix I

Criteria for Acceptable Training Courses for Fixed Gauge Users

Appendix I
Criteria for Acceptable Training Courses for Fixed Gauge Users

Handling and use of fixed gauges is restricted to an Authorized User (AU) or requires the direct supervision of an Authorized User. Authorized user is required to complete an eight-hour course provided by the manufacturer of the device or any Department approved course. (180 NAC 15-027)

Documentation of fixed gauge radiation safety training must be maintained on file for inspection.

Criteria for acceptable training course for fixed gauge users:

Courses must be at least eight hours in length.

Radiation Safety and Regulatory Requirements emphasizing practical subjects important to safe use of gauges:

- **Types and Characteristics of Radiation:** Model of the Atom; Alpha, Beta, X-ray, and Neutron Radiation; Exposure: Natural versus Man-made Radiation; Irradiation versus Contamination/Internal vs. External; Radioactive Material Used in Fixed Gauges
- Units of Radiation Dose and Quantities of Radioactivity: Curies, Rad, Rem, Roentgen; Prefixes, SI Units
- **Basic Math and Calculations Related to Radioactivity:** Radioactive Decay; Dose Rates; Inverse Square Law; and Half-value Layers
- **Biological Effects of Radiation:** Acute, Chronic and Genetic Effects of Exposure; Radiation Protection Standards, The ALARA Philosophy
- Radiation Levels from Radioactive Sealed Sources
- Methods of Controlling Radiation Dose: Time, Distance and Shielding
- **State and Federal Regulations:** Material control and accountability, applicable regulations, annual audit of safety program
- Licensing and Inspections by regulatory Department
- Employee protection
- Need for complete and accurate information
- Incidents
- Inventory
- Record keeping
- Transfer/disposal requirements
- Transportation

Practical explanation of fixed gauge theory and operation:

- **Radiation Detection Instruments:** Types of Radiation Survey Meters; Operation, Calibration and Limitation; and Monitoring Techniques
- **Operating procedures**: Training and supervision, Personnel monitoring, Availability of procedures, Security, ALARA, Inventory, Record Keeping, Posting Requirements, General Rules of Use
- **Emergency procedures**: Preventive measures, Emergency response, Notification Requirements, Case Histories
- Lockout procedures
- Maintenance procedures
- Transportation procedures
- **Radiation detection instruments**: Types of radiation survey meters, Operation, Calibration and limitation, Monitoring techniques

Practical Training:

- Field training emphasizing radiation safety, including test runs of:
- Setting up and making measurements with the gauge
- Controlling and maintaining surveillance of the fixed gauge
- Performing routine cleaning and lubrications
- Packaging and transporting the gauge
- Storing the gauge
- Following emergency procedures

Q&A Session

Written Exam

Exam Review

Training Assessment

Management will ensure that proposed AUs are qualified to work independently with each type of gauge with which they may work. Management will ensure that proposed RSO's are qualified to work independently with and are knowledgeable of the radiation safety aspects of all types of gauges to be possessed by the applicant. This may be demonstrated by written or oral examination or by observation.

Course Examination

25-50 question, closed-book written test -- 70 percent grade

- Emphasis on radiation safety of fixed gauge on controlled access, storage, use, sealed source location, maintenance, and transportation, rather than the theory and art of making fixed gauge measurements
- Review of correct answers to missed questions with prospective gauge user immediately following the scoring of the test

Department Approved Course for Authorized Users

The course examination and instructor qualifications listed below will be used by the Department to evaluate the approval of a course, plus the course outline listed above.

Course Instructor Qualifications

Instructor should have either:

- Bachelor's degree in a physical or life science or engineering
- Successful completion of a fixed gauge user course
- Successful completion of an 8-hour radiation safety course AND
- 8 hours hands-on experience with fixed gauges
  OR
- Successful completion of fixed gauge user course
- Successful completion of 40-hour radiation safety course; AND
- 30 hours of hands-on experience with fixed gauges.
  OR
- The applicant may submit a description of alternative training and experience for the course instructor.

Note: Additional training is required for those applicants intending to perform non-routine operations such as installation, initial radiation survey, repair, and maintenance of components related to the radiological safety of the gauge, gauge relocation, replacement, and disposal of sealed sources, alignment, or removal of a gauge from service. See Appendix P - "Non-Routine Operations."

Appendix J

Sample SSD Registration Certificate

Sample SSD Registration Certificate

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
AMENDED IN ENTIRETY

NO: DATE: PAGE 1 OF 7

DEVICE TYPE: Pipe Wall Thickness Caliper

MODEL: Tube Wall Caliper

MANUFACTURER/DISTRIBUTOR:

SEALED SOURCE MODEL DESIGNATION:

1. 3M Model 4f6s or 4F6H
2. Gulf Nuclear Model CSV
3. Amersham Model CDC 711m

ISOTOPE: 1. cesium-137

MAXIMUM ACTIVITY:

1. 1.5 curies
2. 1.5 curies
3. 1.5 curies

LEAK TEST FREQUENCY: 6 Months

PRINCIPAL USE: Gamma Gauges (D)

CUSTOM DEVICE: ___ YES X NO

CUSTOM USER:

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

AMENDED IN ENTIRETY

NO: DATE PAGE 2 OF 7

DEVICE TYPE: Pipe Wall Thickness Caliper

DESCRIPTION: This device has an exterior housing that is doughnut shaped with a center hole that will accommodate pipe sizes from 1 inch to 17 inches OD but be increased by enlargement of the cylinder through which the pipe passes. The housing is mounted on its edge so the pipe can pass through its center. The device can be used as a stationary or rotating unit at either a fixed location or in a mobile van.

Inside the housing, a tungsten source holder emits a collimated beam of radiation through the pipe to be inspected to a detected to a detector on the other side of the housing which has a beam stop behind it. The source holder and detector are oppositely mounted on a frame inside the housing which rotates about the pipe as the pipe is conveyed through the device. Flaws in this section of pipe are detected by the variation in beam attenuation.

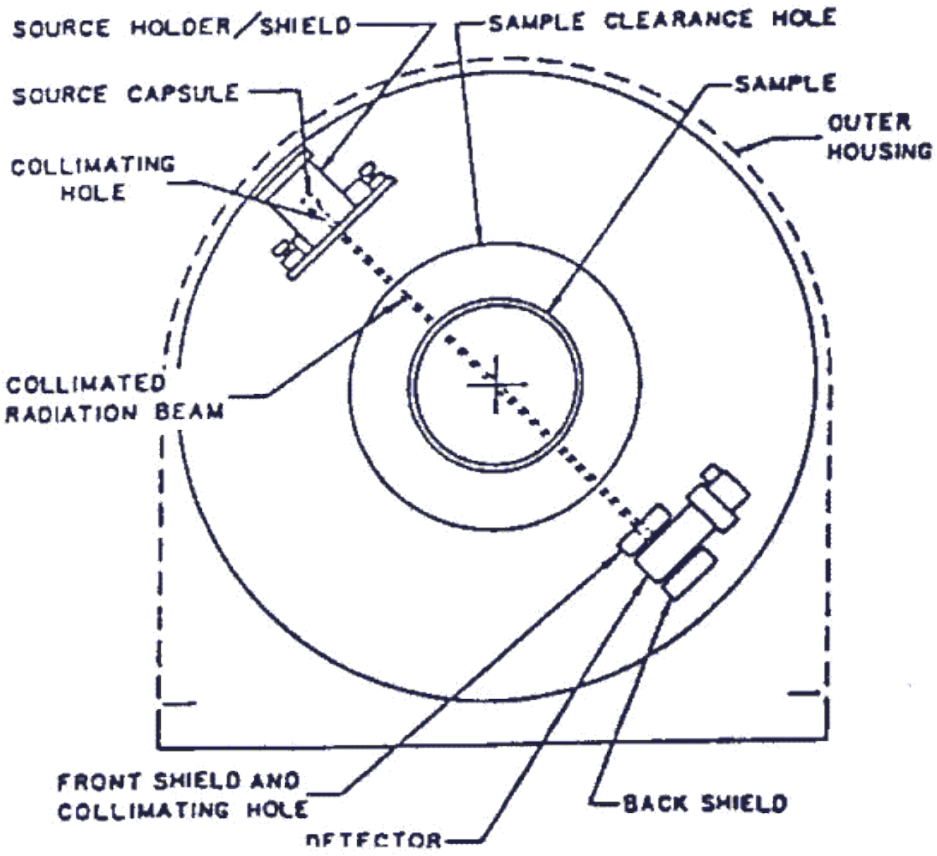


Figure 1: Functional Sketch of the Model

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

AMENDED IN ENTIRETY

NO: DATE: PAGE 3 OF 7

DEVICE TYPE: Pipe Wall Thickness Caliper

DESCRIPTION (Continued): The source holder is made of a solid tungsten body with a tungsten slide shutter which aligns a beam collimation hold with the source when in operation. The shutter can be locked in either the "ON" or "OFF" position. When in the "ON" position, red is visible on the back cover, while in the "OFF" position black is indicated. The source is inaccessible to the user and cannot be removed unless four security wire seals are broken, and the respective cover lugs removed.

LABELING: The outer housing and the source holder are both labeled with the conventional radioactive symbol. Another source holder label also includes isotope, number of curies, date and serial number as seen below.

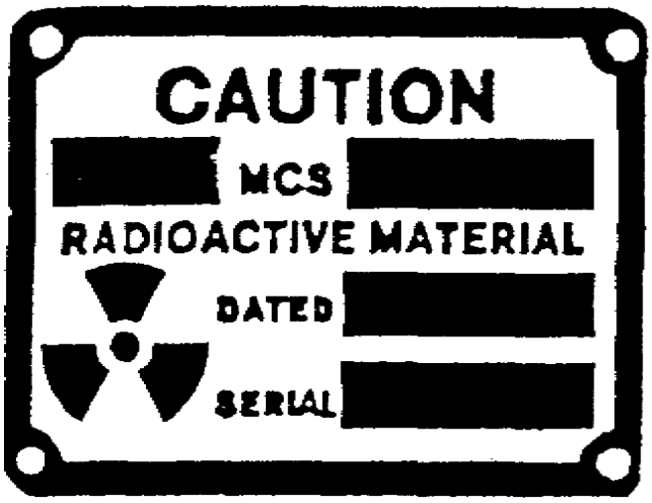


Figure No. 2 – Model

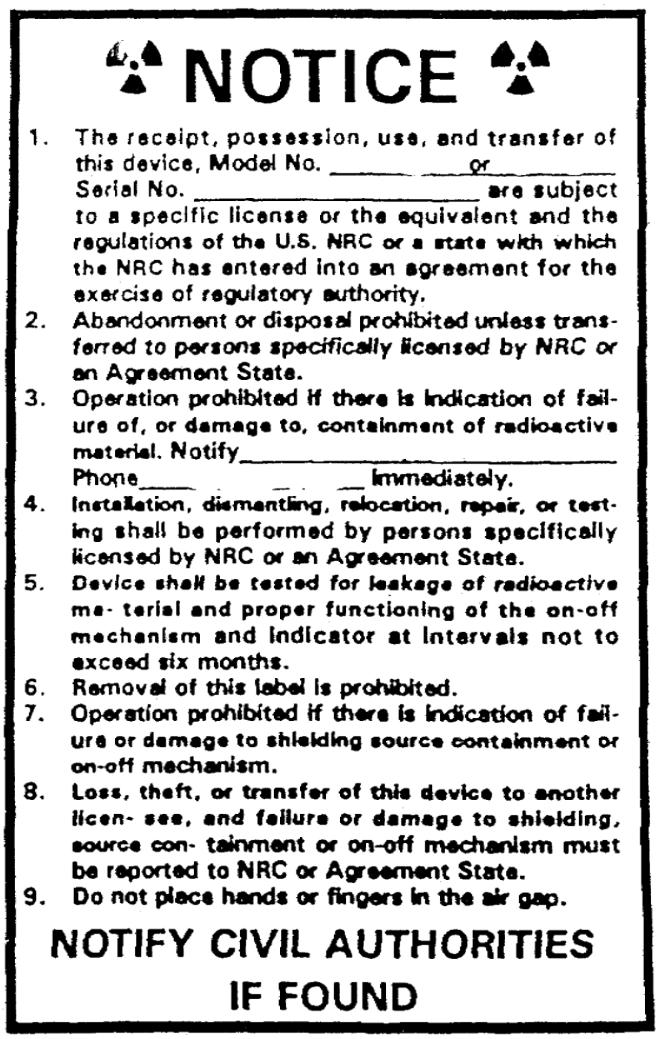


Figure No. 3: Label on Outer Housing

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
AMENDED IN ENTIRETY

NO: DATE: PAGE 4 OF 7

DEVICE TYPE: Pipe Wall Thickness Caliper

CONDITIONS OF NORMAL USE: The Model_____ is designed to provide wall thickness measurements of oilfield pipe, from a portable platform as part of a fixed facility in a pipe yard. It is designed to be used in environmental conditions compatible with man. Because of its construction, the source holder will withstand the extreme conditions present during a fire and/or explosion.

PROTOTYPE TESTING: This device is a modification tungsten shielding to replace the more cumbersome lead shielding of the Model_____. This device, also, has been in operation for more than 17 years. During this time three pipe inspection units containing the Model _____ tube wall caliper. Two units were destroyed by fire and one unit was destroyed in a vehicle accident. All three source holders were removed, cleaned and reinstalled in new pipe inspection units with no loss of integrity.

EXTERNAL RADIATION LEVELS: Maximum surface readings are approximately 70 mR/hr on the side of the source holder. Rigid quality control of all components is maintained throughout the manufacturing process. When construction of the source holder is complete, it is sent to another sub-contractor for source installation and inspected once again before installation into the pipe inspection unit.

QUALITY ASSURANCE AND CONTROL: _____ sub-contracts all construction of component parts of the source holder. Rigid quality control of all components is maintained throughout the manufacturing process. When construction of the source holder is complete, it is sent to another sub-contractor for source installation and inspected once again before installation into the pipe inspection unit.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

1. Installation, dismantling, relocation, repair, or testing must be performed only by persons specifically licensed to perform such operations.
2. Leak testing of the source must be performed at intervals not to exceed 6 months
3. Operation of this device must be performed only by persons who have received radiation safety training by the manufacturer, or another person specifically authorized by the Commission, an Agreement State, or a Licensing State to present such training. Routine maintenance on the electronics of this device may be performed by the licensee.
4. Routine maintenance on the source holder by the licensee may be authorized if adequate procedures for securing the shutter mechanism are provided.

SAFETY ANALYSIS SUMMARY: Although radiation fields at the surface on the side of the source holder are relatively high, the metal housing of the device used to protect the operator form the moving parts will also prevent the operator from excessive exposures.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

AMENDED IN ENTIRETY

NO: DATE: PAGE 5 OF 7

DEVICE TYPE: Pipe Wall Thickness Caliper

SUMMARY: Review of the information provided by _____ indicates that the design and construction exceeds the ANSI classification for industrial gauging devices. Because these devices were intended for use in an environment compatible with man, the source and source holder will maintain their integrity during all applicable accident conditions.

REFERENCES: This summary was prepared with the aid of _____ letters dated associated drawings, documents, and procedures.

DATE: _____ REVIEWED BY: _____
DATE: _____ REVIEWED BY: _____

ISSUING DEPARTMENT:

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

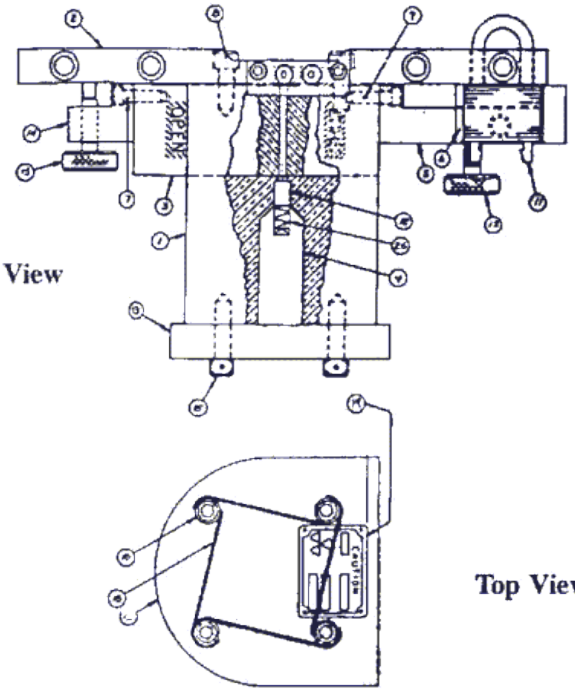
AMENDED IN ENTIRETY

NO: DATE: PAGE 6 OF 7

DEVICE TYPE: Pipe Wall Thickness Caliper

DIAGRAM:

DIAGRAM:



Legend

1. Main Source Sheild
2. Base Plate
3. Shutter Block
4. Core Insert
5. Block
6. Yoke
7. Bolt
8. Bolt
9. Bolt
10. Locking Pin
11. Lock Assembly
12. Sealed Source
13. Top Plate
14. Block
15. Anchor Screw
16. Bolt for Top Plate
17. Not Used
18. Lockwire
19. Source Holder I.D. Tag
20. Source holder Decal
21. Block
22. Maintenance Block
23. Bolt
24. Setscrew
25. Capscrew
26. Compression Spring

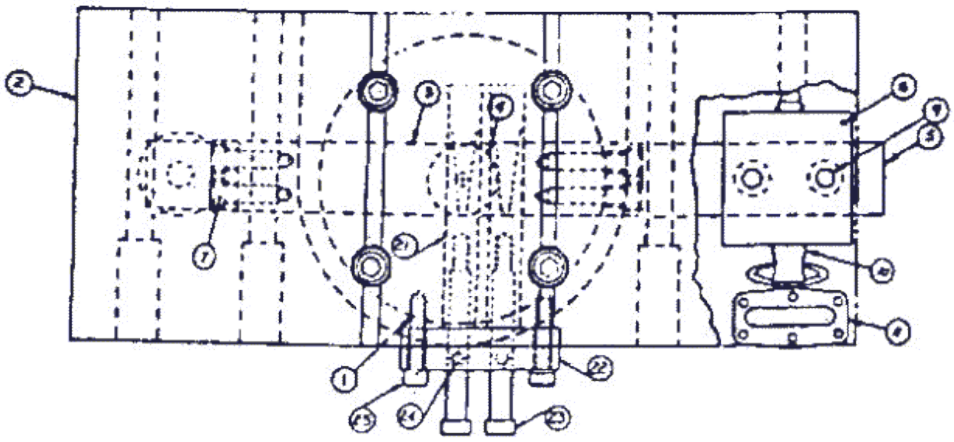
REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE

AMENDED IN ENTIRETY

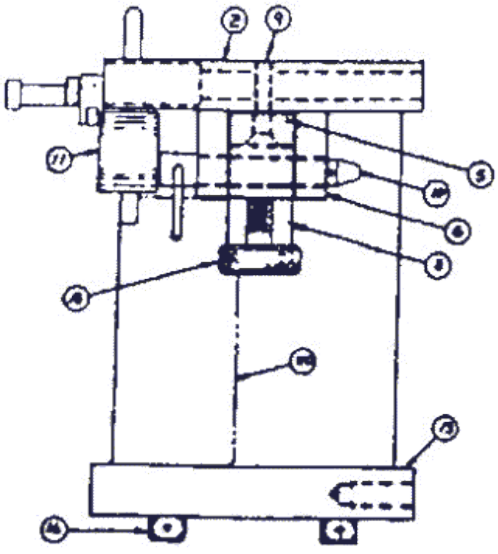
NO: DATE: PAGE 7 OF 7

DEVICE TYPE: Pipe Wall Thickness Caliper

DIAGRAM:



Bottom Plate View



Side View, 90° Rotation

Appendix K

RESERVED

Appendix L

Survey Instrument Calibration Program

Appendix L
Survey Instrument Calibration Program
Training

Before independently calibrating survey instruments, an individual should complete both classroom and on-the-job training as follows:

- 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 using and measuring radioactivity
  - Biological effects of radiation.
- On-the-job training will be considered complete if the individual has:
  - Observed authorized personnel performing survey instrument calibration; and
  - Conducted survey meter calibrations under the supervision, and in the physical presence of an individual already authorized to perform calibrations

Facilities and Equipment

- To reduce doses received by individuals not calibrating instruments, calibrations will be conducted in an isolated area of the facility or at times when no one else is present
- Individuals conducting calibrations will wear assigned dosimetry
- Individuals conducting calibrations will use a calibrated and operable survey instrument to ensure that unexpected changes in exposure rates are identified and corrected

Model Procedure for Calibrating Survey Instruments

- A radioactive sealed source(s) will be used for calibrating survey instruments, and this source will:
  - Approximate a point source
  - Have its apparent source activity or the exposure rate at a given distance traceable by documented measurements to a standard certified to be within ± 5% accuracy by National Institutes of Standards and Technology (NIST)
  - Contain a radionuclide which emits radiation of identical or similar type and energy as the sealed sources that the instrument will measure
  - Be strong enough to emit a radiation field that is representative of the field being emitted by the gauge. For calibration of instruments intended to measure gamma radiation, the exposure rate should be at least 30 mR/hour (7.7 microcoulomb/kilogram per hour) at 100 cm [e.g., 3.1 gigabecquerels (85 millicuries) of Cs-137 or 780 megabecquerels (21 millicuries) of Co-60].
- Inverse square and radioactive decay laws must be used to correct changes in exposure rate due to changes in distance or source decay.
- record must be made of each survey meter calibration.
- A single point on a survey meter scale may be considered satisfactorily calibrated if the indicated exposure rate differs from the calculated exposure rate by less than ±20%.
- There are three kinds of scales frequently used on radiation survey meters. They are calibrated either as described in ANSI N323A-1996, "American National Standard Radiation Protection Instrumentation Test and Calibration - Portable Survey Instruments," or as follows:
  - Meters on which the user selects a linear scale must be calibrated at not fewer that two points on each scale. The points will be at approximately 1/3 and 2/3 of the decade.
  - Meters that have a multidecade logarithmic scale must be calibrated at one point

(at the least) on each decade and not fewer than two points on one of the decades. Those points will be approximately 1/3 and 2/3 of the decade.
    - Meters that have an automatically ranging digital display device for indicating exposure rates must be calibrated at one point (at the least) on each decade and at no fewer than two points on one of the decades. Those points should be at approximately 1/3 and 2/3 of the decade.
- Readings above 200 mR/hour (50 microcoulomb/kilogram per hour) need not be calibrated. However, higher scales should be checked for operation and approximately correct response.
- Survey meter calibration reports will indicate the procedure used and the results of the calibration. The reports will include:
    - The owner or user of the instrument
    - A description of the instrument that includes the manufacturer's name, model number, serial number, and type of detector
    - A description of the calibration source, including the exposure rate at a specified distance on a specified date, and the calibration procedure
    - For each calibration point, the calculated exposure rate, the indicated exposure rate, the deduced correction factor (the calculated exposure rate divided by the indicated exposure rate), and the scale selected on the instrument
    - The exposure reading indicated with the instrument in the "battery check" mode (if available on the instrument)
    - For instruments with external detectors, the angle between the radiation flux field and the detector (i.e., parallel or perpendicular)
    - For instruments with internal detectors, the angle between radiation flux field and a specified surface of the instrument
    - For detectors with removable shielding, an indication whether the shielding was in place or removed during the calibration procedure
    - The exposure rate from a check source, if used
    - The signature of the individual who performed the calibration and the date on which the calibration was performed.
- The following information will be attached to the instrument as a calibration sticker or tag:
    - The source that was used to calibrate the instrument
    - The proper deflection in the battery check mode (unless this is clearly indicated on the instrument)
    - For each scale or decade not calibrated, an indication that the scale or decade was checked only for function but not calibrated
    - The date of calibration and the next calibration due date
    - The apparent exposure rate from the check source, if used

Appendix M
Dosimetry-related Guidance

Part 1:
Guidance for Demonstrating that Unmonitored Individuals are Not Likely to Exceed 10 Percent of the Allowable Limits

&

Part 2:
Guidance for Demonstrating that Individual Members of the Public Will Not Receive Doses Exceeding the Allowable Limits

Appendix M
Dosimetry-related Guidance

Part 1:
Guidance for Demonstrating that Unmonitored Individuals are Not Likely to Exceed 10 Percent of the Allowable Limits

Dosimetry is required for individuals likely to receive, in 1 year from sources external to the body, a dose in excess of 10% of the applicable regulatory limits in 180 NAC 4-005. To demonstrate that dosimetry is *not* required, a licensee needs to have available, for inspection, an evaluation to demonstrate that its workers are not likely to exceed 10% of the applicable annual limits.

The most common way that individuals *might* exceed 10% of the applicable limits is by performing frequent routine cleaning and lubrication of gauges. Thus, a licensee would need to evaluate the doses its workers might receive in performing these tasks to assess whether dosimetry is required.

Example

One gauge manufacturer has estimated the doses to the extremities and whole body of a person replacing the assay plate on one of its series of gauges. Each gauge in the series is authorized to contain up to 7.4 gigabecquerels (200 millicuries) of Cs-137. The manufacturer based its estimate on observations of individuals performing the recommended procedure according to good radiation safety practices. The manufacturer had the following types of information:

- Time needed to perform the entire procedure (e.g., 15 minutes)
- Expected dose rate received by the whole body of the individual, associated with the shielded source and determined using measured or manufacturer-determined data (e.g., 0.02 mSv/hr [2 mrem/hr] at 46 cm [18.1 in] from the shield)
- Time the hands were exposed to the shielded source (e.g., 6 min)
- Expected dose rate received by the extremities of the individual, associated with the shielded source, and determined using measured or manufacturer-determined data on contact with the shield (e.g., 0.15 mSv/hr [15 mrem/hr])

From this information, the manufacturer estimated that the individual performing each routine cleaning and lubrication could receive the following:

- Less than 0.005 mSv (0.5 mrem) TEDE (whole body) and
- 0.015 mSv (1.5 mrem) to the hands.

The applicable TEDE (whole body) limit is 50 mSv (5 rems) per year and 10% of that value is 5 mSv (500 millirems) per year. If one of these procedures delivers 0.005 mSv (0.5 mrem), then an individual could perform 1,000 of these procedures each year and remain within 10% of the applicable limit.

The applicable shallow-dose equivalent (SDE) (extremities) is 500 mSv (50 rems) is 500 mSv (50 rems) per year and 10% of that value is 50 mSv (5 rems or 5000 millirems) per year. If one

of these procedures delivers 0.015 mSv (1.5 mrem), then an individual could perform 3,333 of these procedures each year and remain within 10% of the applicable limit.
Based on the above specific situation, no dosimetry is required if a worker performs fewer than 1,000 routine maintenance procedures per year.

GUIDANCE TO LICENSEES
Licensees who wish to demonstrate that they are not required to provide dosimetry to their workers need to perform prospective evaluations similar to that shown in the example above. The expected dose rates, times, and distances used in the above example may not be appropriate to individual licensee situations. In their evaluations, licensees need to use information appropriate to the type(s) of gauge(s) they intend to use; this information is generally available from the gauge manufacturer, or the SSD Registration Certificate maintained by the NRC and Agreement States.

Table M1-1 may be helpful in performing a prospective evaluation.

Licensees should review evaluations periodically and revise them as needed. Licensees need to check assumptions used in their evaluations to ensure that they continue to be up-to-date and accurate. For example, if workers become lax in following good radiation safety practices, perform the task more slowly than estimated, work with new gauges containing sources of different activities or radionuclides, or use modified procedures, the licensee would need to conduct a new evaluation.

Table M1-1, Dosimetry Evaluation

Dosimetry Evaluation for _____ Model _____ Fixed Gauge			
A.	Time needed to perform the entire routine cleaning and lubrication procedure on the gauge	_____minutes/60	_____hour
B.	Expected whole body dose rate received by the individual, determined using exposure rates measured on contact with the gauge while the sealed source is in the shielded position.		_____mrem/hr
C.	Time the <u>hands</u> were exposed to the unshielded source	_____minutes/60	_____hour
D.	Expected extremity dose rate which the individual will encounter, determined using measured or manufacturer-provided data for the unshielded source at the typical distance from the hands to the unshielded source.		_____mrem/hr
Formula: **(_____#hours in Row A) x (_____mrem/hr in Row B) = (_____estimated mrem) x (_____# of clean and lubrications conducted each year) = _____ mrem *Whole Body Dose Equivalent**			
Formula: **(_____#hours in Row C) x (_____mrem/hr in Row D) = (_____estimated mrem) x (_____# of clean and lubrications conducted each year) = _____ mrem **Extremity Dose Equivalent**			
Whole Body Dose Equivalent ***less than 500 mrem requires no dosimetry ****Extremity Dose Equivalent ***<u>less than</u>*** 5000 mrem requires no dosimetry			

Appendix M, Part 2

Guidance for Demonstrating that Individual Members of the Public will not Receive Doses Exceeding the Allowable Limits

Appendix M, Part 2
Guidance for Demonstrating that Individual Members of the Public will not Receive Doses Exceeding the Allowable Limits

Licensees must ensure that:

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

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

- 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 nonradioactive 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 regulation. Calculations or a combination of calculations and measurements (e.g., using an environmental TLD) are often used to prove compliance.

CALCULATIONAL METHOD

For ease of use by most fixed gauge licensees, the examples in this Appendix use conventional units. The conversions to SI units are as follows: 1 ft = 0.305 m; 1 mrem = 0.01 mSv.
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:

- each gauge is a point source;
- typical radiation levels encountered when the source is in the shielded position are taken from either the Sealed Source & Device (SSD) Registration Certificate or the manufacturer's literature; and
- 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 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 ABC Bottling, Inc., a fixed gauge licensee. Yesterday, while on a walk-through during product changeover, the company's president noted that three new gauges will be very close to a bottling control panel where a quality control supervisor, a worker who does not work with fixed gauges, works. The company's president asked Joe, the Radiation Safety Officer (RSO), to determine if the company is complying with Department's regulations.

Joe measures the distances from each gauge to the bottling control panel and looks up in the manufacturer's literature the radiation levels individuals would encounter for each gauge. Figure M1 is Joe's sketch of the areas in question, and Table M2-1 summarizes the information Joe has on each gauge.

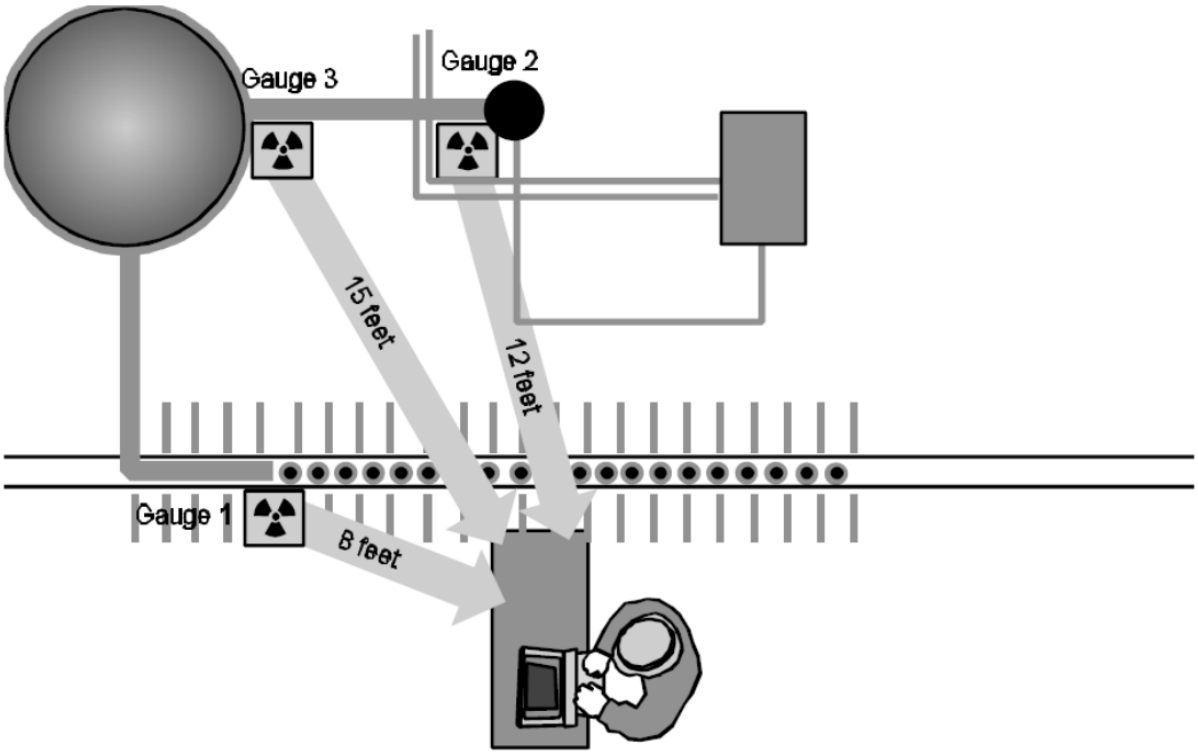


Figure M1**: Diagram of Bottling Line and Fixed Gauges.** *This sketch shows the areas described in Examples 1 and 2.*

Table M2-1, Information Known about Each Gauge

DESCRIPTION OF KNOWN INFORMATION	GAUGE 1	GAUGE 2	GAUGE 3
How gauge is located	Gauge on bottling line	Gauge on main feed line	Gauge on tank
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 bottling control panel may be sufficient to show compliance with the regulation in 180 NAC 4-013. So, taking a worst-case approach, he assumes: 1) the gauges are constantly present (i.e., 24 hr/d), 2) all three gauges are on (i.e., shutters are open), and 3) a quality control (QC) supervisor, a worker who does not work with the fixed gauges, is constantly sitting at the control panel (i.e., 24 hr/d). Joe proceeds to calculate the dose the QC supervisor might receive hourly and yearly from each gauge as shown in Tables M2-2, M2-3, and M2-4 below.

Table M2-2, 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 bottling control panel 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 the worker at the bottling control panel**, 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 M2-3, 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 bottling control panel 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 worker at the bottling control panel**, 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 M2-4 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 bottling control panel in a 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 a worker at the bottling control panel, **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 M2-5, Calculational Method, Part 1---Total Hourly and Annual Dose Received from Gauges 1, 2, and 3

Step No.	Description	Gauge 1	Gauge 2	Gauge 3	Sum
7	**TOTAL HOURLY DOSE RECEIVED** from Step 5 of Tables M2-3, M2-4, and M2-5, in mrem in an hour	0.031	0.056	0.08	0.031 + 0.056 + 0.08 = **0.167**
8	**TOTAL ANNUAL DOSE RECEIVED** from Step 6 of Tables M2-3, M2-4, and M2-5, in mrem in a year	272	491	701	272 + 491 + 701 = **1464**

NOTE: **The Sum in Step 7 demonstrates compliance with the 2 mrem in a 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 QC supervisor is not at the bottling control panel 24 hr/d. He decides to make a realistic estimate of the number of hours the QC supervisor would be present at the bottling control panel, keeping his other assumptions constant (i.e., the gauges are constantly present (i.e., 24 hr/d), all three gauges remain on (i.e., shutter is open). He then recalculates the annual dose received.

Table M2-6, 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., worker present at bottling control panel 5 hr/day; the remainder of the day the worker is away from the area performing other duties that are not in the vicinity of gauges) B. Average number of days per week in area (e.g., worker is part time and works 3 days/week) C. Average number of weeks per year in area (e.g., worker works all year)	5 3 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 x 3 x 52 = **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 x 780 = **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 Gauge 3 will only be used on the process line during product changeovers and Gauge 2 has different radiation levels depending on whether the gauge is in the on or off position (i.e., shutter is open or closed). As he examines the situation, he realizes he must consider each gauge individually.

Table M2-7, Calculational Method, Part 3---Summary of Information

INFORMATION ON WHEN GAUGES ARE PRESENT IN THE STORAGE AREA:

- **Gauge 1:** operates continuously (24 hrs/day) on the bottling line.
- **Gauge 2:** operates (in the "on" position) while the tank is being filled, approximately 1 hour during the time the worker is present. When the pipe is not filling the tank, the gauge is in the "off" position. While in the "off" position, the radiation level around the gauge drops to 2 mrem/hr at 1ft, one-fourth of the radiation level as when the gauge is in the "on" position.
- **Gauge 3:** is only used on the process line during product changeovers, 4 weeks per year. While affixed, it operates continuously (24 hrs/day).

INFORMATION FROM EXAMPLE 1, PART 2, ON WHEN THE WORKER IS PRESENT AT THE BOTTLING CONTROL PANEL:

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

Table M2-8, Calculational Method, Part 3---Annual Dose Received from Gauges 1, 2, and 3

Step No.	Description	GAUGE 1	GAUGE 2 "ON'	GAUGE 2 "OFF"	GAUGE 3
12	Average number of **hours per day** gauge operates when worker is present at the bottling control panel	**5**	**1**	**5**	**5**
13	Average number of **days per week** gauge operates when worker is present at the bottling control panel	**3**	**3**	**3**	**3**
14	Average number of **weeks per year** gauge operates when worker is present at the bottling control panel	**52**	**52**	**32**	**4**
15	Multiply the results of Step 12 by the results of Step 13 by the results of Step 14 = **TOTAL hours each gauge operates when worker is present at the bottling control panel**	5 x 3 x 52 = **780**	1 x 3 x 52 = **156**	4 x 3 x 52 = **624**	5 x 3 x 4 = **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 x 0.031 = **24**	156 x 0.056= **8.7**	624 x (0.056/4) = **8.7**	312 x 0.08 = **4.8 in mrem in a year**

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 OPERATES**, in mrem in a year	24 + 8.7 + 8.7 + 4.8 = **46.2**

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 operates are accurate, revise the assumptions as needed, and recalculate using the new assumptions
- Calculate the effect of any shielding located between the gauges and the bottling control panel -- such calculation is beyond the scope of this Appendix
- Take corrective action (e.g., add shielding, move the bottling control panel) and perform new calculations to demonstrate compliance
- Train the QC supervisor as required by 180 NAC 10-003.

Note that in the example, Joe evaluated the unrestricted area at the bottling control panel. 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., adding a gauge to the process line, changing the QC supervisor's schedule, or changing the estimate of the portion of time spent at the bottling control panel) and to perform additional evaluations, as needed.

RECORD KEEPING: 180 NAC 4-053 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. 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.

Licensees may also choose to use environmental TLDs. 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 rem/yr) limit. If licensees 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. 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.

Example 2

As in Example 1, Joe is the RSO for ABC Bottling, Inc., a fixed gauge licensee. The company has three gauges located near a bottling control panel which is operated by a worker who does not work with the fixed gauges. See Figure M-1 and Table M2-1 for information. Joe wants to see if the company complies with the public dose limits at the bottling control panel.

Joe placed an environmental TLD badge at the bottling control panel for 30 days. The TLD processor sent Joe a report indicating the TLD received 100 mrem.

Table M2-10, Combination Measurement-Calculational Method

Step No.	Description	Input Data and Results
	PART 1	
1	**Dose** received by ***TLD***, in mrem	**100**
2	**Total hours *TLD*** 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 regulations.**	
	PART 2	
	At this point Joe can adjust for a realistic estimate of the time the worker spends at the bottling control panel 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 adjust for realistic estimates of the time spent in the area of concern as in Part 3 of Example 1. (Recall that the TLD measurement was made while all the gauges were operating, i.e., 24 hr/d for the 30 days that the TLD was in place.)	

Appendix N

Typical Incident Notifications Required for Fixed Gauge Licenses

Appendix N

Typical Incident Notifications Required for Fixed Gauge Licenses

Event	Telephone Notification	Written Report	Regulatory Requirement
Theft or loss of material in an aggregate quantity equal or greater than 1,000 times the quantity specified in Appendix 180 NAC 4-C	immediate	30 days	180 NAC 4-057.01 (A)
Theft or loss of material in an aggregate quantity equal or greater than 10 times the quantity specified in Appendix 180 NAC 4-C that is still missing	none	30 days	180 NAC 4-057.01 (B)
Whole body dose greater than 0.25 Sv (25 rems)	immediate	30 days	180 NAC 4-058.01 (A)(i)
Extremity dose greater than 2.5 Sv (250 rems)	immediate	30 days	180 NAC 4-058.01 (A)(iii)
Whole body dose greater than 0.05 Sv (5 rems) in 24 hours	24 hours	30 days	180 NAC 4-058.02 (A)(i)
Extremity dose greater than 0.5 Sv (50 rems) in 24 hours	24 hours	30 days	180 NAC 4-058.02 (A)(iii)
Whole body dose greater than 0.05 Sv (5 rems)	none	30 days	180 NAC 4-059.01 (B)(i)
Dose to individual member of public greater than 1 mSv (100 mrems)	none	30 days	180 NAC 4-059.01 (B)(iv)
Defect in equipment that could create a substantial safety hazard	2 days	30 days	
Filing petition for bankruptcy under 11 U.S.C.	none	immediately after filing petition	180 NAC 3-017.05
Expiration of license	none	60 days	180 NAC 3-019.04
Decision to permanently cease licensed activities at *entire site*	none	60 days	180 NAC 3-019.04
Decision to permanently cease licensed activities in any separate building or outdoor area that is unsuitable for release for unrestricted use	none	60 days	180 NAC 3-019.04
No principal activities conducted for 24 months at the entire site	none	60 days	180 NAC 3-019.04
No principal activities conducted for 24 months in any separate building or outdoor area that is unsuitable for release for unrestricted use	none	60 days	180 NAC 3-019.04
Event that prevents immediate protective actions necessary to avoid exposure to radioactive materials that could exceed regulatory limits	immediate	30 days	180 NAC 3-026.01
Equipment is disabled or fails to function as designed when required to prevent radiation exposure in excess of regulatory limits	24 hours	30 days	180 NAC 3-026.02 (B)
Unplanned fire or explosion that affects the integrity of any licensed material or device, container, or equipment with licensed material	24 hours	30 days	180 NAC 3-026.02 (D)

Telephone notifications must be made to:

Nebraska Department of Health and Human Services
Office of Radiological Health (402) 471-2168 (Monday through Friday 8AM to 5PM)
Off Hours: State Patrol (402) 479-4921 (Ask to speak to the NEMA Duty Officer as you have an incident to report involving radioactive materials.)

Appendix O

Requests to Perform Leak Testing And Sample Analysis

Appendix O

Model Leak Test Program and Sample Analysis

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
- 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.
- A 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 were 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% 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 the Department

Appendix P

Information Needed to Support applicant's Request to Perform Non-Routine Operations

Appendix P

Information Needed to Support Applicant's Request to Perform Non-Routine Operations

Applicants should review the section in this document on "Maintenance," which discusses, in general, licensee responsibilities before any maintenance or repair is performed.

Non-routine operations include installation of the gauge, initial radiation survey, repair or maintenance involving or potentially affecting components, including electronics, related to the radiological safety of the gauge (e.g., the source, source holder, source drive mechanism, shutter, shutter control, or shielding), gauge relocation, replacement, and disposal of sealed sources, alignment, removal of a gauge from service, and any other activities during which personnel could receive radiation doses exceeding Department limits. See Figure 5.

Any non-manufacturer/non-distributor supplied replacement components or parts, or the use of materials (e.g., lubricants) other than those specified or recommended by the manufacturer or distributor need to be evaluated to ensure that they do not degrade the engineering safety analysis performed and accepted as part of the device registration. Licensees also need to ensure that after maintenance or repair is completed, the gauge is tested, and functions as designed before the unit is returned to routine use.

If non-routine operations are 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 Department limits. Radionuclides and activities in fixed gauges vary widely. For illustrative purposes in less than one minute, an unshielded cesium-137 source with an activity of 100 millicuries can deliver 0.05 Sv (5 rems) to a worker's hands or fingers (i.e., extremities), assuming the extremities are 1 centimeter from the source. However, gauges can contain sources of even higher activities with correspondingly higher dose rates. The threshold for extremity monitoring is 0.05 Sv (5 rems) per year.

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

Describe the types of work, maintenance, cleaning, repair that involve:

- Installation, relocation, or alignment of the gauge
- Components, including electronics, related to the radiological safety of the gauge (e.g., the source, source holder, source drive mechanism, shutter, shutter control, or shielding)
- Replacement and disposal of sealed sources
- Removal of a gauge from service

- A potential for any portion of the body to come into contact with the primary radiation beam; or
- Any other activity during which personnel could receive radiation doses exceeding Department 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.

A licensee may initially mount a gauge, without specific Department, NRC or Agreement State authorization, if the gauge's SSD Certificate explicitly permits mounting of gauges by users and under the following conditions:

- The gauge must be mounted according to written instructions provided by the manufacturer or distributor;
- The gauge must be mounted in a location compatible with the "Conditions of Normal Use" and "Limitations and/or Other Considerations of Use" in the certificate of registration issued by Department, NRC or an Agreement State;
- The on-off mechanism (shutter) must be locked in the off position, if applicable, or the source must be otherwise fully shielded;
- The gauge must be received in good condition (package was not damaged); and
- The gauge must not require any modification to fit in the proposed location.

Mounting does not include electrical connection, activation, or operation of the gauge. The source must remain fully shielded and the gauge may not be used until it is installed and made operational by a person specifically licensed by the Department, NRC or an Agreement State to perform such operations.

- Identify who will perform non-routine operations and their training and experience. Acceptable training would include manufacturers or distributors courses for non-routine operations or equivalent.
- Submit procedures for non-routine operations. 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 is secured against unauthorized removal or access or under constant surveillance;
    - appropriate labels and signs are used;
    - manufacturer or distributor instructions and recommendations are followed;
    - any non-manufacturer/non-distributor supplied replacement components or parts, or the use of materials (e.g., lubricants) other than those specified or recommended by the manufacturer or distributor are evaluated to ensure that they do not degrade the engineering safety analysis performed and accepted as part of the device registration; and
    - before being returned to routine use, the gauge is tested to verify that it functions as designed and source integrity is not compromised.

- Confirm that individuals performing non-routine operations on gauges will wear both whole body and extremity monitoring devices or perform a prospective evaluation demonstrating that unmonitored individuals performing non-routine operations are not likely to receive, in one year, a radiation dose in excess of 10% of the allowable limits.
- Verify possession of at least one survey instrument that meets the criteria in "Radiation Detection Instruments" in Regulatory Guide 3.13, 'Radioactive Material Guidance for Fixed Gauge Licenses"
- Describe steps to be taken to ensure that radiation levels in areas where non-routine operations will take place do not exceed 180 NAC 4-013 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 operations; 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 180 NAC 4-048.

Appendix Q

Major DOT Regulations; Sample Shipping Documents, Placards, Labels, and Bill of Lading

Appendix Q1

Major DOT Regulations and Examples

Note: The following list of U.S. Department of Transportation (DOT) regulations is provided to inform licensees about typical requirements that apply to the transportation of licensed material including the preparation of shipments of licensed material. Licensees should note that the list is incomplete in that not all potentially applicable requirements have been included. Also, transportation requirements change; therefore, licensees should consult the regulations for definitive information about current requirements. Additional information on transportation requirements may be found at the DOT Web site: http://www.dot.gov/.

Table of Hazardous Materials and Special Provisions - 49 CFR 172, Subpart B

- FR 172.101—Hazardous Materials Table [proper shipping name, hazard class, identification number]
- FR 172.101—List of Hazardous Substances and Reportable Quantities, Table 2 to Appendix A—Radionuclides

Shipping Papers - 49 CFR 172, Subpart C

- 49 CFR 172.201—Preparation and retention of shipping papers
- 49 CFR 172.202—Description of hazardous material on shipping papers
- 49 CFR 172.203—Additional description requirements
- 49 CFR 172.204—Shipper's certification

Marking - 49 CFR 172, Subpart D

- 49 CFR 172.300—Applicability
- 49 CFR 172.301—General marking requirements for non-bulk packagings
- 49 CFR 172.304—Marking requirements
- 49 CFR 172.310—Class 7 (radioactive) materials
- 49 CFR 172.324—Hazardous substances in non-bulk packagings [designation of "reportable quantities" with the letters "RQ"]

Labeling - 49 CFR 172, Subpart E

- 49 CFR 172.400—General labeling requirements
- 49 CFR 172.400a—Exceptions from labeling
- 49 CFR 172.401—Prohibited labeling
- 49 CFR 172.403—Class 7 (radioactive) material
- 49 CFR 172.406—Placement of labels
- 49 CFR 172.436—RADIOACTIVE WHITE-I label
- 49 CFR 172.438—RADIOACTIVE YELLOW-II label
- 49 CFR 172.440—RADIOACTIVE YELLOW-III label

Emergency Response Information - 49 CFR 172, Subpart G

- 49 CFR 172.600—Applicability and general requirements
- 49 CFR 172.602—Emergency response information
- 49 CFR 172.604—Emergency response telephone number

Training - 49 CFR 172, Subpart H

- 49 CFR 172.702—Applicability and responsibility for training and testing
- 49 CFR 172.704—Training requirements

Shippers - General Requirements for Shipments and Packagings—49 CFR Part 173

- 49 CFR 173.25—Authorized packagings and overpacks
- 49 CFR 173.403—Definitions
- 49 CFR 173.411—Industrial packages
- 49 CFR 173.412—Additional design requirements for Type A packages
- 49 CFR 173.415—Authorized Type A packages
- 49 CFR 173.433—Requirements for determining basic radionuclide values, and for the listing of radionuclides on shipping papers and labels
- 49 CFR 173.435—Table of A1 and A2 values for radionuclides
- 49 CFR 173.441—Radiation level limitations and exclusive use provisions
- 49 CFR 173.471—Requirements for U.S. Nuclear Regulatory Commission approved packages
- 49 CFR 173.475—Quality control requirements prior to each shipment of Class 7
- (radioactive) materials
- 49 CFR 173.476—Approval of special form Class 7 (radioactive) materials

Carriage by Public Highway - 49 CFR Part 177

- 49 CFR 177.817—Shipping papers
- 49 CFR 177.842—Class 7 (radioactive) material [includes requirement for blocking and bracing during transport]

Note: The following reference charts are for reference only and are not a substitute for DOT and U.S. Nuclear Regulatory Commission transportation regulations.

Appendix Q2

1. Minimum Required Packaging for Class 7 (Radioactive) Material:[1] (49 CFR 173 and 10 CFR 71)[2]

These are basic reference charts; refer to current U.S. DOT and NRC regulations for complete requirements.

Minimum Packaging Required for Radioactive Materials other than Low Specific Activity (LSA) Material and Surface Contaminated Objects (SCO) based on Activity of Package Contents

Radioactive Material Quantity[3]		Limited Quantities and Articles	Type A[4] [9]	Type B
Activity Restrictions		≤ the limits specified in Table 4 of § 173.425	≤ A_1 for special form ≤ A_2 for normal form	> A_1 for special form > A_2 for normal form
Contents of Package	Non-fissile and Fissile Excepted	Excepted Package	Type A Package	Type B(U) or Type B(M) package
	Fissile	N/A	Type AF[10] package	Type B(U)F or Type B(M)F package

Minimum Packaging Required for LSA Material and SCO[5,6]

Type(s) of LSA and/or SCO	LSA-I	LSA-II	LSA-III	SCO-I	SCO-II
Category of Package for Domestic or International Transport[7,8]	**Unpackaged**[8] **IP-1:** solids or liquids/exclusive use **IP-2:** liquids/non-exclusive use **Specification tank cars or cargo tank motor vehicles:** liquids/exclusive use	- - **IP-2:** exclusive use[9] **IP-3:** liquids or gases/non-exclusive use[9]	- - **IP-2:** exclusive use **IP-3:** non-exclusive use	**Unpackaged**[8] **IP-1** - -	- - **IP-2** -
Alternative Provisions for Domestic only Transport[8]	**Packaging shall meet the requirements of §§ 173.24, 24a, and 173.410.** **Transportation shall be an exclusive use shipment.** **Activity per shipment must be less than an A_2 quantity (see § 173.427(b)(4)).**				

[1] Additional provisions may apply for radioactive materials that are pyrophoric, oxidizing, fissile excepted, or uranium hexafluoride.
[2] Each NRC licensee shall comply with the applicable requirements of the DOT regulations in 49 CFR parts 107, 171 through 180, and 390 through 397 (see § 71.5).
[3] Materials that contain radionuclides, where both the activity concentration and the total activity in the consignment exceed either the values specified in the table in § 173.436 or the values derived according to the instructions in § 173.433, must be regulated in transport as Class 7 (radioactive) material.
[4] Except for LSA material and SCO, a Type A package may not contain a quantity of Class 7 (radioactive) material greater than A_1 or A_2 (see § 173.431(a)). See A_1 and A_2 definitions in § 173.403.
[5] The external dose rate from LSA material or SCO in a single package may not exceed 10 mSv/h (1 rem/h) at 3 meters from the unshielded material or objects (see §§ 173.427(a)(1) and (d)).
[6] LSA material and SCOs that are or contain fissile material in quantities that are not fissile excepted must be packaged in appropriate Type AF or Type BF packages, and not classified as LSA material or SCO. For alternate domestic transport provisions, see § 173.427(b)(4). For comprehensive guidance on packaging and transportation of LSA material and SCO, see NUREG-1608.
[7] For the quantity of LSA material and SCO transported in a single conveyance, see the limits specified in § 173.427(a)(2).
[8] LSA material or SCO shall be appropriately packaged in accordance with § 173.427(b) or (d). Certain LSA-I material and SCO-I may be transported unpackaged under the conditions in § 173.427(c).
[9] See §§ 173.411(c) and 173.415(a) for requirements related to package record retention (2 years) and associated documentation of physical tests.
[10] See §§ 71.22(a), 71.23(a) and 173.417(a) for regulations regarding the use of non-AF packages for fissile materials.

2. Radiation Level, TI and CSI Limits for Transportation by Mode:[1] (49 CFR 173 - 177, and 10 CFR 71)[10]

Type of Transport	Non-exclusive use	Exclusive use		
Mode of Transport	Road, Rail, Vessel and Air[9]	Road and Rail	Vessel	Air (cargo only)
Radiation Level Limits[2]				
Package Surface	2 mSv/h (200 mrem/h)	**2 mSv/h (200 mrem/h):** other than closed vehicles **10 mSv/h (1000 mrem/h):** closed vehicles	2 mSv/h[11] (200 mrem/h)	2 mSv/h (200 mrem/h)[3]
Conveyance[4]	N/A	**2 mSv/h (200 mrem/h):** outer surfaces (sides, top and underside) of vehicle[5]	N/A	N/A
		0.1 mSv/h (10 mrem/h): at any point two (2) m (6.6 ft) from sides of the vehicle[5]	N/A	N/A
Occupied position	N/A	**0.02 mSv/h (2 mrem/h):** in any normally occupied area[6]	**Requirements of § 176.708 apply**	N/A
Transport Index (TI) Limits[2]				
Package[7]	**3:** passenger aircraft **10:** road, rail, vessels and cargo aircraft	No limit		10
Conveyance[4]	**50:** road, rail and passenger aircraft **50 to No limit:** vessels[8] **200:** cargo aircraft	No limit		200
Overpack	**N/A:** for road, rail **50 to 200:** vessel[8] **3:** passenger aircraft; **10:** cargo aircraft	N/A	No limit[8]	N/A
Criticality Safety Index (CSI) Limit for fissile material[2]				
Package[7]	50	100	100	100
Conveyance[4]	**50:** road, rail and air **50:** for holds, compartments or defined deck areas of vessels[8] **200 to No limit:** for a total vessel[8]	100	**200 to No limit:** for a total vessel[8]	100
Overpack	**50:** road, rail, vessels[8] and air	N/A		

[1] Radiation level, TI, and CSI are defined in § 173.403.
[2] In addition to any applicable radiation level, TI and CSI limits, separation distance requirements apply to packages, conveyances, freight containers and overpacks; to occupied positions; and to materials stored in transit. Separation distances are based on the sum of the TIs and, for fissile materials, the sum of the CSIs. [see applicable 49 CFR references for: Rail - § 174.700; Air – §§ 175.700 through 175.703; Vessel - §§ 176.700 through 176.708; and Highway - § 177.842].
[3] Higher package surface radiation levels may be allowed through an approved special arrangement.
[4] Conveyance is, for transport by public highway or rail, any transport vehicle or large freight container; and for transport by air, any aircraft. See definitions in § 173.403.
[5] The outer surfaces (sides, top and underside) of vehicles are specified for road and rail vehicles in § 173.441.
[6] For rail, normally occupied areas include the transport vehicle and adjacent rail cars. The 0.02 mSv/h (2 mrem/h) limit does not apply to carriers operating under a State or federally regulated radiation protection program where personnel wear radiation dosimetry devices.
[7] Additional TI and CSI limits apply for individual packages when non-fissile radioactive material packages are mixed with fissile material packages (see § 173.459).
[8] For details on TI and CSI limits for transport by vessel, see § 176.708.
[9] Only excepted packages and packages intended for use in research, medical diagnosis, and treatment are permitted on passenger aircraft (see §§ 173.448(f) and 175.700).
[10] The limits in this table do not apply to excepted packages. See the following references for the radiation level limits for: limited quantities, § 173.421; instruments and articles, § 173.424; articles containing natural uranium or thorium, § 173.426; or empty packaging, § 173.428.
[11] 2 mSv/h (200 mrem/h) other than intermodal transport of closed transport vehicles or exclusive use vessel.

3. Contamination Limits and Quality Control for Class 7 (Radioactive) Materials: (49 CFR 173.443 and 173.475, and 10 CFR 71)

These are basic reference charts; refer to current U.S. DOT and NRC regulations for complete requirements.

Maximum Permissible Limits for Non-fixed Radioactive Contamination on Packages When Offered for Transport

The level of non-fixed (removable) radioactive contamination on the external surface of each package, conveyance, freight container, and overpack offered for transport must be kept as low as reasonably achievable, and shall not exceed the values shown in the following table:

Contaminant	Maximum permissible limits (§ 173.443(a), Table 9)		
	Bq/cm^2	µCi/cm^2	dpm/cm^2
Beta and gamma emitters and low toxicity alpha emitters	4	10^{-4}	220
All other alpha emitting radionuclides	0.4	10^{-5}	22

The non-fixed contamination shall be determined by:

(a) wiping, with an absorbent material using moderate pressure, sufficient areas on the package to obtain a representative sampling of the non-fixed contamination;
(b) ensuring each wipe area is 300 cm^2 in size;
(c) measuring the activity on each single wiping material and dividing that value by the surface area wiped and the efficiency of the wipe procedure, where an actual wipe efficiency may be used, or it may be assumed to be 0.10.

Alternatively, the contamination level may be determined using alternative methods of equal or greater efficiency.

A conveyance used for non-exclusive use shipments is not required to be surveyed unless there is reason to suspect that it exhibits contamination (see § 173.443(a)(2)).

Provisions for Control of Contamination on Radioactive Material Packages Offered for Transport and at the Time of Receipt

- When offered for transport, the non-fixed contamination on each package of radioactive material must be kept as low as reasonably achievable and may not exceed the limits set forth in § 173.443(a), Table 9 (as shown above).
- During transport, non-fixed contamination levels on packages transported as exclusive use by rail or highway may not exceed 10 times the limits in § 173.443(a), Table 9 (as shown above).

Provisions for Non-fixed (Removable) Contamination on Excepted and Empty Radioactive Material Packages

- The non-fixed radioactive surface contamination on the external surface of excepted and empty packages shall not exceed the limits specified in § 173.443(a), Table 9 (as shown above).
- The internal contamination of an empty package must not exceed 100 times the limits in § 173.443(a), Table 9 (as shown above).

Provisions for Non-fixed (Removable) Contamination on Packages and in Rail and Road Vehicles used for Exclusive Use Shipments of Radioactive Material

- The levels of non-fixed radioactive contamination on the packages (a) at the beginning of transport, may not exceed the levels prescribed in the above table, and (b) at any time during transport, may not exceed ten times the levels prescribed in § 173.443(a), Table 9 (as shown above) [see § 173.443(b)].
- Each conveyance, overpack, freight container, or tank used for transporting Class 7 (radioactive) material as an exclusive use shipment that utilizes the provisions of § 173.443(b) must be surveyed with appropriate radiation detection instruments after each exclusive use transport. If contamination values exceed acceptable levels, the transport vehicle may not be returned to exclusive use transport service, and then only for subsequent exclusive use shipment, unless the radiation dose rate at each accessible surface is demonstrated to be 0.005 mSv/h (0.5 mrem/h) or less, and that there is no significant non-fixed radioactive surface contamination as specified in § 173.443(a), Table 9 (as shown above) [see § 173.443(c)].

Provisions for Non-fixed (Removable) Contamination in Closed Rail and Road Vehicles that are used Solely for the Transportation of Radioactive Material (§ 173.443(d))

- The contamination levels must not exceed 10 times the levels prescribed in § 173.443(a), Table 9 (as shown above).
- Each vehicle is marked with the words "*For Radioactive Materials Use Only*" in letters at least 76 mm (3 in) high in a conspicuous place on both sides of the exterior of the vehicle.
- The vehicle must meet the placard requirements of Subpart F of Part 172.
- A survey of the interior surfaces of the empty closed vehicle must show that the radiation dose rate at any point does not exceed 0.1 mSv/h (10 mrem/h) at the surface or 0.02 mSv/h (2 mrem/h) at 1 m (3.3 feet) from the surfaces.
- Each vehicle shall be kept closed except for loading or unloading.

Provisions for Quality Control Prior to Each Shipment of Radioactive Material (§ 173.475)

- Before each shipment of any radioactive materials package, the offeror must ensure, by examination or appropriate tests, that:
  (a) the packaging is proper for the contents to be shipped;
  (b) the packaging is in unimpaired physical condition, except for superficial marks;
  (c) each closure device of the packaging, including any required gasket, is properly installed, secured, and free of defects;
  (d) for fissile material, each moderator and neutron absorber, if required, is present and in proper condition;
  (e) each special instruction for filling, closing, and preparation of the packaging for shipment has been followed;
  (f) each closure, valve, or other opening of the containment system is properly closed and sealed;
  (g) each packaging containing liquid in excess of an A_2 quantity and intended for air shipment has been tested to show that it will not leak under an ambient atmospheric pressure of not more than 25 kPa, absolute (3.6 psia), where the test must be conducted on the entire containment system, or on any receptacle or vessel within the containment system, to determine compliance with this requirement;
  (h) the internal pressure of the containment system will not exceed the design pressure during transportation; and
  (i) the external radiation and contamination levels are within the allowable limits specified in §§ 173.441 and 173.443.

4. Hazard Communications for Class 7 (Radioactive) Materials: Shipping Papers (49 CFR 172, Subpart C)

These are basic reference charts; refer to current U.S. DOT and NRC regulations for complete requirements.
NOTE: IAEA, IATA/ICAO, and IMO may require additional hazard communication information. [1]

Shipping Paper Entries

Always Required	Sometimes Required	Optional Entries
Basic description (in sequence): • **UN Identification number** • **Proper Shipping Name** • **Hazard Class (7)** • **Maximum activity contained in each package in SI units** (e.g., Bq, TBq), or in both SI and customary units (e.g., Ci, mCi) with customary units in parentheses following the SI units • **Number and type of packages** Additional description: • **Name of each radionuclide**[2] • **Description of physical and chemical form** (unless special form) • **"Special form" when not in the proper shipping name** • **Category of label** used • **Transport index (TI)** of each package bearing a Yellow-II or Yellow-III label Additional entry requirements: • 24 hour **emergency telephone number** • **Shipper's Certification** shall be provided by each person offering radioactive material for transportation[3] • Proper page numbering (e.g., Page 1 of 4)	Materials-based Requirements: • The criticality safety index (CSI) or "Fissile Excepted" for fissile material • "Highway route controlled quantity" or "HRCQ" for highway route controlled quantities • The letters "RQ" entered either before or after the basic description for each hazardous substance [see § 171.8] • Enter applicable subsidiary hazard class(es) in parentheses immediately following the primary hazard class when a subsidiary hazard label is required • A hazardous waste manifest and the word "Waste" preceding the proper shipping name is required for radioactive material that is hazardous waste Package-based Requirements: • The applicable DOE or NRC package approval identification marking for each Type B(U), Type B(M), or fissile material package • The International Atomic Energy Agency (IAEA) Certificate of Competent Authority identification marking for export shipment or shipment in a foreign made package Shipment- and Administrative-based Requirements: • Specify "exclusive use shipment" as required • Specify instructions for maintaining exclusive use controls for shipments of LSA material or SCO under exclusive use • Specify the notation "DOT–SP" followed by the special permit number for a special permit shipment	• The weight in grams or kilograms may be inserted instead of activity units for fissile radionuclides, except for Pu-239 and Pu-241 • The weight in grams of Pu-239 and Pu-241 may be inserted in addition to the activity units • Other information is permitted provided it does not confuse or detract from the proper shipping name or other required information

Special Considerations/Exceptions for Shipping Papers

- For shipments of multiple cargo types, any HAZMAT entries must appear as the first entries on the shipping papers, or be entered in a color that readily contrasts with any description on the shipping papers or highlighted on the shipping papers in a contrasting color, or be designated by an "X" (or "RQ" if appropriate).
- Emergency response information consistent with §§ 172.600 – 172.606 shall be readily available on the transport vehicle.
- Shipments of excepted radioactive material in excepted packages, under UN2908, UN2909, UN2910, and UN2911, are excepted from shipping paper requirements if (a) the material is not a hazardous substance or hazardous waste and (b) the package does not contain fissile material or contain fissile material that is excepted by § 173.453.
- For road transport, the shipping papers shall be (a) readily available to authorities in the event of accident or inspection, (b) stored within the driver's immediate reach while he is restrained by the lap belt, (c) readily visible to a person entering the driver's compartment or in a holder which is mounted to the inside of the door on the driver's side of the vehicle, and (d) either in a holder mounted to the inside of the door on the driver's side of the vehicle or on the driver's seat [see § 177.817(e)].

[1] International Atomic Energy Agency (IAEA); International Air Transportation Association (IATA); International Civil Aviation Organization (ICAO); International Maritime Organization (IMO).

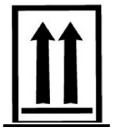
[2] For mixtures of radionuclides, the radionuclides to be shown must be determined in accordance with § 173.433(g), which is commonly known as the 95% rule; abbreviations (symbols) are authorized.

[3] The Shipper's certification shall satisfy the requirements of § 172.204.

5. Hazard Communication for Class 7 (Radioactive) Materials: Marking of Packages: (49 CFR 172, Subpart D; and 49 CFR 173.471, 178.3 and 178.350)

These are basic reference charts; refer to current U.S. DOT and NRC regulations for complete requirements.
NOTE: IAEA, IATA/ICAO, and IMO may require additional hazard communication information.

Markings on Packages

Markings Always Required Unless Excepted[1]	Additional Markings Sometimes Required	Optional Markings
For Non-bulk Packages: • Proper shipping name • Identification number (preceded by "UN" or "NA," as appropriate) • Name and address of consignor or consignee, unless the package is: ▪ highway only and no motor carrier transfers; or ▪ part of a rail carload or truckload lot or freight container load, and entire contents of railcar, truck, or freight container are shipped from one consignor to one consignee **For Bulk Packages:** • Identification number on orange panel or white square-on-point display [see §§ 172.332 or 172.336]: ▪ on each side and each end, if the packaging has a capacity of 3,785 L (1,000 gallons) or more[2], or ▪ on two opposing sides, if the packaging has a capacity of less than 3,785 L (1,000 gallons)[2]]	**Package-based marking requirements:** • Gross mass, including the unit of measurement (which may be abbreviated) for each package with gross mass greater than 50 kg (110 lb) • Package type as appropriate, i.e., "TYPE IP–1," "TYPE IP–2," "TYPE IP–3," "TYPE A," "TYPE B(U)" or "TYPE B(M)"[1] • Marked with international vehicle registration code of country of origin for IP–1, IP–2, IP–3 or Type A package design (e.g., "USA") • Radiation (trefoil) symbol[3] on outside of outermost receptacle of each Type B(U) or Type B(M) packaging design  • Each NRC-approved package (e.g., Type AF, Type B(U), Type B(M), Type B(U)F, and Type B(M)F) must be marked with the identification marking indicated in the package approval • For Specification 7A packaging, mark on the outside with "USA DOT 7A Type A", and the name and address or symbol of the manufacturer satisfying §§ 178.3 and 178.350 **Materials-based requirements:** • For a non-bulk IP-1 package containing a liquid, use underlined double arrow symbol indicating upright orientation[4], where the symbol is placed on two opposite sides of the packaging [see § 172.312]  • For a non-bulk package containing a hazardous substance, mark the outside of each package with the letters "RQ" in association with the proper shipping name **Administrative-based requirements:** • For each Type B(U), Type B(M) or fissile material package destined for export shipment, mark "USA" in conjunction with specification marking, or certificate identification; and package identification indicated in the U.S. Competent Authority Certificate • Mark "DOT–SP" followed by the special permit number assigned for each package authorized by special permit • Competent authority identification marking and revalidation for foreign made Type B(U), Type B(M), Type H(U), Type H(M), or fissile material package for which a Competent Authority Certificate is required	• Both the name and address of consignor and consignee is recommended. • Other markings on packages such as advertising are permitted, but must be located away from required markings and labeling. For marking exceptions for LSA material and SCO, [see § 173.427(a)(6)(vi)] (e.g., RADIOACTIVE-LSA, RADIOACTIVE-SCO, or RQ, as appropriate). For an overpack, the marking "OVERPACK" in lettering 12 mm (0.5 inches) high. This marking is not required if the package type contained in the overpack is visible from the outside [see § 173.25].

Special Considerations for Marking Requirements

- All markings are to be (a) on the outside of each package, (b) durable and legible, (c) in English, (d) printed on or affixed to the surface of a package or on a label, tag, or sign, (e) displayed on a background of sharply contrasting color, and (f) unobscured by labels or attachments.
- When an overpack is used, see §§ 173.25 and 173.448(g) for marking requirements.

[1] Some marking exceptions exist for excepted packages, as specified in §§ 173.421, 173.422, 173.424, 173.426 and 173.428.

[2] If the identification number marking on a bulk package is not visible, the transport vehicle or freight container must be marked on each side and each end [see § 172.331].

[3] The radiation symbol shall be resistant to the effects of fire and water, plainly marked by embossing, stamping or other means resistant to the effects of fire and water and conform to the size requirements of Appendix B to Part 172.

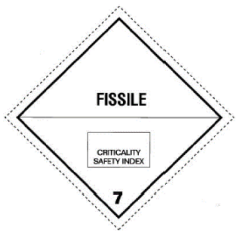
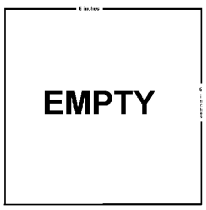
[4] The arrows must be either black or red on white or other suitable contrasting background and commensurate with the size of the package; depicting a rectangular border around the arrows is optional.

6. Hazard Communications for Class 7 (Radioactive) Materials:
Labeling of Packages (49 CFR 172.400-450)

These are basic reference charts; refer to current U.S. DOT and NRC regulations for complete requirements.
NOTE: IAEA, IATA/ICAO, and IMO may require additional hazard communication information.

Requirements for Labels[1]

- Label each package, except for (a) excepted packages of radioactive material; and (b) Low Specific Activity (LSA) material and Surface Contaminated Objects (SCO), packaged or unpackaged, when transported under exclusive use controls domestically and when the material or object contains less than an A_2 quantity.
- Labels are required to be (a) printed or affixed to a surface other than the bottom of the package, (b) placed near the proper shipping name marking, (c) printed or affixed to a background of contrasting color or have a dotted or solid line outer border, (d) clearly visible, (e) not obscured by markings or other attachments, (f) representative of the hazardous material content, and (g) in conformance with the label specifications of § 172.407.
- The appropriate radioactive label must be affixed to opposite sides or two ends (other than the bottom) of all non-bulk packages of radioactive material.

Category of Radioactive Labels [3]			Other Radioactive Labels[2]	
				
White-I	**Yellow-II**	**Yellow-III**	**Fissile**	**Empty**
Maximum Radiation Surface Level (RSL)			Fissile labels required for each package containing fissile material, other than fissile-excepted material; and labels must be affixed adjacent to radioactive category labels.	Empty labels required for empty Class 7 (radioactive) packages satisfying § 173.428; and any previously-used labels must not be visible.
mSv/h	**RSL** ≤ 0.005	0.005 < **RSL** ≤ 0.5	0.5 < **RSL** ≤ 2[5]	
mrem/h	**RSL** ≤ 0.5	0.5 < **RSL** ≤ 50	50 < **RSL** ≤ 200[5]	
Transport Index (TI):[4]				
TI = 0		0 < **TI** ≤ 1	1 < **TI** ≤ 10[5]	

Contents on Labels

- Each radioactive category label must contain: (a) Except for LSA-I material, the names of the radionuclides in the package where, for mixtures of radionuclides, the names listed must be in accordance with the 95% rule specified in § 173.433(g); and, for LSA-I material, the term "LSA-I"; (b) maximum activity in appropriate SI units (e.g., Bq, TBq), or appropriate customary units (e.g., Ci, mCi) in parentheses following SI units; and (c) for Yellow-II or Yellow-III labels the Transport Index (TI). Abbreviations and symbols may be used. Except for Pu-239 and Pu-241, the weight in g or kg of fissile radionuclides may be inserted instead of activity units; for Pu-239 and Pu-241, the weight in g of fissile radionuclides may be inserted in addition to the activity units [see § 173.403 for fissile material definition].
- Each fissile label must contain the relevant Criticality Safety Index (CSI) [see § 172.403(e)].

[1] Additional labels may be required if the contents of a package contains material that also meets the definition of one or more other hazard class. See §§ 172.402 and 406(c) for details on additional labeling requirements. [See §§ 172.400a, 173.421 through 173.427 for details when labels are not required, and see § 172.407 for details on label durability, design, size, color, form identification, exceptions, and the trefoil symbol size].

[2] A "Cargo Aircraft Only" label is required for each package containing a hazardous material which is authorized for cargo aircraft only [see § 172.402(c)].

[3] The category of the label must be the higher of the two values specified for RSL and TI [see § 172.403(b)].

[4] The TI is determined from the radiation level 1 meter from the package surface [see TI definition in § 173.403]. If the measured TI is not greater than 0.05, the value may be considered to be zero. When an overpack is used, it must be labeled in accordance with § 172.403(h).

[5] Packages with a TI > 10 or an RSL > 2 mSv/h (200 mrem/h) must be transported under exclusive use provisions [see § 173.441(b)]. Any package containing a Highway Route Controlled Quantity (HRCQ) must be labelled as RADIOACTIVE YELLOW-III.

7. Hazard Communications for Class 7 (Radioactive) Materials: Placarding (49 CFR 172, Subpart F)

These are basic reference charts; refer to current U.S. DOT and NRC regulations for complete requirements.
NOTE: IAEA, IATA/ICAO, and IMO may require additional hazard communication information.

Conditions when Display of Placards is Required [§§ 172.504, 172.507(a), 172.508, and 172.512]

- Each bulk package, freight container, unit load device[1], transport vehicle, or rail car containing any quantity of hazardous material must be placarded on each side and each end with the placards specified in § 172.504(e).
- Radioactive placards are required for: shipments that contain a package labeled as Radioactive Yellow-III; unpackaged LSA-I or SCO-I when transported under exclusive use provisions; shipments required by §§ 173.427, 173.441, and 173.457 to be operated under exclusive use; and closed vehicles marked "For Radioactive Materials Use Only" transported under § 173.443(d).
- The Radioactive placard is placed on a square background on any motor vehicle used to transport a package containing a Highway Route Controlled Quantity (HRCQ) Class 7 (radioactive) material[2].

Visibility and Display of Radioactive Placards [§ 172.516]

- Placards are required to:
  - be clearly visible, on a motor vehicle and rail car, from the direction they face, except from the direction of another transport vehicle or rail car to which the motor vehicle or rail car is coupled[3]
  - be securely attached or affixed thereto or placed in a holder thereon
  - be located clear of appurtenances and devices such as ladders, pipes, doors, and tarpaulins
  - be located, so far as practical, so dirt or water is not directed to it from the transport vehicle wheels
  - be located at least 3 inches (76.0 mm) away from any marking (e.g. advertising) that could reduce its effectiveness
  - have "RADIOACTIVE" printed on it displayed horizontally, reading from left to right
  - be maintained by the carrier so format, legibility, color, and visibility of the placard will not be substantially reduced due to damage, deterioration, or obscurement by dirt or other matter
  - be affixed to a background of contrasting color, or have a dotted or solid line outer border which contrasts with the background color.

Radioactive Placards

PLACARD (FOR OTHER THAN HRCQ)	PLACARD FOR HRCQ
	
White triangular background color in the lower portion with yellow triangle in the upper portion; trefoil symbol, text, class number and inner and outer borders in black. [see § 172.556 and Appendix B of Part 172]	Square background must consist of a white square surrounded by one-inch black border. The placard inside the square is identical to that for other than HRCQ. [see § 172.527]

General Specifications for Placards and Subsidiary Hazard Placarding

- Placards must conform to the specifications in § 172.519.
- A CORROSIVE placard is also required for each transport vehicle that contains 454 kg (1001 pounds) or more gross weight of non-fissile, fissile-excepted, or fissile uranium hexafluoride [see § 172.505(b)].
- Placards are also required for subsidiary hazards of POISON INHALATION HAZARD, POISON GAS, or DANGEROUS WHEN WET [see § 172.505].

[1] See § 172.512 for exceptions and variations to the placarding requirements for freight containers and aircraft unit load devices.

[2] See § 173.403 for the definition of Highway Route Controlled Quantity (HRCQ). A package containing an HRCQ must be labeled with RADIOACTIVE Yellow-III labels [see §§ 172.403(c) and 172.507(a)].

[3] Required placarding of the front of a motor vehicle may be on the front of a truck-tractor instead of or in addition to the placarding on the front of the cargo body to which a truck-tractor is attached § 172.516(b).

8. Requirements/Guidance for Registration, Emergency Response and Action for Class 7 (Radioactive) Materials: (49 CFR 107, Subpart G; 49 CFR 171.15; 49 CFR 172, Subparts F and G)

These are basic reference charts; refer to current U.S. DOT and NRC regulations for complete requirements.

Provisions for Persons Who Offer or Transport Class 7 (Radioactive) Materials (49 CFR 107, Subpart G)

- Any person, other than those excepted by § 107.606, who offers for transportation, or transports, in foreign, interstate or intrastate commerce any of the following Class 7 (radioactive) materials must satisfy registration and fee requirements of Part 107, Subpart G:
  - a highway route-controlled quantity of radioactive material;
  - a shipment in a bulk packaging with a capacity ≥ 13,248 L (3,500 gallons) for liquids or gases, or > 13.24 cubic meters (468 cubic feet) for solids; or
  - any quantity of radioactive material that requires placarding, under provisions of Part 172, Subpart F.
- Any person required to register must submit a complete and accurate registration statement on DOT Form F 5800.2 by June 30th for each registration year, or in time to have on file a current Certificate of Registration in accordance with § 107.620.
- Each registrant or designee must maintain for a period of 3 years from the date of issuance a copy of the registration statement and Certificate of Registration issued by PHMSA and must furnish its Certificate of Registration (or a copy thereof) and related records to an authorized representative or special agent of DOT upon request.
- Each motor carrier subject to registration requirements of this subpart must carry a copy of its current Certificate of Registration or another document bearing the registration number on board each truck and truck tractor, and the Certificate of Registration or document must be made available, upon request, to enforcement personnel.
- The amount of fees to be paid and procedures to be followed are found at §§ 107.612 and 107.616.

Provisions for Providing and Maintaining Emergency Response Information (49 CFR 172, Subpart G)

- When shipping papers for the transportation of radioactive materials are required [see Part 172, Subpart C], emergency response information shall
  - be provided and maintained during transportation and at facilities where materials are loaded for transportation, stored incidental to transportation, or otherwise handled during any phase of transportation;
  - be provided by persons who offer for transportation, accept for transportation, transfer or otherwise handle hazardous materials during transportation;
  - be immediately available for use at all times the hazardous material is present; and
  - include and make available the emergency response telephone number [see § 172.604] to any person, representing a Federal, State or local government agency, who responds to an incident involving the material or is conducting an investigation which involves the material.
- Emergency response information is information that can be used in mitigating an incident involving radioactive materials. It must contain at least the information specified in §§ 172.602 and 172.604; and includes an emergency response telephone number that is monitored at all times the material is in transportation by (a) knowledgeable person, or (b) a person who has immediate access to a knowledgeable person, or (c) an organization capable of accepting responsibility for providing the necessary detailed information concerning the material.
- Each carrier who transports or accepts for transportation radioactive material for which a shipping paper is required shall instruct, according to the requirements of § 172.606, the operator of a conveyance to contact the carrier in the event of an incident involving the material.

Actions to be Taken in the Event of Spillage, Breakage, or Suspected Contamination by Radioactive Material

- If there is evidence of a leaking package or conveyance, access to the package or conveyance must be restricted, the area impacted and the extent of the contamination must be determined, and appropriate measures must be taken to minimize impact to persons and the environment [see § 173.443(e)].
- Except for a road vehicle used solely for transporting Class 7 (radioactive) material [see § 173.443(d)], each aircraft used routinely, and each motor vehicle used for transporting radioactive materials under exclusive use, must be (a) periodically checked for radioactive contamination, (b) taken out of service if contamination levels are above acceptable limits, and (c) remain out of service until the radiation dose rates at accessible surfaces are less than 0.005 mSv/h (0.5 mrem/h) and non-fixed radioactive surface contamination levels are below the limits in §§ 173.443(a), Table 9; and 173.443(c) for exclusive use vehicle provisions [see Chart 3].
- Following any breakage, spillage, release or suspected radioactive contamination incident, any rail or air carrier shall notify, as soon as possible, the offeror (i.e. the consignor); special provisions apply for buildings, areas, and equipment that might become contaminated during rail transport. Alternative provisions may apply for motor vehicles transporting radioactive materials under exclusive use [see §§ 174.750(a), 175.705(e), and 177.843(b)].

Provisions for Immediate Notification for Reportable Incidents Involving Radioactive Materials (§§ 171.15 and 171.16)

- Each person in physical possession of radioactive material must provide notice in the event of a reportable incident (see § 171.15(b)) as soon as practical, but no later than 12 hours after the occurrence of the reportable incident, to the National Response Center (NRC) by telephone at 800–424–8802 (toll free) or 202–267–2675 (toll call) or online at http://www.nrc.uscg.mil.
- Each notice must include the information specified in § 171.15(a)(1) – (a)(7).
- A detailed incident report must also submitted as required by § 171.16.

Guidance on Responding to Emergencies (Emergency Response Guidebook)

- The DOT issues guidance to aid first responders in quickly identifying the hazards of the dangerous goods involved in an accident or incident, and for protecting themselves and the general public during the initial response to the accident or incident. For each proper shipping name or UN ID Number, the user is led to a specific guide that provides insight into potential hazards and steps to be taken for public safety and emergency response.
- The current edition of the Emergency Response Guidebook is available at http://phmsa.dot.gov/hazmat/outreach-training/erg.

9. Requirements for Training and Safety and Security Plans for Class 7 (Radioactive) Materials: (49 CFR 172, Subparts H and I, 49 CFR 173, and 10 CFR 37)

These are basic reference charts; refer to current U.S. DOT & NRC regulations for complete requirements.

Training (49 CFR 172, Subpart H)

- For any person who is employed by an employer or is self-employed, and who directly affects hazardous materials transportation safety, a systematic program shall be established to ensure that the person:
  - has familiarity with the general provisions of Part 172, Subpart H;
  - is able to recognize and identify radioactive materials;
  - has knowledge of specific requirements of Part 172 that are applicable to functions performed by the employee;
  - has knowledge of emergency response information, self-protection measures and accident prevention methods and procedures; and
  - does not perform any function related to the requirements of Part 172 unless instructed in the requirements that apply to that function.
- The person shall be trained pursuant to the requirements of § 172.704(a) and (b), may be trained by the employer or by other public or private sources, and shall be tested by appropriate means. The training must include the following:
  (a) general awareness training providing familiarity with applicable regulatory requirements;
  (b) function-specific training applicable to functions the employee performs;
  (c) safety training concerning emergency response information, measures to protect the employee from hazards, and methods and procedures for avoiding accidents;
  (d) security awareness training providing awareness of security risks and methods designed to enhance transportation security; and
  (e) in-depth security training if a security plan is required for the shipment(s) involved.
- Initial and recurrent training shall comply with the requirements of § 172.704(c).
- Records of training shall be created and retained in compliance with the requirements of § 172.704(d).

Security (49 CFR 172, Subpart I, 49 CFR 173, and 10 CFR 37)

- A security plan for hazardous materials that conforms to the requirements of Part 172, Subpart I must be developed and adhered to by each person who offers for transportation in commerce or transports in commerce in a motor vehicle, rail car, or freight container any of the following radioactive materials:
  (a) IAEA Code of Conduct Category 1 and 2 materials (see §§ 172.800(b)(15) and 10 CFR 37);
  (b) a highway route controlled quantity (HRCQ) of radioactive material as defined in § 173.403 [see § 172.800(b)(15)];
  (c) known radionuclides in forms listed as radioactive material quantities of concern (RAM–QC) by the NRC [see §§ 172.800(b)(15) and 10 CFR 37]; or
  (d) a quantity of uranium hexafluoride requiring placarding under § 172.505(b) [see § 172.800(b)(14)].
- The security plan must include an assessment of possible transportation security risks and appropriate measures to address the assessed risks.
- Specific measures put into place by the plan may vary commensurate with the level of threat at a particular time.
- At a minimum, a security plan must address personnel security, unauthorized access, and enroute security.
- The security plan must be
  (a) in writing;
  (b) retained for as long as it remains in effect;
  (c) available as copies or portions thereof to the employees who are responsible for implementing it, consistent with personnel security clearance or background investigation restrictions and a demonstrated need to know;
  (d) revised and updated as necessary to reflect changing circumstances; and
  (e) maintained (all copies) as of the date of the most recent revision, when it is updated or revised.
- Security plans that conform to regulations, standards, protocols, or guidelines issued by other Federal agencies, international organizations, or industry organizations may be used to satisfy the requirements in Part 172, provided such security plans address the requirements specified in Part 172, Subpart I.
- Additional security planning requirements may apply for rail transport of a highway route controlled quantity of radioactive material [see §§ 172.820 and 173.403].

Appendix R

Guide to SI Unit for Radiation Protection

Appendix R

Guide to SI Unit for Radiation Protection

Introduction to SI Units

SI (System International) units comprise the primary measurement system for most countries. The system is also finding increasing use in the United States. State and federal regulatory agencies, including the Department and the U.S. Nuclear Regulatory Commission, have adopted SI units for radiation measurements; other agencies (e.g., the U.S. Department of Transportation) require their use.

Common Radiological Unit Prefixes

Submultiples				Multiples			
m	Milli	10^{-3}	thousandth	k	kilo	10^{3}	thousand
μ	Micro	10^{-6}	millionth	M	mega	10^{6}	million
n	Nano	10^{-9}	thousand millionth	G	giga	10^{9}	thousand million
p	Pico	10^{-12}	million millionth	T	tera	10^{12}	million million

Length

1 centimeter (cm)	=	0.3937 in	=	.03287 ft		
1 meter (m)	=	100 cm	=	39.37 in	=	3.281 ft
1 inch (in)	=	2.54 cm	=	0.254 m		
1 foot (ft)	=	30.48 cm	=	0.3048 m		

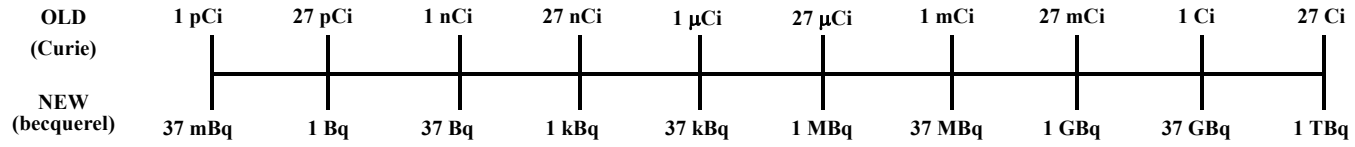
Activity

The traditional unit is the Curie (Ci); the SI unit is the Becquerel (Bq)

1 Ci = 3.7 x 10^{10} Bq = 37 GBq 1 Bq = 1 disintegration per second = 2.7027 x 10^{-11} Ci or ≅ 27 pCi

To convert Bq to Ci, divide the Bq figure by 37 x 10^{9} (or multiply the Bq figure by 2.7027 x 10^{-11})

To convert Ci to Bq, multiply the Ci figure by 37 x 10^{9}



Examples: **9 mCi = 333 MBq = 0.333 GBq 10 mCi = 370 MBq = 0.37 GBq**
44 mCi = 1628 MBq = 1.63 GBq 50 mCi = 1850 MBq = 1.85 GBq

Activity (continued)

Table A

Curie Units	Becquerel Units
µCi	kBq
mCi	MBq
Ci	GBq
0.1	3.7
0.25	9.25
0.5	18.5
0.75	27.75
1	37
2	74
3	111
5	185
7	259
10	370
20	740
25	925.

From Table A: 0.1 mCi = 3.7 MBq
0.1 Ci = 3.7 GBq

Table B

Curie Units	Becquerel Units
µCi	MBq
mCi	GBq
Ci	TBq
50	1.85
60	2.22
100	3.7
200	7.4
250	9.25
500	18.5
800	29.6
1000	37

From Table B: 50 mCi = 1.85 GBq
3.7 MBq = 100 µCi

To convert from one unit to another, read across from one column to the other, ensuring the units are in the same line of the column headings.

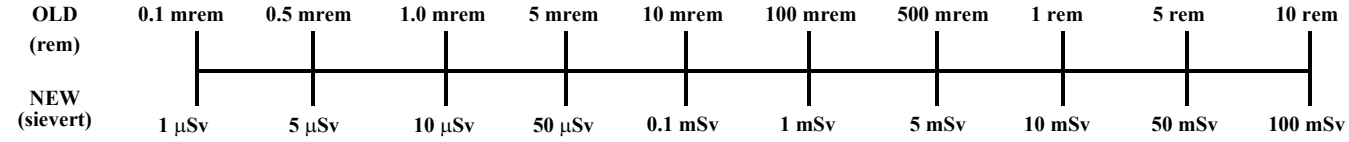
Radiation Dose Equivalent

The traditional unit is the rem; the SI unit is the sievert (Sv).

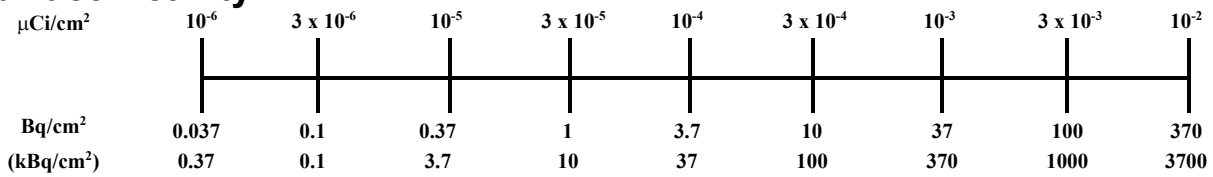
1 rem = 0.01 sievert (Sv) = 10 mSv **100 rem = 1 Sv = 0.01 Sv** **500 rem = 5 Sv = 0.5 mSv**

1 rad = 0.01 gray (Gy) = 10 mGy **100 rads = 1 Gy = 0.01 Gy** **500 rads = 5 Gy = 0.5 mGy**

The working SI unit is the sievert (Sv)



Surface Activity



Appendix S

Fixed Gauge Audit Checklist

Appendix S

Fixed Gauge Audit Checklist

This form can be used to document the annual radiation protection program audit as required by 180 NAC 4-004. The audit consists of a review of the program's content and implementation, evaluating it's effectiveness in complying with regulatory requirements and keeping radiation exposures to worker and general public as low as reasonable achievable (ALARA). Records of annual audits must be available for inspection by the Department.

NOTE: All areas indicated in this audit checklist 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 at intervals not to exceed 12 months? [180 NAC 4-004] Yes No

C. Were records of previous audits maintained? [180 NAC 4-047] N/A Yes No

D. Were any deficiencies identified during last two audits or two years, whichever is longer? Yes No

If yes please write a brief description of prior deficiencies and corrective actions taken:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

2. Organization and Scope of Program

A. If the mailing address or permanent address changed, has the license has been amended to reflect the change? N/A Yes No

B. If ownership changed or bankruptcy filed, was the Department's prior consent obtained or was the Department notified? N/A Yes No

C. If the RSO was changed, was license amended? N/A Yes No

D. Does new RSO meet the Department training requirements? N/A Yes No

E. Is the RSO fulfilling his/her duties? N/A Yes No

F. To whom does the RSO report? _____

G. If the designated contact person for the Department changed, was the Department notified? N/A Yes No

H. Does the license authorize all of the Department-regulated radionuclides contained in gauges possessed? N/A Yes No

I. Are the gauges as described in the Sealed Source and Device (SSD) Registration Certificate or Sheet? Yes No
Have copies of (or access to) SSD Certificates? Yes No
Have manufacturers' manuals for operation and maintenance? Yes No

J. Are the actual uses of gauges consistent with the authorized uses listed on the license? N/A Yes No

K. Is company management appropriately involved with the radiation protection program and oversight of the RSO's activities? Yes No

L. Does RSO have sufficient time to perform all duties/responsibilities? Yes No

3. Training and Instructions to Workers

A. Were all workers who are likely to exceed 100 mrem/yr provided radiation awareness training per 180 NAC 10-003? Yes No

B. Did each authorized user complete a 8 hour course provided by the manufacturer of the device or any Department approved course? Yes No

C. Are training records maintained for each gauge operator? Yes No

D. Did interviews with operators reveal that they know the emergency procedures? Yes No

M. Did this audit include observations of operators:

Using the gauge in a field situation?	Yes	No
Operating the gauge?	Yes	No
Performing routine cleaning and lubrication?	Yes	No
Transporting the gauge?	Yes	No
Storing the gauge?	Yes	No

E. HAZMAT training provided as required? [49 CFR 172.700, 49 CFR 172.701, CFR 172.702, 49 CFR 172.703, 49 CFR 172.704] N/A Yes No

4. Radiation Survey Instruments

A. If the licensee possesses its own survey meter, does it meet the Department's criteria? N/A Yes No

B. If the licensee does not possess a survey meter, are specific plans made to have one available? N/A Yes No

C. Is the survey meter needed for non-routine maintenance calibrated as required (180 NAC 4-021)? N/A Yes No

D. Are calibration records maintained (180 NAC 4-048)? N/A Yes No

5. Gauge Inventory

A. Is a record kept showing the receipt & transfer/disposal of each gauge? (180 NAC 1-004) Yes No

B. Are all gauges received physically inventoried every six months? N/A Yes No

C. Are records of inventory results with appropriate information maintained? Yes No

6. Personnel Radiation Protection

A. Are ALARA considerations incorporated into the radiation protection program? (180 NAC 4-004.02) Yes No

B. Is documentation kept showing that unmonitored users receive $\leq$10% of limit? (180 NAC 4-022.01) Yes No

C. Did unmonitored users' activities change during the year which could put them over 10% of limit? Yes No

D. If yes to c. above, was a new evaluation performed? Yes No

E. Is external dosimetry required (user receiving >10% of limit)? Yes No
And is dosimetry provided to users? Yes No

1) Is the dosimetry supplier NVLAP approved? (180 NAC 4-021.03) Yes No

2) Are the dosimeters exchanged monthly for film badges and at industry recommended frequency for TLDs? Yes No

3) Are dosimetry reports reviewed by the RSO when they are received? Yes No

4) Are the records Department Forms or equivalent?
(180 NAC 4-009.04, 180 NAC 4-052.03) Yes No
NRH-1 "Cumulative Occupational Exposure History" completed? Yes No
NRH-2 "Occupational Exposure Record for a Monitoring Period" completed? Yes No

5) If a worker declared her pregnancy, did licensee comply with (180 NAC 4-012)? Yes No
Were records kept of embryo/fetus dose per 180 NAC 4-052.04? Yes No

F. Are records of exposures, surveys, monitoring, and evaluations maintained (180 NAC 4-047, 180 NAC 4-048, 180 NAC 4-052) Yes No

7. Public Dose

A. Are gauges stored in a manner to keep doses below 100 mrem in a year? (180 NAC 4-013.01, Item 1) Yes No

B. Has a survey or evaluation been performed per 180 NAC 4-021.01? Yes No

Have there been any additions or changes to the storage, security, or use of surrounding areas that would necessitate a new survey or evaluation? Yes No

C. Do unrestricted area radiation levels exceed 2 mrem in any one hour? (180 NAC 4-013.01, Item 2) Yes No

D. Are gauges being controlled in a manner that would prevent unauthorized use or removal? (180 NAC 4-031) Yes No

E. Records maintained? (180 NAC 4-048, 180 NAC 4-053] Yes No

8. Operating and Emergency Procedures

A. Have operating and emergency procedures been developed? Yes No

B. Do they contain the required elements? Yes No

C. Does each individual working with the gauges have a current copy of the operating and emergency procedures (including lock-out procedures and emergency telephone numbers)? Yes No

D. Is a lock-out warning sign posted at each entryway to an area where it is possible to be exposed to the beam? Yes No

E. Does the operating and emergency procedures list the correct phone number for the RSO and the Department? Yes No

F. Did any emergencies occur? Yes No

If so, and were they handled properly by operator? Yes No

Were appropriate corrective actions taken? Yes No

9. Leak Tests

A. Was each sealed source leak tested every 6 months or at other prescribed intervals? Yes No

B. Was the leak test performed as described in correspondence with the Department and according to the license? Yes No

C. Are records of results retained with the appropriate information included? Yes No

D. Were any sources found leaking? Yes No
If yes, was the Department notified? Yes No

10. Maintenance of Gauges

A. Are manufacturer's procedures followed for routine cleaning and lubrication of gauge? Yes No

B. Was each on-off mechanism tested for proper operation every 6 months or at other prescribed intervals? Yes No

C. Are repair and maintenance of components related to the radiological safety of the gauge performed by the manufacturer, distributor or person specifically authorized by the Department, NRC or Agreement State and according to license requirements (e.g. extent of work, procedures, dosimetry, survey instrument, compliance with 180 NAC 4-013? Yes No

E. Is non-routine maintenance performed in-house? Yes No

F. Is yes to E., is non-routine gauge maintenance conducted by authorized personnel following procedures approved by the Department? Yes No

G. Are labels, signs, and postings identifying gauges containing radioactive material, radiation areas, and lock-out procedures/warnings clean and legible? Yes No

11. Transportation

(Note: This section will not apply if you have not transproted gauges during the period covered by this audit.)

A. Only DOT-7A or other authorized packages is used to transport gauges? [49 CFR 173.415, 49 CFR 173.416(b)] Yes No

B. Package performance test records are on file? Yes No

C. Special form sources documentation? [49 CFR 173.476(a)] Yes No

D. Package has 2 labels (ex. Yellow-II) with TI, Nuclide, Activity, and Hazard Class? [49 CFR 172.403, 49 CFR 173.441] Yes No

E. Packages used to ship gauges properly marked and labeled per 49 CFR 172.301, 49 CFR 172.304, 49 CFR 172.310 49 CFR 172.324? Yes No

F. Shipping containers properly locked, blocked & braced prior to transport? [49 CFR 173.475(f)] Yes No

G. Shipping papers prepared and used? [49 CFR 172.200(a)] Yes No

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] Yes No

I. Shipping papers within drivers reach and readily accessible during transport? [49 CFR 177. 817(e)] Yes No

J. Secured against movement? [49 CFR 177. 834] Yes No

K. Placarded on vehicle, if needed? [49 CFR 172.504] Yes No

L. Proper overpacks, if used? [49 CFR 173.25] Yes No

M. Any incidents reported to DOT? [49 CFR 171.15, 16] Yes No

12. Auditor's Independent Survey Measurements (If Made)

A. Describe the type, location, and results of measurements. Do any radiation level exceed regulatory limits?_____

_____

_____
_____
_____
_____
_____

13. Notification and Reports

A. Was any radioactive material lost or stolen? (180 NAC 4-057, 180 NAC 3-026) Yes No
If yes, were reports made? Yes No

B. Did any reportable incidents occur? (180 NAC 4-058, 180 NAC 3-026) Yes No
If yes were reports made? Yes No

C. Did any overexposures and high radiation levels occur? (180 NAC 4-059, 180 NAC 3-026) Yes No

Reported? Yes No

N. If any events (as described in items a through c above) did occur, what was root cause?

_____
_____
_____
_____
_____
_____

Were corrective actions appropriate?_ Yes No

F. Is the licensee aware of telephone number for the Department Emergency Operations Center? Yes No

14. Posting and Labeling

A. Following documents are posted at permanent facility:
NRH-3 "Notice to Employees" posted (180 NAC 10-002) Yes No

B. Below documents are posted or a notice indicating the location of the following documents.?

. Title 180 NAC Yes No
Operating &Emergency Procedures Yes No
Lock-out Procedures Yes No
The license, conditions or documents incorporated into the license by reference and amendments Yes No
Any notice of violation involving radiological working conditions, proposed imposition of civil penalties, or order issued to Title 180 NAC and any response from the licensee. NA Yes No

C. Radiation signs: (180 NAC 4-034, 180 NAC 4-035)

1) "Caution (or Danger), Radioactive Material" signs: posted at facility (unlessdocumentation kept describing eligibility for exception described 180 NAC 4-035? Yes No

D. " Gauges bear durable, clearly visible labels w/ radiation symbol, Caution (or Danger), Radioactive Material" warning, & sufficient information to permit individuals to avoid/minimize exposures? Yes No

15. Record Keeping for Decommissioning

A. Records kept of information important to decommissioning? (180 NAC 3-017.07) Yes No

B. Records include all information outlined in (180 NAC 3-018.07)? Yes No

16. Bulletins and Information Notices

a. Department Bulletins, Department Information Notices, Department Newsletters, received? Yes No

B. Appropriate training and action taken in response? Yes No

17. Special License Conditions or Issues

A. Did auditor review special license conditions or other issues (e.g., non-routine maintenance)? Yes No

18. 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.

19. Evaluation of Other Factors

A. Senior licensee management is appropriately involved with the radiation protection program and/or Radiation Safety Officer (RSO) oversight? Yes No

B. RSO has sufficient time to perform his/her radiation safety duties? Yes No

C. Licensee has sufficient staff to support the radiation protection program? Yes No

Appendix T

Inventory Procedure
&
Inventory Log of Material Sources & Devices

Appendix T
Inventory Procedure

Fixed Gauge Audit Checklist

Semiannual inventories are required to account for the sealed sources contained in fixed gauges possessed under a radioactive materials license. To ensure accountability of radioactive material, the procedure described below will be followed.

Physical Inspection

Every 6 months the general condition of each gauge will be evaluated to determine is any damage to the source housing or shielding has occurred. The inspection will also verify that all the identification and warning labels remain attached.

If the inspection reveals missing labels or apparent damage, the device will be removed from service until the problem can be corrected. Any apparent damage to the gauge will be reported to the Radiation Safety Officer immediately. If excessive radiation levels are discovered, notify the Nebraska Health and Human Services Regulation and Licensure, Radioactive Materials Program.

Inventory Records

A semiannual inventory record will be retained for 3 years from the date of the inventory. The attached inventory form (or equivalent) will be used. Relevant inventory information includes:

- Device Manufacturer, Model Number and Serial Number
- Source Manufacturer, Model Number and Serial Number
- Source Activity
- Location
- Condition
- Date of Inventory
- Signature of the Radiation Safety Officer (or designee)

INVENTORY OF RADIOACTIVE SEALED SOURCES & DEVICES

Company: _____License No. _____

Date of Inventory:_____ Radiation Safety Officer (or designee) Signature: _____

#	GL or SL	DEVICE MANUFACTURER	DEVICE MODEL NO.	DEVICE SERIAL NO.	SOURCE MANUFACTURER	SOURCE MODEL NO.	SOURCE SERIAL NO.	SOURCE ACTIVITY	LOCATION	CONDITION

Notes: (1) Listing “In Storage” under the CONDITION column identifies a source held in secured storage with no use anticipated prior to transfer/disposal.
(2) GL = General Licensed; SL = Specific Licensed

Appendix U

Records Retention

RECORD RETENTION

Records pertaining to fixed gauging operations will be maintained in accordance with the requirements specified in Title 180

DOCUMENT	RETENTION INTERVAL
Title 180, Nebraska Administrative Code	Until termination of license
Radioactive materials license (with all active amendments and supporting documents)	Until termination of license
Provisions of radiation protection program	Until termination of license
Rad. protection program Audits	Until termination of license
Training and testing records	Until worker's termination or 5 years, whichever is greater
Leak test records	5 years after records are made
Inventory records	3 years after records are made
Copies of "IAEA Certificate of Competent Authority" for each gauge's source (Special Form Source Certificate)	1 year beyond last gauge shipment
Records of Type A package test results for each authorized fixed gauge model	1 year beyond last gauge shipment
Copies of manufacturer's operation/safety manual for each authorized gauge model	As long as each gauge model is authorized by the license
Receipt records	For as long as the material is possessed until 5 years after transfer or disposal
Transfer & disposal records	Until the Department terminates each pertinent license requiring the record
Prior occupational dose histories	3 years after records are made
Personnel monitoring (PM) results	Until termination of license
Annual PM exposure notification reports	3 years after reports are made
Individual PM reports following employee termination	3 years after reports are made
Records demonstrating compliance with individual members of the public dose limits	Until termination of license
Records of surveys/measurements used to determine external/internal doses	Until termination of license
Records of surveys performed to evaluate radiation levels or radiation hazards	Until termination of license
Survey instrument calibration records	Until termination of license
Records not otherwise specified in the regulations	1 year beyond last inspection by the Department unless any litigation, claim, negotiation, audit, licensure action before the expiration of the one-year period

Appendix V

Transfer/Disposal

Appendix V
Transfer/Disposal

180 NAC 3-025, address transfer and disposal of radioactive material. Fixed gauges will be transferred only to companies or individuals specifically licensed to possess them, in accordance with the below procedure.

Verification

If a gauge or other device containing radioactive material is bought, sold or transferred for disposal, verification of the transferor's and transferee's authorization to possess the radioactive material will be documented. Either a copy of each other's radioactive materials license will be exchanged, and the transferor's license will be retained on file as evidence of an authorized transfer, or one of the other verification methods listed in 180 NAC 3-025, will be used.

Documentation

As a minimum, documentation of the transfer will include the following:

- The material being transferred (gauge manufacturer name, model and serial number, type and activity of radioactive material, and source manufacturer name and model number);
- The date of the transfer;
- The name, address, and license number of the transferor and transferee; and
- The signatures of the individuals shipping and/or receiving the gauge.

All transfer and disposal records will be retained on file for inspection purposes until license termination.

Appendix W

NRH-60

Certification of Disposition Of Materials

NEBRASKA
Good Life. Great Mission.
DEPT. OF HEALTH AND HUMAN SERVICES

Form NRH-60
Revised 3-2022

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
RADIOACTIVE MATERIALS PROGRAM

CERTIFICATION OF DISPOSITION OF MATERIALS

INSTRUCTIONS - (Use additional sheets where necessary.)
Type or Print except where indicated.
Retain one copy for your files and submit original application to: Department of Health and Human Services, Division of Public Health, Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, NE 68509-5026.
Upon approval of this Certification of Disposition of Materials the licensee will receive a termination notice of this radioactive material license.

1. Licensee Information

Licensee Number: _____

License Expiration Date: _____

2. Person to Contact Regarding this Application

_____

Telephone #: _____

Licensee Name and Street Address:

Applicant Name: _____

Address: _____

_____

City, State Zip+4 _____

Telephone #: _____

FAX#: _____

E-mail Address:

3. Materials Data

☐ No Materials have ever been procured or possessed by the Licensee under this License.

☐ All Materials procured and/or possessed by the Licensee under the License Number cited above have been disposed of in the following manner:

☐ Transfer
Specify the date of the transfer, the name of the licensed recipient and the recipient's Department, NRC or Agreement State license number.
Describe specific materials transfer actions and if there were radioactive wastes generated in terminating this license, the disposal actions, including the disposition of low-level radioactive waste, mixed waste, Greater-than-Class-C waste, and sealed sources, if applicable.

☐ Disposed of directly by Licensee
Describe specific disposal procedures (e.g., decay in storage).

4. Other Data

☐ Our License has not yet expired, please terminate it.
A Radiation Survey was conducted to confirm the absence of licensed radioactive materials and to determine whether any contamination remains on the premises covered by the license:

☐ NO (Attach Explanation)

☐ YES, the results:

☐ Are attached

☐ Were forwarded to the Agency on (Date)
_____

4. Other Data *(Continued)*

Address all future correspondence regarding this license to:

Name:

Address:

City, State Zip+4:

Telephone #:

FAX#:

E-mail Address:

5. CERTIFICATION
(This item must be completed by applicant.)

The applicant and any official executing this document on behalf of the applicant named in Item 1., certify that this application is prepared in conformity with the Nebraska Department of Health and Human Services, Title 180, Regulations for Control of Radiation and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

Applicant Name from Item 1.

By: _____ *Date:* _____
Signature

_____
Print Name and Title of certifying official authorized to act on behalf of the applicant

Appendix X

Delegation of Authority to Make Legally Binding Statements Form

Appendix X

Delegation of Authority to Make Legally Binding Statements

Below is a sample copy of a delegation of authority to make legally binding statement.

Memo to: All Employees and Nebraska Office of Radiological Health

From: Chief Executive Officer

Subject: Delegation of Authority to Make Legally Binding Statements

_____ has been delegated the authority to make legally binding statements with regard to the radioactive materials license application, inspections, renewal, amendments and termination.

_____
License Certifying Official (signature)

_____
Name (type or printed)

_____
Title

_____
Date