Alaska
Department of Transportation
and
Public Facilities

Alaska Radiation Protection Program Manual

Foreword

Introduction

Instruments containing radioactive materials are licensed and highly regulated by the US Nuclear Regulatory Commission (NRC). All aspects of acquisition, use, storage, and disposal of these materials are subject to government regulation and inspection. The ability of DOT&PF to use these materials is dependent on satisfying the requirements of the NRC and State of Alaska Department of Health and Social Services.

This *Radiation Protection Program Manual* contains DOT&PF policies and procedures. It is an integral part of the Radiation Protection Program and provides guidance to ensure the safety of the public and DOT&PF personnel. All work involving nuclear moisture density gauges or asphalt content gauges must be done in accordance with the policies and procedures in this manual.

Suggestions for improving the Radiation Protection Program Manual should be forwarded to Gregory S. Christensen (Statewide Radiation Safety Officer) by phone at (907) 269-6248, by e-mail at Greg.Christensen@alaska.gov, or by mail at 5800 E. Tudor Rd., Anchorage, AK 99507. The Statewide Radiation Safety Officer can also provide detailed information on regulatory requirements and additional reference materials dealing with radiation protection, radiation measurement, and radiation biology.

Statements of Policy

It is the policy of DOT&PF that all activities involving nuclear gauges shall be conducted in such a manner so as to keep exposure "as low as reasonably achievable" (ALARA). Persons involved in such activities must comply with the NRC regulations and all rules and guidelines issued by DOT&PF.

The responsibility for making policy and approving and issuing this manual resides with the Chief Engineer of DOT&PF. The Statewide Radiation Safety Officer (SRSO) is responsible for maintenance and control of the Radiation Protection Program and updating and maintaining this manual. The Regional Radiation Safety Officer(s) (RRSO) assists the SRSO in overseeing the Radiation Protection Program, reviewing the program's effectiveness and proposing changes to the program.

Safety Conscious Work Environment (SCWE) Policy Statement

DOT&PF is committed to provide an environment where employees are encouraged to raise concerns without fear of retaliation. It is appropriate for employees to spend work time in reporting concerns. Management at all levels invites safety concerns and are committed to the timely investigation and resolution of all safety related issues. Retaliation for raising concerns will not be tolerated and when found appropriate discipline will be taken.

ALARA Statement

The DOT&PF is committed to the program described in this manual for keeping radiation exposures As Low as Reasonably Achievable (ALARA). We are organized administratively to develop the necessary written policies, procedures, and instructions to foster the ALARA concept at DOT&PF. The organization includes a Statewide Radiation Safety Officer (SRSO) and three Regional Radiation Safety Officers (RRSO).

To ensure our ALARA commitment, the SRSO will conduct an annual review of the Radiation Protection Program with the assistance of the RRSO. This review will include operating procedures, radiation exposure records, inspections, and consultations with radiation safety consultants as appropriate.

To the extent practicable, procedures and engineered controls will be based on sound radiation protection principles to achieve occupational doses and doses to the public that are ALARA. ALARA practices must include as a minimum:

- Wearing of dosimeters for radiation workers
- Use of proper survey instruments
- Proper storage of licensed materials
- Training and qualification of personnel
- Periodic field inspections of the use of licensed materials

Table of Contents

1. Program Organization and Training Requirements

1.1. Radiation Safety Team

The Radiation Safety Team (RST) is lead by the Statewide Radiation Safety Officer (SRSO) and includes the three Regional Radiation Safety Officers (RRSO's). See Tables 2-1 and 2-2 for contact information.

1.1.1 Responsibilities

The RST shall:

1. Be familiar with radiation regulations, policies and procedures, and the terms of the DOT&PF's radioactive materials license and its amendments
2. Review the radiation safety program and make recommendations to the SRSO
3. Hold committee meetings and maintaining written records of all meetings and recommendations. The RST will meet as often as necessary to conduct its business, but not less than once in each calendar year.

1.2. Statewide Radiation Safety Officer

The DOT&PF's SRSO receives authority from DOT&PF management and the NRC license.

The SRSO is authorized to initiate remedial action or to temporarily halt or immediately terminate the use of a nuclear gauge or licensed activities that are found to be a threat to health, safety, or property, or are otherwise in violation of federal or state regulations or the requirements of this document.

A temporary halt is a cessation of the activity and securing of the gauge(s) until the violation is corrected on site. If it is not possible to immediately correct the violation, the SRSO will terminate the use of the gauge(s) and remove it from the project. Any or all gauges will be placed under lock, accessible only to the SRSO.

Remedial action also includes but is not limited to coaching, demonstrating, or otherwise enforcing the required procedures of handling and using the nuclear gauges or licensed activities.

The SRSO also has authorization to travel to ensure the compliance of all licensed activities and is authorized for immediate travel to ensure the security of the nuclear gauges or the safety of members of the public and DOT&PF personnel, or to respond to emergency situations.

1.2.1 Responsibilities

The Statewide Radiation Safety Officer shall:

1. Oversee and control activities involving radioactive material, including monitoring users through routine inspections performed at least twice per year and special surveys conducted at the request of the RST or at the discretion of the SRSO
2. Perform audits of the regional programs at least annually
3. Provide updates to the RRSO's regarding changes in NRC policies and regulations as they apply to the regional programs
4. Request amendments to NRC Nuclear Materials License as necessary
5. Review proposed purchases of licensed materials for compliance with the requirements of the NRC license
6. Determine compliance with policies, procedures, and license conditions as specified by the RST and the NRC
7. Maintain this manual and recommend changes to the Chief Engineer
8. Supervise, coordinate, and maintain accurate records of the gauge acquisition and disposal process
9. Keep records of personnel exposures, and investigate exposures in excess of NRC limits
10. Ensure the performance of leak tests on sealed sources
11. Provide training programs for instruction of personnel in the policies, procedures, and

regulations regarding the use of radioactive materials

12. Consult on aspects of radiation safety with personnel at all levels
13. Maintain an inventory of nuclear gauges and limit, when necessary, the number of gauges to the number authorized by the license
14. Arrange calibration of nuclear gauges
15. Provide standard practices for transporting nuclear gauges
16. Review temporary and permanent storage facilities of the gauges and direct or make recommendations as required to ensure or improve public safety and gauge security. The review may be done on site, or with documents provided by the RRSO that will include a drawing or sketch of the facility showing locks and relationship to areas available to the public, as well as surveys of the radiation exposure in the public areas. (See 2.13, 2.14) The exposures may be calculated.
17. Maintain a central file of copies of records including inventories, storage facility surveys, leak tests, dosimeter reports, violations, and remedial actions. Statewide files will also include the license and all amendments, correspondence to and from the NRC, the results of the reviews of the regional programs, and the results of the annual review of the Statewide Radiation Protection Program, including deficiencies noted and the corrective actions taken.
18. Indicate by initial and date on the first page of the document, when documents are received and reviewed.
19. Maintain a calibrated radiation detection device, to be used for conducting surveys as required
20. Arbitrate Safety Conscious Work Environment investigations that involve the nuclear gauge program.

1.3. Regional Radiation Safety Officer

All operations involving the use of nuclear gauges must be carried out under the direction of a Regional Radiation Safety Officer (RRSO). The Regional Construction Engineer designates an RRSO in each of the three regions.

The RRSO is authorized to initiate remedial action or to temporarily halt or immediately terminate the use of a nuclear gauge or licensed activities that are found to be a threat to health, safety, or property or otherwise in violation of federal, state, or local regulations or the requirements of this manual.

1.3.1 Responsibilities

Each Regional Radiation Safety Officer shall:

1. Ensure that adequate facilities are provided, including equipment, storage facilities, instruments, supervision, and instructions to control nuclear gauges, and to comply with the requirements of this manual and the RST
2. Maintain with the SRSO an up-to-date listing of storage areas both permanent and temporary in which nuclear gauges are stored, including dates used, surveys or calculations of potential exposures, and locations
3. Either perform or cause to be performed leak testing of all nuclear test gauges in the region. Leak tests are performed on all gauges in service at an interval not to exceed the time limit specified in the Sealed Source and Device Registry for the specific gauge.
4. Maintain an up-to-date listing of the names of individuals who are authorized to use nuclear gauges.
5. Keep an inventory of the number, model, and serial numbers of nuclear gauges and their locations
6. Keeps record of disposal of all radioactive material in the region and provides copies of the disposal records to the SRSO within seven days of receipt of the record.
7. Conduct radiation surveys of all restricted and unrestricted areas around the gauge storage annually.
8. Demonstrate radiation levels of each storage area are less than the 100 mrem/yr or 2 mrem in any one-hour requirement. Demonstration can be calculated based on the gauges Transportation Index (TI) or from survey meter readings.
9. Control the entry to storage areas to ensure radiation protection and security

10. Provide security against unauthorized removal or use of nuclear gauges
11. Ensure that radiation workers in the region wear radiation exposure monitors during periods of possible exposure and that these monitors are stored in an appropriate location
12. Instruct radiation workers in the region and document this instruction prior to allowing them to use a nuclear gauge (See 1.4, 1.5)
13. Ensure that all radiation protection procedures are consistent with the DOT&PF's policy of maintaining exposures as low as reasonably achievable (ALARA).
14. Perform audits of active radiation workers in the field and verifies that tasks are performed according to this manual, the license, DOT&PF policies, and all federal and state regulations. The RRSO performs a minimum of three field audits during the construction season and keeps a written record of the audit including date, name of the radiation worker, items reviewed, deficiencies found, and corrective actions taken.
15. Respond within the specified time frame to all requests for remediation or corrective action. The request must specify the time frame.
16. Transfer copies of all records to the Electronic Document Management System (EDMS). These shall include but are not limited to acquisition, inventory audits, leak tests, exposure records, training, audits performed and surveys of storage facilities, temporary or permanent. Prior to transferring records, initial and date the first page showing the date reviewed.
17. Investigate Safety Conscious Work Environment (SCWE) concerns that involve radiation issues

1.4. Authorized Nuclear Gauge User

Authorized nuclear gauge users are individuals authorized by the RRSO to work with nuclear gauges. An individual must obtain authorized nuclear gauge user status prior to performing any procedure involving nuclear gauges. To be designated as an authorized user, the individual must successfully complete an approved 8 hour gauge users class, be supplied with a dosimeter, and be given access to gauge(s) by the RRSO.

Authorized users must:

- Have a basic understanding of radiation protection practices and the hazards associated with use of the DOT&PF's gauges, as well as an understanding of the Safety Conscious Work Environment program.
- Act in accordance with the practices established in this manual, rules established by the SRSO, and all applicable laws and regulations. Authorized users can initiate remedial action or temporarily halt or immediately terminate the use of a nuclear gauge or licensed activities that are found to be a threat to health, safety, or property, or are otherwise in violation of federal or state regulations or the requirements of this document.
- Have a current copy of the Operation and emergency procedures in possession when ever transporting or using a gauge.
- Make every effort to keep their exposure ALARA.
- Report any safety concerns regarding the use or storage of the nuclear gauges.
- Have a current dosimeter issued by the RRSO

1.5. Training Requirements

1.5.1 Authorized Nuclear Gauge User Training:

DOT&PF is obligated by 10 CFR 20 to ensure that individuals who work with nuclear gauges are supervised and instructed in the hazards of radiation and related regulations, and are competent to safely use nuclear gauges. Each person who wishes to work with nuclear gauges for the DOT&PF must complete the eight-hour radiation safety and gauge operation training course and training in a SCWE. Alternately, approved online training will be accepted in lieu of classroom training for both the initial and refresher class requirements.

This training provides an overview of the principles and practices of radiation protection, monitoring techniques, biological effects, regulations, gauge-specific instruction and SCWE.

To retain status as an authorized nuclear gauge user, they are required to complete nuclear gauge user HAZMAT and SCWE refresher training at three-year intervals for gauge users transporting gauges by vehicle, or on a two-year basis if they transport gauges by air under the International Air Transportation Act

(IATA). All training lesson plans and presentations must be approved by the SRSO.

The initial nuclear gauge user training program consists of an eight-hour class on radiation safety, gauge instruction, and SCWE that is documented and directed by the Regional Radiation Safety Officer. Training shall cover the following items:

1. Applicable regulations and license conditions (Radiation Protection Program Manual, RRSO lectures, and regulatory review)
2. Safety Conscious Work Environment
3. Radiation hazards, biological effects, and risk assessment (videotapes, instruction, and RRSO lecture)
4. Radiation safety procedures including work rules, exposure monitoring, survey instrument use, and contamination monitoring (RRSO lecture and manual)
5. Obligation to report safety concerns
6. Emergency procedures
7. The right to be informed of radiation exposure results
8. Instructions on proper use of the gauge
9. Posting and license location

The HAZMAT and SCWE refresher course shall cover applicable portions of items 1, 2, 4, and 5. Students will take an examination at the end the class to evaluate knowledge of the DOT&PF's Radiation Protection Program, SCWE Program, biological effects, associated hazards, related rules and regulations, radiation terminology, and consequences of failure to comply with all state and federal rules and regulations. A passing score of 70% on both the 8 hour gauge uses class and the HAZMAT and SCWE refresher class is required.

1.5.2 SRSO and RRSO Training

All RSOs must receive the training required for an authorized nuclear gauge user, an eight-hour training course specifically for RSOs from an institution approved by the NRC, and a 40-hour RSO training course from an NRC-approved institution. The requirement for an eight-hour course can be waived if a 40-hour RSO course is taken within two months of being appointed. The 40-hour course must be completed within one year of appointment.

The 40-hour RSO training includes at a minimum the following:

- Overview of duties of the RSO
- NRC regulatory requirements pertaining to the Radiation Protection Program
- HAZMAT and DOT transportation regulations for licensed materials.
- Leak tests

1.5.3 Radiation Safety Instructor

All personnel who will teach either the department approved eight-hour Authorized Nuclear Gauge User course or the approved nuclear materials HAZMAT and SCWE refresher course must meet one of following sets of criteria:

- Bachelor's degree in physical, life science or engineering
- Successful completion of the eight-hour Gauge User Training Class
- Eight-hour RSO course
- Eight hours of hands-on experience with the gauges

Or:

- Successful completion of the eight-hour Gauge User Class
- Successful completion of a 40-hour RSO course
- Thirty hours of hands-on experience with the gauges

All personnel who will teach the SCWE portion of either the department approved eight-hour Authorized Nuclear Gauge User Course or the approved nuclear materials HAZMAT refresher course must meet the following criteria:

- 40-hour safety-related course (HAZMAT, RSO, OSHA)
- ADOT&PF SCWE training course

The RRSO and SRSO will transfer training records to the Electronic Document Management System (EDMS) at least annually. Records shall be

maintained in the EDMS for at least 75 years or until the USNRC license is terminated.

1.5.4 Additional Training

Authorized nuclear gauge users will also receive training in specific functions prior to performing the functions, which include non-routine maintenance, from a radiation safety instructor or approved vender as required to facilitate the gauge program. The instructor will document the successful completion of the instruction and performance exam by issuing a certificate designating the gauge user as qualified to perform either of these functions.

2. Radiation Safety

2.1. General

This section of the *Radiation Protection Program Manual* outlines the requirements and procedures for DOT&PF's purchase and use of radioactive materials. All reports and records generated by this program will be kept long term in the EDMS. Purging will not be done until after 75 years or the termination of the license.

Radioactive material use at DOT&PF is bound by the limits and requirements established in the DOT&PF's NRC Radioactive Materials License. This license imposes limits on the quantities, types, and forms of radioactive materials that can be possessed and outlines specific requirements for DOT&PF's Radiation Protection Program. All aspects of the purchasing, use, and disposal of radioactive materials must comply with the terms of the DOT&PF's Radioactive Materials License and State of Alaska laws and regulations.

2.2. Audit Program

To comply with the requirements of 10 CFR 20.1101, 10 CFR 20.2102 and the NRC Radioactive Materials License, each of the regional programs, and the statewide program must be audited annually. In addition, unannounced audits of gauge users in the field to verify compliance with the Radiation Protection Program shall be conducted.

The SRSO audits the Radiation Protection Program for each region annually and must complete the audit no later than December 31st of each year. Audits are conducted in accordance with NUREG 1556 Vol. 1 Appendix F, "Portable Gauge Audit Checklist." The RRSO must address any deficiencies, and forward a record of all corrective actions taken to the SRSO within 60 days of the completion of the audit.

The State Materials Engineer or his/her designee must audit the SRSO's program no later than December 31th of each year. Conduct the audit in accordance with NUREG 1556 Vol. 1 Appendix F, "Portable Gauge Audit Checklist." The SRSO must address any deficiencies, and forward a record of all corrective actions to the State Materials Engineer within 60 days of the completion of the audit.

RST members shall make unannounced random audits of gauge users in the field. The RRSO will perform a minimum of three field audits during the construction season and keeps a written record of the audit including date, name of the radiation worker, items reviewed, deficiencies found, and corrective actions taken.

Transfer all records of audits to the EDMS. Records include the date of the audit, audit findings, corrective actions, and follow-up.

2.3. Gauge Receipt and Accountability (Including Registration with Dept. of Health)

DOT&PF's Radioactive Material License requires an active inventory of all of its radioactive sources. To ensure compliance with this requirement, notify the SRSO prior to the purchase, receipt, or disposal of any radioactive material. The SRSO must review all requests for purchase or disposal of radioactive materials to ensure that the possession limits of source types are within the scope of the license or that disposals are by properly licensed parties. Anticipate all purchases of nuclear gauges in advance so that a review and amending of the license, if required, can be completed prior to purchasing.

The SRSO must approve in writing nuclear gauge requisition or disposal requests prior to purchase or disposal. The approval will identify the make, model, source, and quantity.

The RRSO will assess the storage facility to verify that the additional source(s) will not cause the regulatory ALARA requirements to be exceeded, notably the 100 mrem/yr and 2 mrem/hr requirement for the general public.

When the new gauge is received, set up a gauge file with the shipping documents, certificate of competent authority, current leak test results, initial calibration records, sealed sources and devices certificate, and emergency procedures. Add the gauge to the regional inventory and place a copy of the file in the EDMS.

Notify the State of Alaska Department of Health and Social Services of the new gauge(s) by submitting a completed Registration Form – Radioactive Materials (see 4.1) within seven days of the acquisition.

Retain all records pertaining to the gauge for three years after its final disposition.

RRSOs must inventory all sealed sources at least every six months. Inventory records must include the nuclear isotope and quantity, manufacturer's name, model number, serial number of both the gauge and the source, location of the gauge, and the date of the inventory. Place a copy in the EDMS within seven days of completion.

2.4. Occupational Dose

All DOT&PF personnel who have been trained and who have been approved to work with the nuclear gauges will receive either a film badge or a thermolumenescent dosimeter, which they are required to wear when working with a nuclear gauge. This will allow the SRSO and the RRSO to verify that the exposures are within the regulatory limits and that our program is functioning according to the principles of ALARA.

The data collected by personal dosimeters are for department use only. None of our employees are likely to received annual doses in excess of 10 percent of the regulatory required limit and therefore use of personal dosimeters is not required by regulation. A memo is on file with the SRSO describing the methodology used to verify the use of personal dosimeters is not required by regulation.

If an authorized nuclear gauge user is likely to exceed 10% of the allowable occupational dose, prior to beginning work, the RRSO must request exposure information from prior employment. In complying with this request, the RRSO may accept

- a written signed statement from the employee stating the occupational dose he or she received during that year,
- a signed statement from the employee's former employer stating the nature and amount of the occupational dose the individual received during the current year,
- a completed NRC Form 4 or equivalent,
- or copies of the individual's dose reports.

The RRSO may receive documents by fax, letter, or electronic media. In the absence of this information, the RRSO will assume the gauge user has received 1250 mrem/quarter toward the allowable exposure of 5000 mrem/year for the year in which the gauge user is hired.

If a dosimeter is lost or stolen, report it to the RRSO within 48 hours. The RRSO will report the loss to the SRSO quarterly and assign a temporary dosimeter until a replacement is received.

Under the direction of the RRSO, the authorized user shall perform a personal exposure investigation. Notify the dosimeter provider to estimate the quarter's dose based on the user's history. When no history is available, the authorized user shall estimate the dose using the available dose estimate report in this manual. Notification of the estimated dose shall be reported to the dosimeter provider so that the Year To Date dose can be updated.

The personal exposure investigation shall establish an estimated dose by multiplying the estimated hours the gauge was in close proximity (30 cm) to the gauge user times the dose rate at (30 cm). The time shall be calculated with the following assumptions: assign five minutes for each density tests taken: and 10 minutes for each loading/unloading into storage.

If other functions were performed by the individual, i.e. leak testing, cleaning gauges, etc., these functions shall also be estimated and added to the estimated dose.

The dosimeters will be supplied and processed by a processor who is National Voluntary Laboratory Accreditation Program (NVLAP) approved.

When the holder of a dosimeter is not working with or around the nuclear gauges, the worker must store the dosimeter in a way that exposes it only to background radiation, out of direct sunlight, and away from heat or

nuclear sources not being used by the wearer during occupational activities, i.e. x-rays, sources not related to licensee work, etc.

The doses received by authorized users wearing a dosimeter will be monitored so the total annual dose does not exceed 5000 mrem.

The RRSO must review quarterly dosimeter reports within 48 hours of receipt. When the measured quarterly dose is more than 150 mrem/quarter, the RRSO must notify the SRSO immediately and begin an investigation. The investigation will review when and where the dosimeter has been worn, where it is stored, and any possible sources of exposure. The RRSO will notify the SRSO within seven days of receipt. These dose reports will be kept in the EDMS until the NRC terminates the license.

The SRSO will issue each authorized nuclear gauge user an annual report noting the total dose received during the previous year. The SRSO will deliver the report no later than May 31st of the year following the exposure year.

2.5. Public Dose

Monitor transportation, use and storage so that the general public is not exposed to more than 100 mrem/year and 2 mrem in any one hour at 30 cm. Demonstrate the exposure levels at storage sites according to Section 2.14.

Maintain constant surveillance over gauges that are not in storage and secure stored gauges from unauthorized removal or use to ensure the public dose is not exceeded.

2.6. Embryo/Fetus Dose

Authorized users are encouraged to notify supervision when pregnant, however, declaration of pregnancy is voluntary and implies a willingness to abide by lower dose limits for the protection of the embryo/fetus and accept temporary changes in work schedules, location, or assignments.

All declarations of pregnancy shall be made in writing to the individual's supervisor, the RSO, or the personnel department and shall include the estimated date of conception. A sample form for declaring pregnancy is contained in Appendix 3.5. A doctor's statement is not required. A woman may withdraw a declaration of pregnancy at any time by providing written notice.

Upon declaration of pregnancy, an evaluation shall be performed to determine the potential for the employee to exceed the regulatory exposure limit during the nine-month gestation period. If the potential for exposure in excess of the dose limits exists, the employee may be transferred to a different job assignment.

Declared pregnant women with the potential to exceed 50 mrem during the course of pregnancy shall be assigned a Thermo Luminescent Dosimeter (TLD).

Dose to an embryo/fetus of a declared pregnant woman shall not exceed 500 mrem during the entire pregnancy.

If the dose to an embryo/fetus is found to have exceeded 450 mrem by the time the woman declares the pregnancy, additional dose to the embryo/fetus shall not exceed 50 mrem during the remainder of the pregnancy.

If a woman does not declare pregnancy, she will be subject to the normal occupational exposure limits.

2.7. Operating and Emergency Procedures

2.7.1 Operating Procedure

- All gauge operators shall wear a dosimeter when working with and around the nuclear gauges. Nuclear gauge operators shall wear only the dosimeter that is issued to them.
- Before removing a gauge from storage, verify that the source is locked in the fully shielded position and that the gauge is properly secured in the locked transport case.
- Sign the gauge out on the gauge's utilization/ transportation log and indicate date, individual removing the gauge from storage, and the location where the gauge is to be used.
- Block or brace the gauge so that the gauge cannot move during transport, and lock the gauge to the vehicle using two independent, tangible barriers. See section 2.10. for more details. Follow all current applicable U.S. Department of Transportation (USDOT) requirements when transporting the gauge. This includes but is not limited to sealing the gauge case with a seal that is evidence that the case has not been opened (zip ties are acceptable).
- Place the shipping and emergency response papers in the driver's door pocket or on the seat next to

the driver while the gauge is being transported. Move the papers from beside the driver onto the driver's seat when the gauge is in the vehicle and the driver is not. When the gauge is removed from the vehicle, move the transport papers out of sight.

- Do not touch the unshielded source with fingers, hands, or any part of the body.
- Do not place fingers, hands, feet, or any part of the body in the radiation field from an unshielded source.
- Use the gauge according to the manufacturer's instructions and recommendations.
- After completing the final measurement, immediately return the source to the shielded position. Verify visually that the sliding block has closed completely. If the sliding block does not close completely, see 2.7.2 and contact your RRSO.
- Maintain constant surveillance and immediate control of the gauge when the gauge is unsecured. At the job site, do not walk away from the gauge and leave it on the ground. Protect yourself and the gauge from danger of moving heavy equipment.
- Keep unauthorized persons at least three feet away from the gauge. Exceptions can be made for individuals viewing data after a test. Keep these exceptions as brief as possible.
- Perform cleaning and routine maintenance according to the manufacturer's instructions.
- When the gauge is not in use (and under the constant surveillance of the radiation worker) on a temporary job site, keep the gauge secured by locking it in an RRSO-approved storage site.
- Return the gauge to its proper, secured storage area at the end of each work shift.
- Log the gauge in the gauge's utilization/ transportation log when it is returned to storage.
- After making changes to the gauge storage area (such as changing locations in the storage area, adding gauges, changing occupancy of adjacent areas, and moving the storage area to a new location), reevaluate compliance with public daily dose limits and ensure proper security of the gauges. Proper security includes maintaining two independent, tangible barriers. If changes are initiated by the authorized user, they must notify the RRSO prior to making any changes in the storage of a nuclear gauge.

2.7.2 Emergency Procedures

Damaged Gauge or Source Rod

A gauge or source rod is considered damaged if any of the following conditions exist.

- If the source fails to return to the fully shielded position (e.g., as a result of being damaged, source becomes stuck below the surface),
- or gauge internals are exposed from damage, or if the source could inadvertently become unshielded (e.g. the gauge locking mechanism on the handle becomes damaged),
- or if any other emergency or unusual situation arises (e.g., the gauge is struck by a moving vehicle, is dropped, is in a vehicle involved in an accident):

If any of the above conditions exist, the following actions must be taken:

- Immediately secure the area (i.e. cordon off with rope, etc.) and keep people at least 15 feet away from the gauge until the situation is assessed and radiation levels are known. However, perform first aid for any injured people and remove them from the immediate area only when it is medically safe.
- Notify the RRSO and the SRSO. The NRC must be notified of the incident within 24 hours. If the gauge was part of an event such as a fire or explosion, the NRC must be notified within 4 hours.
- Inspect the gauge to determine the extent of the damage to the source(s), source housing, and shielding. ***Do not attempt to remove the gauge until a technician authorized in using a survey meter has completed a radiation survey and determined the source is shielded or the exposed rod is contained in a lead shielding pig.***
- If any heavy equipment is involved, immediately detain the equipment and the operator until it is determined there is no contamination present.

- Gauge users and other potentially contaminated individuals should not leave the scene until released by the RRSO, the SRSO, or the State of Alaska Department of Health and Social Services representative.

Table 2-1

RRSO contact information:

Name	Work Number	Home Number	Cell Phone Number
Jeanne Dirks—Central Region RSO	(907) 269-0469		(907) 244-7321
Carl Heim— Northern Region RSO			(907) 460-2894
Pat Harmon—Southeast Region RSO	(907) 465-1797	(907) 586-9532	(907) 723-9905

Table 2-2

If unable to contact the RRSO, contact the following:

Name	Work Number	Home Number	Cell Phone Number
Greg Christensen—SRSO	(907) 269-6248	(907) 357-7055	(907) 354-7054
Troxler – Gauge Manufacturer	(919) 549-9539		
NRC—24 hour hot line	(301) 816-5100	N/A	N/A
Clyde Pearce—Chief, Radiological Health Program— State of Alaska Dept. of Health	(907) 334-2100		

Theft or Loss of a Gauge

- Immediately notify the RRSO. The RRSO should then contact the SRSO and the police. The SRSO will contact the NRC, the Department of Health and Social Services and Troxler.
- For lost gauges, where practical, initiate a search after making notifications.

Fire

- Immediately call the Fire Department.
- Take appropriate action to protect personnel. ***Remember, this is your first priority!***
- Notify the RRSO as soon as possible. Notification to the NRC must be made immediately or not to exceed 4 hours after the incident.
- Stand by to advise firefighters of the nature, location, and potential hazard of the radioactive materials. ***Do not leave the scene.*** Supply firefighters with all necessary information regarding facility layout, gauge storage area, number of gauges, etc. Be sure to include any other potential hazards present such as chemicals, explosives, guard dogs, locked doors, etc.

Figure 2-1
Melting Points

Gauge Technical Information

Temperatures from most industrial fires will normally range from 500 °F near floor level up to 1800° F near ceiling height. These temperatures are high enough to melt the Lexan plastic gauge cover and the lead shielding around the source rod. The aluminum housing around the gauge bottom and containing the Am-241/Be source would only melt in the most severe fire. The double stainless steel capsules in which the Cs-137 and Am-241/Be sources are sealed would not reach their melting point.

Melting Points of Nuclear Gauge Construction Materials

Stainless steel	2550° F
Aluminum	1005° F
Lead	620 ° F
Lexan and Poly	257° F

Responsibilities of the RRSO and SRSO

- Arrange for a radiation survey as soon as possible by an authorized person using a survey meter. This could be the RRSO, SRSO, 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.
- The SRSO will notify authorities as required including; notify the Department of Health and Social Services through the emergency number listed above of any potential radiation hazards; and NRC notification is required when gauges containing licensed material are stolen, lost, or involved in accidents that involve exposures in excess of 10 CFR 20.2203 limits; when it becomes apparent that attempts to recover a source stuck below the surface will be unsuccessful; if the gauge is involved in a fire or explosion; or if the source rod cannot be returned to its shielded position.

The 10 CFR 20.2203 limits and time requirements are:

- Report immediately if the total effective dose exceeds 25 rem, the lens dose exceeds 75 rem, or the shallow dose to the skin or extremities exceeds 250 rad.
- Report within 24 hours if a person's total effective dose exceeds 5 rem or the lens dose exceeds 15 rem or the shallow dose to the skin or extremities exceeds 50 rem.
- Use the phone numbers listed above to report to the NRC.

2.8. Leak Tests and Inventory

Only personnel who have been instructed in performing leak tests shall conduct them. Leak tests shall be performed at a frequency as specified in the SS&D, and positive visual match inventories shall be performed at least every six months. The leak testing must be done in accordance with service provider's procedures. The leak test kits will be supplied and processed by a processor who is NRC approved.

- Perform leak tests at the direction of the RRSO and send them to the NRC-approved processor.
- The SRSO will audit the RRSOs to ensure that all gauges were leak tested within the time limit required.
- If the RRSO does not perform the leak testing or inventory within the intervals specified, the SRSO will secure the gauge(s) from use and report a violation to the RST. The gauges will not be released for use until the SRSO has finalized their investigation and all issues have been resolved.
- The RRSO will check into the EDMS a copy of the Leak Test Certificate within seven days of receipt from the service provider.
- RRSOs must conduct a physical inventory of all sealed sources at least every six months. Inventory records must include the nuclear isotope(s) and quantity, model number, serial number of both the gauge and the source, and the date of the inventory. Check into the EDMS a copy of the physical inventory within seven days of completion.

2.9. Maintenance

Cleaning, lubrication, and routine maintenance will be done by licensee personnel according to instructions

of the gauge manufacturer and the NRC license. All routine maintenance must follow ALARA principles. Authorized licensee personnel, gauge manufacturers, or licensed service providers will do all non-routine maintenance.

2.10. Transportation

Transport of nuclear gauges must be according to the requirements of USDOT and International Air Transport Association (IATA).

The following language is taken directly from NUREG 1556 v1r1 Appendix H.

"When a portable gauge is being stored in a vehicle, the licensee is specifically required to use a minimum of two independent physical controls to secure the portable gauge.

Using two chains is not the preferred method. To provide adequate security licensees are encouraged to use other combinations. The security rule permits the usage of two chains under certain circumstances in order to allow licensees flexibility; however, having two chains with locks would not satisfy the NRC's requirement unless **each** chain and lock combination used is physically robust enough to provide **both** a deterrence, and a reasonable delay mechanism. When two chains or cables are used, the second chain or cable should be substantially more robust and more difficult to cut than the first chain or cable.

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

1. The locked transportation case containing the portable gauge is physically secured to a vehicle with brackets, and a chain or steel cable (attached to the vehicle) is wrapped around the transportation case such that the case cannot be opened unless the chain or cable is removed. In this example, the locked transportation case would count as one control because the brackets would prevent easy removal of the case. The chain or cable looped only through the transportation case handle is not acceptable;

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

- Source rods must be in the locked position and secured with a padlock on the trigger mechanism.
- Gauges must be locked and secured in the vehicle, and the transport container sealed.
- Transport containers must be secured from movement (blocked and braced) and locked to the vehicle in such a manner as to have two independent security measures that must be defeated before the gauge can be removed from the vehicle.
- Gauge placement in the vehicle must be secured as far from the driver and passengers as practical, observing distance requirements dictated by the Transportation Index (TI).
- The transportation case must have all signage required by USDOT and/or IATA, depending the transportation method, and it must be legible. (See 3.1)
- RRSO's will maintain all shipping records and keep them for a minimum of three years from the date of shipping.

2.11. License Termination

Dispose of licensed materials in accordance with NRC regulations.

- Notify the NRC within 60 days when the gauges have not been used for 24 months, or a decision is made to permanently cease licensed activities.
- Certify the disposition of the licensed materials by submitting NRC Form 314 according to NRC instructions.
- Before a license is terminated, send the records important to decommissioning, including survey maps and facility drawings, to the appropriate NRC regional office.

2.12. Survey Instruments

2.12.1 Calibration

Monitoring equipment must be routinely calibrated against standard radiation fields to determine the equipment's detection efficiency. The meter manufacturer or an NRC-approved service provider will calibrate survey instruments annually. Place a calibration sticker on each instrument indicating:

- Calibration date
- Next calibration due date
- Serial Number of meter

Calibrate new survey meters prior to use.

Calibration Documentation

Check a copy of all calibration documentation into the EDMS for all radiation instrumentation calibrations and include:

- The owner/user of the equipment
- A description of the equipment (i.e. manufacturer, model, serial number)
- A description of the calibration source(s)
- The calculated and actual exposure rate at each calibration point
- Battery check reading (if applicable)
- The angle between the radiation flux field and the detector (parallel or perpendicular for external detectors and the angle for internal detectors)
- Calibration results, correction factors, and/or efficiencies as applicable.
- The name of the person who performed the calibration and the date the calibration was performed
- Statement demonstrating the meter was calibrated against a standard(s) that is traceable to National Institute of Standards and Technology (NIST).

2.13. Surveys

Radioactive materials may be stored only in areas that have been approved by the RRSO. The SRSO must be kept informed of all changes in storage areas and will provide assistance in the selection of these areas as requested to ensure compliance with ALARA and NRC regulations.

A new survey is required when one of the following changes occur:

- The number of gauges increases beyond the number used in the survey.
- The gauge storage is relocated or the geometry of the storage changes
- A new gauge storage area is established
- There is a change in the occupancy of the area.

Personnel trained and competent in the use of the survey meter will perform surveys. The survey meter shall be turned on and checks will be performed on the battery and High Voltage output. The survey meter shall be checked for response by passing it into a known radiations field such as that surrounding a nuclear gauge.

Surveys must be done within 24 hours of storing a gauge at the selected location to verify compliance. The survey will include a map showing the storage area and surrounding structures, as well as the geometry of the gauges if multiple gauges will be stored.

If the storage is in a remote location and a visit by the RRSO within 24 hours is not practical, the number, type, and geometry may be reconstructed by the RRSO in a location of their convenience. They will forward the results of the survey including the geometry and distances of measurement to the storage location for posting.

Surveys from previous years may be reused if the facility layout, personnel stations, storage location and gauge numbers remain the same. Complete a Survey/Compliance Update Record (form in Appendix 4.7)

The survey/compliance documents or the Survey/Compliance Update Record shall be checked into the EDMS within five days of completing the survey and verifying regulatory compliance. Measurements shall include both unrestricted and restricted. Post survey maps and results at the storage location.

If surveys indicate radiation levels in excess of 100 mrem/year or 2 mrem/hour, the SRSO will investigate to determine if members of the public have been

exposed to radiation levels in excess of public dose limits.

2.14. Demonstration of Compliance

Demonstration of compliance of exposure limits for members of the public is required. This may be achieved by showing that the member of the public most likely to receive the highest dose is within the regulatory limit. List assumptions made regarding the distance to the individual, time the individual is present, and the time the gauge is in storage when the individual is present.

2.15. Signage and Postings

Storage site signage must conform to NRC regulations. Post the storage container or housing with an approved "Caution—Radiation Area" sign bearing the radiation symbol if at 30 cm the radiation levels exceed 5 mrem/hr. Post a "Caution—Radioactive Materials" sign in the immediate area or on the door of the storage cabinet or closet. Transport cases shall have labels and markings to comply with USDOT and IATA requirements. The appendix gives examples.

Remove all signage when gauge is no longer stored in the facility.

Post all information required by 10 CFR 19.11. Post in a sufficient number of places so that radiation workers can see them as they go about licensed activities. Required postings include NRC Form 3, the NRC license with attachments, this manual, and any violations and responses from the licensee.

Also listed in 10 CFR 19.11 are a number of documents that may not be practical to post due to size, including 10 CFR 19 and 10 CFR 20, and it is acceptable to post a document stating where they are kept.

2.16. Enforcement Policy for Radiation Safety Infractions

The enforcement policy for radiation safety infractions is designed to inform DOT&PF personnel of the sanctions that may be imposed for various radiation safety infractions, cited either during regular inspections or during periodic spot checking. The policy will assist the Radiation Safety Team in assigning enforcement actions to the infractions. The policy is based on Nuclear Regulatory Commission guidance.

The list of infractions that can result in sanctions includes but is not limited to

- Loss or improper use of personal dosimeter
- Improper storage practices
- Improper transportation practices
- Lack of control and constant surveillance during use of the gauge.
- Violations of ALARA

The progression of actions taken for the above infractions will be:

- Coaching
- Coaching with remedial actions/training
- Coaching with mandatory/supervised actions
- Removal/Suspension of Authorized User status
- Progression may be escalated for infractions of danger to health, safety or security

A record of actions taken for infractions will be completed and a copy checked in the EDMS as follows:

- Coaching—Memo to file
- Coaching with remedial actions/training—record of training including time, date and participants
- Coaching with mandatory/supervised actions—record of all actions taken signed by both the RRSO and the authorized user.
- Removal/Suspension of Authorized User status—Record of the removal of access to licensed materials. Copy of the record will be forwarded the SRSO and RRSO's of all regions.

This enforcement policy applies only to access and use of licensed materials by department employees and is separate from any disciplinary actions that may result from personnel actions taken by other supervisory personnel.

3. Appendix

3.1 Sample of Shipping Case Labels
3.2 Example of Transportation Security Measures
3.3 Example of Storage Site Caution Signs
3.4 SCWE Poster
3.5 Public Dose Compliance Calculation Instructions

3.1. Sample of Shipping Case Labels

SAMPLE OF SHIPPING CASE LABELS

Front of Case

Back of Case

3.2. Example of Transport Security Measures

3.3. Example of Storage Site Caution Signs

3.4. Safety Conscious Work Environment Poster

SAFETY CONCERNS?

Under federal and state regulations, you have the right and the responsibility to raise issues of safety. DOT&PF is committed to providing an environment where safety concerns can be raised without fear of retaliation. In order to provide the safe environment we require, please bring safety issues forward and allow us to address them and correct potentially dangerous situations.

Avenues for raising concerns are listed below. All avenues are available to all employees. We encourage you to use the avenue you feel most comfortable with.

Chain of Command—Contact Your supervisor or manager

Radiation Safety Officers

Greg Christensen—Statewide	(907) 269-6248
Jeanne Dirks—Central Region	(907) 269-0469
Carl Heim —Northern Region	(907) 460-2894
Pat Harmon—Southeast Region	(907) 465-1797

Safety Officers

Mickey Hendrickson—Statewide	(907) 338-1482
Mike Oden—Northern Region	(907) 451-2280
Larry White—Southeast Region	(907) 465-1770
Unassigned—Central Region	

Employee Safety Concerns Help Line—(907) 338-1482

NRC 24 Hr. Emergency	**(301) 816-5100**
NRC Safety Hotline	**(800) 695-7403**
AkOSHA	(800) 770-4940

Safety Conscious Work Environment (SCWE)

"An environment in which employees feel free to raise safety concerns without fear of retaliation."

DOT&PF Policy Statement Regarding SCWE

We are committed to provide an environment where employees are encouraged to raise concerns without fear of retaliation. It is appropriate for employees to spend work time in reporting concerns. Management at all levels invites safety concerns and are committed to the timely investigation and resolution of all safety related issues. Retaliation for raising concerns will not be tolerated and when found appropriate discipline will be taken.

3.5. Public Dose Compliance Calculation Instructions

Compliance with 10 CFR 20.1302 is demonstrated when the following two conditions are meet:

1. The individual who will most likely receive the highest dose does not exceed 100 mrem/yr. The identification of this individual may present a challenge on projects where the nearest member of the public is a long way away such as in the example of a lab trailer placed in an old pit and is miles from the nearest member of the public. In these cases, it is reasonable to look at different scenarios. One could be where a project engineer, contractor or inspector visits the lab an hour a day during the project construction. Another could involve a member of the public sitting outside the lab smoking, taking breaks or eating lunch.
2. The radiation dose in unrestricted areas does not exceed 2 mrem in any one hour.

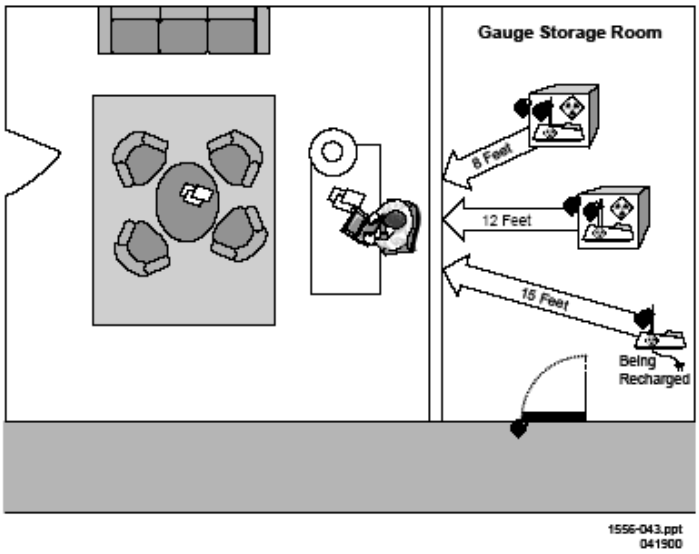
There are two methods for demonstrating compliance with condition number 1. The first method is by calculation and the second is a combination of measurement and calculation.

The calculation method takes a tiered approach, going through a three-part process starting with a worst-case situation and moving toward more realistic situations. It makes the following simplifications: (1) each gauge is a point source; (2) typical radiation levels encountered when the source is in the shielded position are taken from either the Sealed Source & Device (SSD)

Registry or the manufacturer's literature; and (3) no credit is taken for any shielding found between the gauges and the unrestricted areas.

Part 1 assumes that an affected member of the public is present 24 hours a day and uses only the "inverse square law" to determine if the distance between the gauge and the affected member of the public is sufficient to show compliance with the public dose limits. Part 2 considers not only distance, but also the time that the affected member of the public is actually in the area under consideration. Part 3 considers distance and the amount of time that both the gauge and the affected member of the public are present. Using this approach, only those calculations that are needed to demonstrate compliance are performed.

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



The combination measurement/calculation method begins by measuring radiation levels in the occupied areas, as opposed to using manufacturer-supplied rates at a specified distance from each gauge. These measurements must be made with a calibrated survey meters sufficiently sensitive to measure background levels of radiation.

4. Exhibits

4.1 Registration Form: Radioactive Material
4.2 Field Audit of Authorized Nuclear Gauge User
4.3 Radiological Survey Form
4.4 Declaration of Pregnancy
4.5 Gauge Utilization/Transport Log
4.6 Storage Site Compliance Demonstration Record
4.7 Survey/Compliance Update Record
4.8 Dose Estimate Form for Lost Dosimeter

4.1. Registration Form: Radioactive Material

STATE OF ALASKA
DEPARTMENT OF HEALTH & SOCIAL SERVICES
DIVISION OF PUBLIC HEALTH
SECTION OF STATE LABORATORIES
RADIOLOGICAL HEALTH PROGRAM
4500 BONIFACE PARKWAY
ANCHORAGE, ALASKA 99507-1270

REGISTRATION FORM – RADIOACTIVE MATERIAL

Note: *Use ONE form for each source* Please print or type information

Owner:

Address:

Telephone:
Fax:

_____
Person in Charge of Radiation Safety
Name:

Address:

Telephone:

Source Material:
Activity (Ci or MBq):
Physical Form (solid, liquid, gas):

If Part of Equipment:
Manufacturer:
Model Name:
Serial Number:

Location (If different from owner):

(Circle all that apply)
Type:
a. Sealed
Unsealed
b. Stationary
Mobile/portable
c. Other _____

Please provide a brief description of source (Include whether it is for medical, industrial, research, etc. uses)

Note: This registration is valid for two years, and will expire:

Individual completing Registration Form:
Name: Title:

Signature:_____ Date:

This form may be reproduced as needed.
Send completed form to address above.
After review a number is assigned and a copy of this form will be returned to the Registrant as proof of registration.
(907) 334-2107 FAX: (907) 334-2163

FOR DEPARTMENTAL USE ONLY

Reviewed by: _____

Registration Number: _____

4.2. Field Audit of Authorized Nuclear Gauge User

Audit Item	Y/N	Initials
Is the gauge kept under constant control and visual surveillance on the job site? Coaching:		
Does the gauge operator know the emergency response procedures? Coaching:		
Was a dosimeter being properly worn during the operation of the gauge? Coaching:		
Is the gauge handle kept locked whenever the gauge is not in use? Coaching:		
Is the shipping case locked whenever the gauge is not in use? Coaching:		
Does the shipping case have a tamper evident security seal during transit? Coaching:		
Is the gauge blocked and braced to prevent shifting during transport? Coaching:		
Did the gauge user have a copy of the transport papers at hand in the vehicle? What are the emergency procedure? Coaching:		
Is the shipping case secured in the vehicle? (2 Locks) Coaching:		
Is the gauge stored correctly at the temporary job site? (2 Locks)		
Is ALARA being practiced? Coaching:		
Does the gauge user have any safety concerns? List issues:		
Signature: Authorized User	Date:	
Signature: Auditor	Date:	

4.3. Radiological Survey Form

RADIOLOGICAL SURVEY FORM

Instrument:	S/N:	Cal Due:	Date:	Time:
Quantity and Model of Gauge(s):			Location:	
Survey Method (Check Box) ☐ Onsite Readings ☐ Simulated Readings ☐ TI Calculations			Region: CR ☐ SE ☐ NR ☐	
Survey Performed By (Print):	Survey Performed By (Signature):	Reviewed by (Signature):	Review Date:	

Drawing is not to scale and represents an area of approx. 40' X 40'

Symbols:
G= Gauge Location -x-x- = Restricted Area Boundary

= Reading Location

* mrem/hr = (Reading * multiplier / 1000)-Background

Results (Modify Units as Necessary)			
Location	Reading	Multiplier	mrem/hr *
Background			0
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
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19			
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21			
22			
23			
24			
25			
26			
27			
28			
29			

4.4. Declaration of Pregnancy

I hereby voluntarily declare that I am pregnant.

My best estimate of the date of conception is _____ (mo/day/yr)

While this declaration is in effect, I agree to abide by all restrictions deemed necessary by (Your Company) to keep the occupational exposure to my unborn child below 500 mrem. This may include accepting reassignment to different job at equal pay for the duration of the pregnancy.

I understand that I may revoke this declaration at any time by providing written notification to my Regional Radiation Safety Officer.

Name (print) _____ SSN

Signature _____ Date

TO BE COMPLETED BY REGIONAL RADIATION SAFETY OFFICER

Received by _____ Date

Radiation Safety Officer

1. Dose estimate for period from conception to declaration: _____ mrem
2. Dose that may be received during remainder of pregnancy: _____ mrem

   (500 mrem - line 1) If line 1 > 450 mrem, enter 50 mrem.
3. Likely to receive > 50 mrem during pregnancy? Yes ___ No

   (If yes, monitoring required.)

4.5. Gauge Utilization/Transport Log

Proper Shipping Name:	UN ID:
Source/Activity:	Gauge Serial No.:

Operator	Location	Date Removed		Date Returned	
		Date	Initials	Date	Initials

4.6. Storage Site Compliance Demonstration Record

Storage Site Compliance Demonstration Record

Method 1 -- Calculation only

Location: _____ Date: _____

Number and Model of Gauge(s): _____

Calculation Assumptions

Identity of Individual most likely to received the highest dose:	
Distance to Individual:	
Hours per week individual is present:	

Method(s) of Calculation

1	24 Hours per day 365 days per year	
2	Time individual is present hours per year	
3	Time Gauge and individual are present together hours per year	

Region

CR ☐

SE ☐

NR ☐

Method 1 -- Calculation only

Part 1

	Description of Known Information	Gauge 1	Gauge 2	Gauge 3	Gauge 4
A	How is gauge stored				
B	Dose rate from manufacturer's literature				
C	Distance (ft) at which B was determined				
D	Distance (ft) to individual described above				
E	Square Distance C				
F	Square Distance D				
G	B X E				
H	Hourly Dose Rate = G ÷ F				
I	Total Dose = H × 24 (hr) · 365 (days)				
	Total Hourly Dose=		Total Yearly Dose =		

Part 2

J	Average number of Hours present per day				
K	Average number of days present per week				
L	Average number of weeks present per year				
M	Hourly Dose (H)				
N	Yearly Dose received = M × J × K × L				
		Total Yearly Dose =			

Part 3

O	Avg. hours gauge and worker present per day				
P	Avg.days gauge and worker present per week				
Q	Avg.weeks gauge and worker present per year				
R	Avg. hr/yr gauge & worker present = O x P x Q				
S	Hourly Dose (H)				
	Yearly Dose received = R × S				
		Total Yearly Dose=			

Prepared by: _____ Reviewed by: _____

Storage Site Compliance Demonstration Record

Method 2 - Measurement and Calculation

Location: _____ Date: _____

Number and Model of Gauge(s): _____

Calculation Assumptions

Identity of Individual most likely to received the highest dose:	
Distance to Individual:	
Hours per week individual is present:	

Method(s) of Calculation

1	24 Hours per day 365 days per year	
2	Time individual is present hours per year	
3	Time Gauge and individual are present together hours per year	

Region

CR ☐

SE ☐

NR ☐

Method 2 - Measurement and Calculation

Part 1

Description of Known Information

Measurement Taken:

T	Measured dose at individuals location		mrem/hr	Onsite ☐
B	Annual Dose = T X 24 (hr) · 365 (days)		mrem/yr	Simulated ☐

Part 2

U	Average number of Hours present per day		
V	Average number of days present per week		
W	Average number of weeks present per year		
X	Average hours present per year = U x V x W		
Y	Hourly Dose (T)		mrem/hr
	Annual Dose = Y x X		mrem/yr

Part 3

Z	Average hours gauge and Individual present per day		
AA	Average days per week		
AB	Average weeks per year		
AC	Avg. hrs / yr gauge and Individual present = Z x AA x AB		
AD	Hourly Dose (T)		mrem/hr
	Yearly Dose received = AC x AD		mrem/yr

Prepared by: _____ Reviewed by: _____

4.7. Survey/Compliance Update Record

Survey/Compliance Update Record	
Location:	Date:
Region:	
Survey Date:	Survey/Compliance Document Number:

Gauge Model/Quantity	
From Last Survey Date	This Date

Please verify by drawing the location of gauges in relation to office personnel and other members of the public.

Based on the compliance document noted above and verified for this year, no individual member of the public will receive radiation in excess of limits as outlined in 10 CFR 20.1301 (2 mrem/hour and 100 mrem/year).

Prepared by:	Reviewed by:

4.8. Dose Estimate Form for Lost Dosimeter

Name/Region: _____

Quarter: _____

Dates covered by estimate: _____

Date	Activity (see below)	Repetitions (No. of tests, etc)	Total Hours = minutes * reps / 60	Dose Rate (see below)	Dose (mrem) = Total Hrs * Dose Rate
				Total:	

Activities and times can include but are not limited to:

1) Density testing – 5 minutes per test.
2) Oil content testing – 5 minutes per test.
3) Loading and unloading a gauge – 10 minutes.
4) Cleaning a gauge – estimate time spent.
5) Repairing a gauge – estimate time spent.
6) Calibrations – estimate time spent.
7) Other activities – state what the activity was and the amount of time spent.

Doses (use the Transportation Index for the gauge):

1) Troxler 3430 – 0.3 Troxler 3450 – 0.3
2) Troxler 3241C – 0.1
3) Troxler 3440 – 0.6 Troxler 4640B – 0.4

Signature/Date of User:_____