STATE OF FLORIDA
DEPARTMENT OF HEALTH
BUREAU OF RADIATION CONTROL

REGULATORY GUIDE

Regulatory Guide 1.40

Issuance Date: June 2013

GUIDE FOR THE PREPARATION OF APPLICATIONS FOR INDUSTRIAL RADIOGRAPHY

TABLE OF CONTENTS

INTRODUCTION

Purpose of Guide

This guide contains instructions to prepare a radioactive materials specific license application. It is intended for applicants requiring specific licensure of industrial radiographic devices. Each of these devices contains radioactive material in the form of a sealed source.

This guide contains appendices and exhibits, which are model procedures and forms. As a whole, they represent the minimum information necessary to comply with the regulatory requirements. They also serve as the foundation for an effective radiation protection program. The model procedures are written to be stand-alone documents. Therefore, acronyms, abbreviations, and other information may be repeated.

This guide also contains supplements. They are intended to serve as resources for preparing the application. The supplements also provide additional information and resources, including training resources.

This guide provides instructions for applicants seeking a specific license. Unless otherwise noted, when used in this guide, the term "license" refers to a specific license.

Appendices, Exhibits and Supplements

Applicants must acquire and maintain appropriate facilities and equipment, have appropriately trained workers, and implement procedures ensuring compliance with regulatory requirements. This guide provides a set of appendices, exhibits and supplements to assist in the development of a radiation protection program.

- **Appendices** are model procedures which may be used to address regulatory requirements.
- **Exhibits** are samples of the types of documents or forms which must be submitted as part of the application, and in some cases, are model forms which may be used to satisfy regulatory requirements.
- **Supplements** include resources for preparing the application and additional resources and reference material.

Model procedures and forms may be adopted by submitting them as part of the license application or may be used as guides for developing equivalent procedures and forms. Carefully review the regulations, model procedures and forms before deciding if the models are appropriate for the activities being requested.

IMPORTANT NOTICE:

The information provided in a license application must demonstrate proposed equipment, facilities, personnel, and procedures are adequate to protect public health and property in accordance with regulatory requirements. Submission of incomplete or inadequate information will result in delays in the license approval process. Additional information will be requested when necessary to ensure an adequate radiation protection program has been established. Such requests will delay completion of the application review, and may be minimized by a thorough study of the regulations and this guide prior to submitting the application.

While adoption of the attached model procedures and forms should provide for a radiation protection program in compliance with regulatory requirements, applicants may need to consider additional equipment, procedures and training which may be appropriate for the scope of their operations.

Applicable Regulations

Authorization to possess and use radiation sources is regulated by the Florida Department of Health (DOH), Bureau of Radiation Control (BRC) under the authority of Chapter 404, Florida Statutes (FS), and implemented through Chapter 64E-5, Florida Administrative Code (F.A.C.).

Replacement copies of the regulations may be obtained by calling (850) 245-4545, writing the FL BRC, Radioactive Materials Section, 4052 Bald Cypress Way, Bin C21, Tallahassee, Florida, 32399-1741, or from the BRC website: http://www.myfloridaeh.com/radiation .

Part I "General Provisions"

Part II "Licensing of Radioactive Materials"

Part III "Standards for Protection Against Radiation"

Part IV **"**Radiation Safety Requirements for Industrial Radiographic Operations"

Part IX "Notices, Instructions and Reports to Workers; Inspections"

Part XIII "Radiation Safety Requirements for Possession and Use of Sealed or Unsealed Sources of Radioactive Materials"

Part XV "Transportation of Radioactive Materials"

Licensees engaging in transportation of radioactive materials or related activities are also subject to U.S. Department of Transportation (DOT) regulations, which are found in Title 49, Code of Federal Regulations (49 CFR), and are incorporated into Chapter 64E-5 by reference. DOT regulations are available on the Internet at www.access.gpo.gov .

License Requirements

Possession and use of radioactive materials in Florida requires a license issued by the FL BRC Radioactive Materials Section. Form DH-1054 (Application for a Radioactive Materials License – Non-human Use) must be accompanied by a complete radiation safety program covering all aspects of the proposed activities. Following issuance of the license, the BRC sends out an annual invoice for its license fees (the fee schedule is listed in 64E-5.204, F.A.C.), which covers the costs of license amendments and inspections (the latter are scheduled at least annually).

Possession and use of radioactive material must be confined to the locations and purposes authorized by the license. The license is divided into two sections: *Items* and *Conditions*, which are described on the next page. The first part of the license lists Items 1 – 9. The remainder of the document lists the license conditions, which may vary in number based on the authorizations provided by the license, but always begin with Condition 10.

License Items

Item No. & Title	Description
1. Name	Lists the legal name of the licensee. Item 1 must list the company's name as registered with the FL Dept. of State, Div. of Corporations http://www.sunbiz.org . If the business is operating under another name, Item 1 must list both the company's registered name and the fictitious name it is doing business as (d/b/a). Item 1 can be amended to reflect a name change, unless it is a result of a change of ownership or majority of controlling interests, in which case a new license is required.
2. Address	Lists the mailing address, which may be different from the address where records and sources are stored.
3. License No.	Lists the license number assigned by the BRC. The number should be referenced in all license-related correspondence.
4. Expiration Date	Lists the date the license will expire. The license is valid for 5 years from the date of issuance. A renewal application must be received by the BRC at least 30 days prior to the expiration date to ensure the license remains valid. The BRC sends out reminder notices as the license nears its expiration date.
5. Category	Lists the license category. There are two categories for industrial radiography. Category 3C authorizes radiography only in an approved shielded installation; category 3D authorizes radiography both at a permanent facility and at temporary job sites. Authorization to conduct more than one category of licensed activity requires a separate RML for each category of use. One exception the BRC allows is for radiography licensees to possess instrument calibrators under their radiography license for in-house calibration of survey meters and other instruments. Section 64E-5.204, F.A.C., lists license types and fees.
6. Radioactive Material	Describes the type (element and mass number) of material the license authorizes for possession and use.
7. Form	Describes the form of RAM the license authorizes for possession and use. The source manufacturer's name and model number are listed.
8. Possession Limit	Lists the maximum possession limit for sealed sources. A licensee may be authorized for a possession limit higher than the number of sources actually possessed, but possession of more sources than authorized is a license violation and may result in enforcement actions.
9. Use	Describes the types of uses approved for the sources and devices listed in the previous items.

License Conditions

License conditions describe requirements and limitations applicable to the authorized activities. All radiography licenses contain conditions addressing the items listed below. Additional conditions may be incorporated to protect public health and the environment.

- Authorized locations of use and storage
- Enforcement provisions
- Authorized User (AU) and RSO designations
- RAM transfer limitations
- RAM transportation requirements
- Source activity limitations
- Uranium shielding provision
- Enforcement provisions
- 64E-5, Parts III and IX
- Leak testing requirements
- Inventory requirements
- Licensee commitments

FILING AN APPLICATION

A. GENERAL

Chapter 64E-5, F.A.C., this guide, forms and other guidance documents are available on the bureau website: http://www.myfloridaeh/radiation .

An application for a specific license requesting authorization to possess and use industrial radiographic devices must be submitted on Form DH-1054, "Application for Radioactive Materials License, Non-Human Use." The form is included as the final supplement of this guide. Space provided on the application form is limited, so 8.5" x 11" paper should be used to append additional pages. Each page submitted with the application should be identified and keyed to the item number on Form DH-1054 to which it applies. The application and all attachments must be submitted (original and one copy). The applicant must retain at least one complete copy for records and use.

All application items must be addressed in sufficient detail to demonstrate equipment, facilities, personnel qualifications and procedures are adequate to protect public health and safety or property.

Mail to:	If using an overnight delivery service, use:
Florida Department of Health Bureau of Radiation Control Radioactive Materials Program 4052 Bald Cypress Way, Bin C21 Tallahassee, FL 32399	Florida Department of Health Bureau of Radiation Control Radioactive Materials Program 4042 Bald Cypress Way, Rm. 220.05 Tallahassee, FL 32399

With the exception of security-related information, all license applications and documents submitted to the bureau are available for review by the general public. Do not submit proprietary information unless it is absolutely necessary for evaluation of the application. Any request for withholding documents is subject to a determination by the department as to whether the document may actually be withheld in accordance with applicable laws and regulations.

Personal information about employees should not be submitted unless it is necessary.
Home addresses, home telephone numbers, dates of birth, and social security numbers should not be submitted unless the bureau specifically requests it.

When issued, the license will require radioactive material be possessed and used in accordance with statements, representations and procedures provided in the application and supporting documentation (which are incorporated by referenced into the license).
Regulatory requirements specified in Chapter 64E-5, F.A.C., shall govern unless the statements, representations and procedures set forth in the license application and correspondence are more restrictive than the regulations.

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 section 64E-5.204, F.A.C., or Regulatory Guide 6.20 for a description of application fees. Review of the application will not begin until the proper fee is received by the department. 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 section 64E-5.204, F.A.C., or Regulatory Guide 6.20 for a description of annual fees. Annual fees are due within 60 days of issuance of the new license; an invoice for this fee is included with the cover letter accompanying a new license.

Reclamation fee — In addition to the application and annual fees, a reclamation fee will be assessed for the Radiation Protection Trust Fund, established to pay department costs associated with a licensee's abandonment of radioactive materials, default on lawful obligations, insolvency, or other inability to meet regulatory requirements, and to assure the protection of the public and environment. Reclamation fees are equal to 5% of the annual fee. Reclamation fees are due within 60 days of issuance of a new license; a fee invoice is included with the cover letter accompanying a new license.

Notes:

1. **Annual and reclamation fees are assessed on the anniversary of the license issuance date. An invoice is sent in advance of the due date.**

2. **Fees are not assessed for license renewals, amendment requests, licensing actions, inspections initiated by the department, license terminations, or requests for regulatory information (except for document copying costs).**

CONTENTS OF AN APPLICATION

This section provides instructions on completing each item listed in Form DH-1054.

1.a. LEGAL NAME AND MAILING ADDRESS

List the name, mailing address, and telephone number of the individual or company to whom the license will be issued. If available, please include an e-mail address and fax number. An applicant corporation or other legal entity must be specified by legal name as registered with the Department of State, Division of Corporations. If a fictitious name is to be included, it will be identified as the name the applicant is doing business as (d/b/a) and must also be registered with the state Division of Corporations. For example, "ABC Corporation d/b/a ABC Enterprises of Florida." Business registration should be verified by contacting the Division of Corporations at (850) 245-6052 or on the Internet at www.sunbiz.org . To assist in identifying the proper legal entity, applicants should also list their business' Federal Employer Identification (FEI) or Document Number if known or applicable; the FEI or Document Number is available on the Division of Corporations website.

1.b. STREET ADDRESS AT WHICH RADIOACTIVE MATERIAL WILL BE USED AND/OR STORED, IF DIFFERENT FROM 1.a.

Identify by street address the permanent location of radioactive material use and/or storage other than described in Item 1.a. Do not list an address by post office box. Use of temporary job sites should be requested by adding the statement "at temporary job sites." Use of licensed material at temporary job sites will become part of the license conditions. Each separate location of temporary use does not need to be specified so long as the job sites are used only for a single job lasting less than two years.

2.a. LICENSE FEE CATEGORY

Indicate the appropriate license fee category for industrial radiographic devices, list category 3C or 3D. Refer to section 64E-5.204, F.A.C. or to Regulatory Guide 6.20 for a complete list of category descriptions and fees.

2.b. LICENSE FEE ENCLOSED

Indicate the amount of the enclosed license application fee in the space provided.

3. THIS IS AN APPLICATION FOR:

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

4. AUTHORIZED USERS-RADIOGRAPHERS

List each individual to be designated as an Authorized User (AU) of radioactive material (i.e., radiographer). Maintaining documentation of training (including valid training certificates) for each authorized user on file for inspection purposes is required. Radiographers are workers authorized to conduct radiography and supervise assistants during radiographic operations. Radiographers are qualified in accordance with the training, testing and certification requirements specified in Parts IV and IX of Chapter 64E-5, F.A.C., and equivalent NRC and Agreement State regulations. Assistant radiographers (radiographer's assistant or assistant) are workers authorized to perform radiography under the personal supervision of a radiographer.

5.a. RADIATION SAFETY OFFICER (RSO)

The RSO is the individual delegated responsibility for the radiation safety program. The minimum qualifications for the position are: At least 1 year of documented industrial radiography experience as a radiographer; and 16 hours of formal instruction in establishment and maintenance of a radiation safety program, including training on internal audits and mitigation of radiological incidents. An RSO named in a license prior to Sept. 2001 is exempt from the 16 hour formal instruction requirement due to being approved for the position prior to the effective date of the requirement.

5.b. ALTERNATE EMERGENCY CONTACT

During emergencies or after disasters such as hurricanes, the bureau contacts licensees to determine their status or convey important information. Sometimes the radiation safety officer is unavailable and the bureau needs to contact someone else who is familiar with the activities under the radioactive materials license. Therefore, the bureau requests the name and contact information of an individual, in addition to the RSO, who may be contacted. Because communications may be disrupted during or after an emergency, we request several methods to communicate with these individuals (e.g. home phone, cell phone, email, etc.).

6. TRAINING AND EXPERIENCE IN RADIATION SAFETY

a. FORMAL TRAINING IN RADIATION SAFETY

Submit documentation of radiation safety training for each individual listed in Item 4 of the application. Restrict training documentation to relevant information; i.e., demonstrating the individual has the radiation safety training and experience specific to the requested activities to be conducted. Training certificates such as those provided by device manufacturers or other approved third parties are acceptable, but may need to be supplemented with documentation of completion of training in company operating and emergency (O&E) procedures, third party trainers typically do not provide training in specific O&E procedures.

b. EXPERIENCE

Describe any additional relevant work experience with radioactive materials indicating where the experience was obtained.

7. RADIOACTIVE MATERIAL

a. ELEMENT AND MASS NUMBER

List each isotope requested.

b. CHEMICAL AND/OR PHYSICAL FORM

For each isotope requested, state the name of the source manufacturer and the source model number.

c. MAXIMUM AMOUNT TO BE POSSESSED AT ANY ONE TIME

Complete for each radioactive material requested. Indicate the total number of sources and maximum activity per source.

Example:

(a)	ELEMENT AND MASS NUMBER	(b)	CHEMICAL AND/OR PHYSICAL FORM	(c)	MAXIMUM AMOUNT TO BE POSSESSED AT ANY ONE TIME
1.	Cobalt 60		Sealed source (XYZ, Inc. Model 123)		2 sources; not to exceed 110 curies each
2.	Iridium 192		Sealed source (XYZ, Inc. Model 456)		2 sources; not to exceed 150 curies each

8. PURPOSE FOR WHICH RADIOACTIVE MATERIALS LISTED IN ITEM 7 WILL BE USED

Complete for each radioactive material requested. Include the name of the manufacturer and model number of the device or source holder in which each source is used or stored.

Example:

For use in XYZ, Inc. Model 123 radiographic exposure devices for industrial radiography, or XYZ, Inc. Model 123 source changers for source exchanges and storage.

NOTE: X-RAY MACHINE REGISTRATION PROCEDURE

Industrial x-ray machines must be registered with the BRC X-Ray Section using DOH Form DH-1107. An annual fee covering registration and inspection costs is due before October 28 each year. Machine registrants who are not licensees must submit their radiation safety programs to the BRC X-Ray Section for review and approval. When a registrant is also a licensee, the BRC Radioactive Materials Section evaluates the company's radiation safety program for compliance with both x-ray and isotope radiography requirements. The applicability of radiation control regulations to isotope and/or x-ray radiography is determined by whether or not the rule refers to licensees, registrants, or both. Unless clearly applicable only to radioactive material (e.g., leak testing), the rules apply to both isotope and x-ray radiography. You may contact the x-ray section at Department of Health, Bureau of Radiation Control, 705 Wells Road, Suite 300, Orange Park, Florida, 32073, and 904-278-5730.

9. RADIATION DETECTION INSTRUMENTS (i.e. SURVEY METERS)

List type, use, radiation detected, sensitivity range, and quantity of survey meters used.

10. CALIBRATION OF INSTRUMENTS

Mark the appropriate box to indicate how calibrations will be performed. Additional guidance on each subitem is provided below. Calibrations should be sensitive enough to detect all types of radiation emitted from the sources and must meet all requirements identified in section 64E-5.314, F.A.C. and 64E-5.426, F.A.C.

a. CALIBRATED BY SERVICE COMPANY

If using a calibration service company, list their name, address, license number and the government agency who issued the company's license (i.e., U.S. Nuclear Regulatory Commission or an Agreement State agency such as the Florida Bureau of Radiation Control).

b. CALIBRATED BY APPLICANT

If seeking approval to calibrate instruments in-house, submit detailed information describing the facilities, equipment, personnel, and procedures to be used to perform the calibrations. Contact the bureau for additional guidance on equipment calibration requirements.
Note: In-house calibrations require use of reference sources; list each requested calibration/reference source in Item 7.

11. PERSONNEL MONITORING DEVICES

Complete Items a., b., and c. Subsection 64E-5.437, F.A.C., requires individuals working with industrial radiographic devices to wear a whole body personnel monitoring (PM) badge with monthly exchange. PM badges include film badges, thermoluminescent dosimeters (TLDs) and optically stimulated luminescent dosimeters (OSLDs).

12. FACILITIES AND EQUIPMENT

Submit an annotated diagram of the permanent storage facility, identifying all entrances and points of access, rooms, the location of the device storage area, and its distance from occupied work areas. Describe and label all areas adjacent to the permanent facility. If the facility is a multi-story and/or multi-tenant building, identify floors above and below the storage area and their uses, including areas occupied by other tenants.
Sample facility and permanent radiographic installation diagrams are on page 13.

Provide evidence the storage location is capable of storing the maximum number of devices to be authorized by the license. Describe the security measures to be used to prevent unauthorized removal of radioactive materials.

Postings should include emergency procedures, any Notices of Violations and responses, and the FL BRC "Notice to Employees" form outside the vault where they can be viewed by workers. The "Notice to Employees" form identifies where a copy of applicable parts of Chapter 64E-5, F.A.C., and the license, registration and operating procedures can be examined.
Note: Notices of Violations from the FL BRC must be posted within 5 working days after receipt; responses, if any, must be posted within 5 working days after dispatch; the documents must remain posted for at least 5 working days or until action correcting the violation has been completed, whichever is later. **Exception** - increased controls, (IC), documents are exempt from posting.

If using a permanent radiographic installation, postings with a sign bearing the radiation symbol and the warning "CAUTION (or DANGER), RADIOACTIVE MATERIAL(S)." shall be posted. Also, during radiographic operations the entrance door will be posted with a sign bearing the radiation symbol and the warning "CAUTION RADIATION AREA," and the interior door is posted with a sign bearing the radiation symbol and the warning "CAUTION (or DANGER), HIGH RADIATION AREA."

13. RADIATION PROTECTION PROGRAM

Submit a detailed description of the proposed radiation protection program. The appendices, exhibits, and supplements included with this guide are model procedures and forms which may be adopted by including them as part of the submitted radiation protection program or may be used as guides for developing equivalent procedures and forms. **If performing lay-barge, offshore platform, or underwater radiography, submit procedures for conducting these activities.**

14. WASTE DISPOSAL

Submit a procedure describing how the licensed radioactive materials will be disposed. Procedures must include a commitment sealed sources will be disposed of either by return to the manufacturer or by transfer to a specifically licensed recipient.

15. CERTIFICATE

The application must be signed and dated by a certifying official. A certifying official is an individual authorized to make legally binding statements for the licensee such as the president, vice president, chief executive officer, or principal/owner. Any statement of commitment made in the application must be implemented.

LICENSE AMENDMENTS

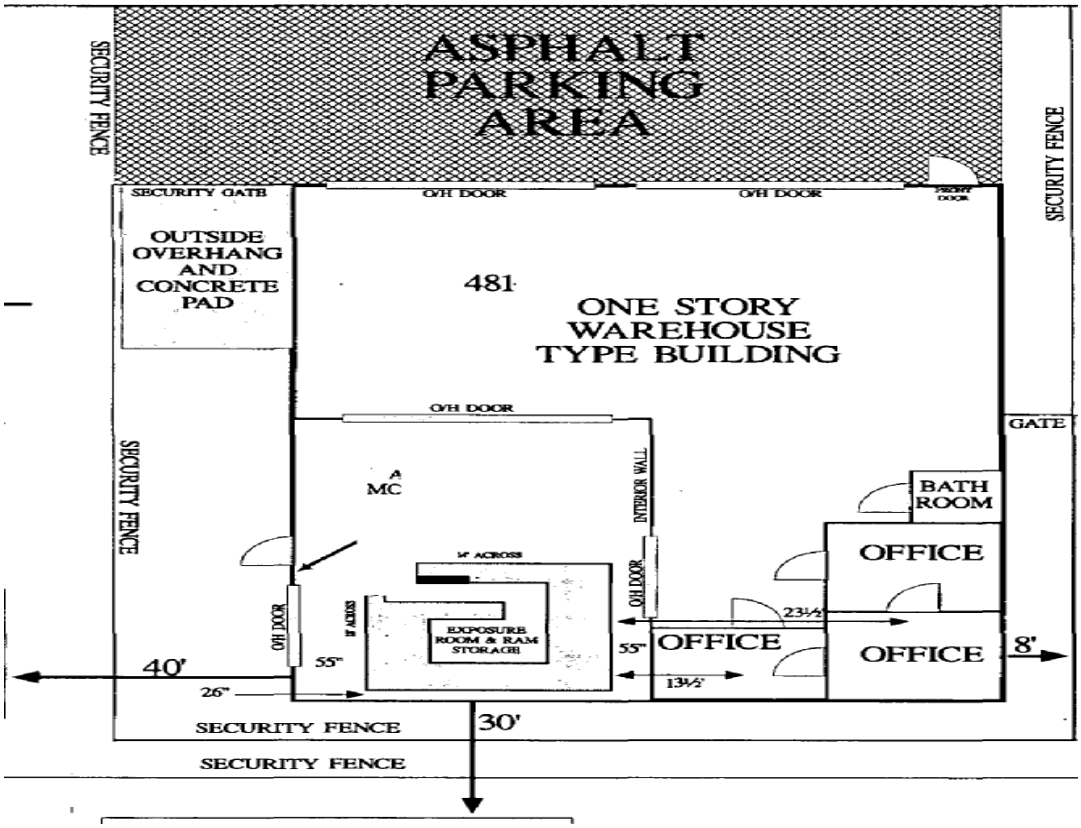
The license must be amended if any changes are planned. Submittal of an amendment request does not allow immediate implementation of proposed changes. Until the license has been amended to reflect approval of the change(s), the licensee must comply with the original terms and conditions of the license. Applications for license amendments may be filed by letter or on Form DH-1054, "Application for Radioactive Materials License, Non-Human Use." The request must be signed and dated by a certifying official, identify the license by name and number, and clearly describe the requested changes. Attach all supporting documentation, including facility diagrams, survey measurements, dosimetry data and calculations. The licensee must maintain a copy of the submitted and referenced documentation on file for inspection purposes.

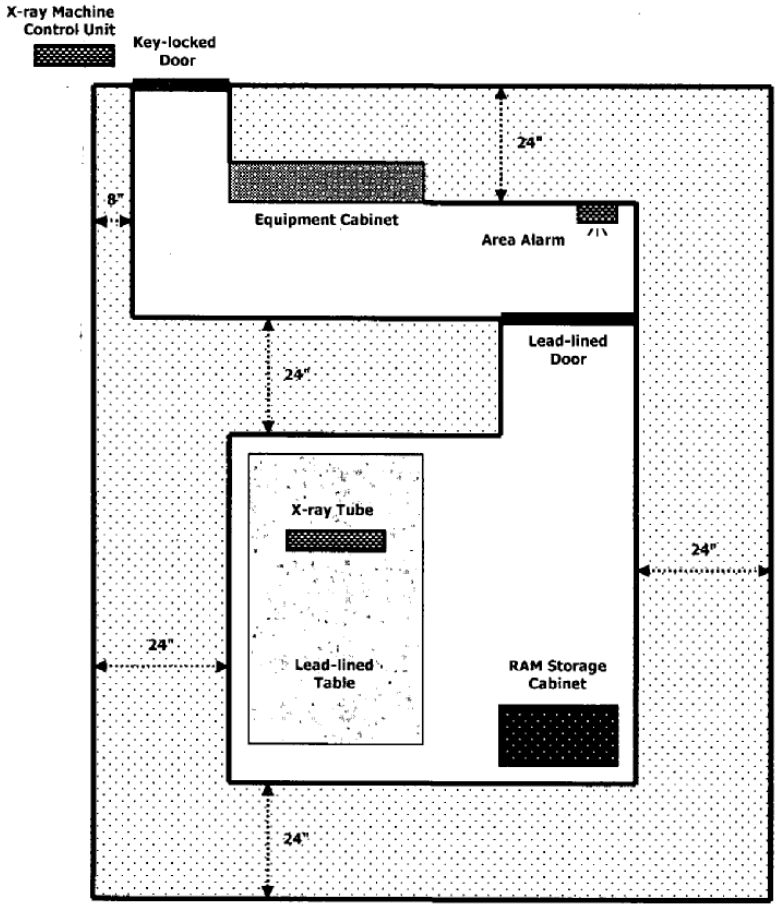
LICENSE RENEWAL

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. This filing will ensure the license does not expire until final action on the application has been taken, as provided for by subsection 64E-5.207(3), F.A.C. If the application is received less than 30 days before the expiration date, the facility or individual may be without a valid license when the license expires. Renewal applications should be filed using Form DH 1054, "Application for Radioactive Materials License, Non-Human Use." The renewal application is completed as if it were an application for a new license, with complete and up-to-date information about the applicant's radiation protection program. Renewal applications should be submitted without reference to documentation and information submitted previously.
Eligible participants described in Information Notice 2007-04, may submit a renewal attestation in lieu of the complete program. Attestations may only be used for every other renewal period.

LICENSE TERMINATION

Prior to license termination, the licensee must properly transfer or dispose of all licensed radioactive material. Complete Form DH-1059, “Certificate – Disposition of Radioactive Material” and submit to the Bureau before the expiration date of the license.





Sample facility diagram (top) and sample permanent radiographic installation diagram (bottom)

Appendices: Model Procedures

App. A	RSO Duties and Responsibilities
App. B	ALARA Policy
App. C	Personnel Monitoring Procedures
App. D	Record Retention Procedure
App. E	Notification and Reporting Procedures
App. F	Radiation Safety Training, Certification and Audits
App. G	Operating Procedures
App. H	Inventory, Transfer & Disposal Procedures
App. I	Emergency Procedures
App. J	Calibration Procedures
App. K	Inspection & Maintenance Procedures
App. L	Leak Testing Procedures
App. M	Member of the Public Dose Compliance Study
App. N	Increased Controls Procedures

Exhibits

Ex. A	Occupational Radiation Dose Record (Form DH-1622)
Ex. B	Cumulative Occup. Rad. Dose Record (Form DH-1623)
Ex. C	Individual Dosimeter Log
Ex. D	Annual Dosimetry Log
Ex. E	Instructions for Women Working With Radiation
Ex. F	Declaration of Pregnancy Form
Ex. G	Instructions for Declared Pregnant Women
Ex. H	Source Movement Log
Ex. I	Source Movement Log – X-ray Machine
Ex. J	Daily Survey Report/Daily Equipment Checklist
Ex. K	Shipping Paper – Private Use Shipment
Ex. L	Emergency Response Information
Ex. M	Radioactive Material Receipt Report
Ex. N	Assistant Radiographer OJT Record – Isotope Radiography
Ex. O	Assistant Radiographer OJT Record – X-ray Radiography
Ex. P	Performance Audit Form
Ex. Q	Radiographic Equipment Inventory Form
Ex. R	Radiographic Equipment Inspection & Maintenance Form
Ex. S	Radiation Protection Program/ALARA Audit Form

Supplements

Supp. A	Radiation Safety Training Course Outlines
Supp. B	Radiation Safety Training Reference Materials
Supp. C	Guide to SI Units for Radiation Protection

APPENDIX A
RSO Duties and Responsibilities

Management

We shall appoint an RSO and delegate the authority needed to fulfill the duties of the position. The minimum qualifications, training, and experience for the RSO shall be:

- One year of documented industrial radiography experience as a radiographer; and
- Sixteen hours of formal instruction in the establishment and maintenance of a radiation protection program, including training to perform internal audits and mitigation of radiological incidents.

Equivalent alternative radiation and safety training and experience in radiographic operations and formal training in the establishment and maintenance of a radiation protection program can substitute for the requirements above.

Radiation Safety Officer

The RSO is assigned responsibility for maintaining active management of the radiation safety program and to assist in keeping occupational radiation exposures of radiographic personnel as low as is reasonably achievable (ALARA).
The position requires an individual with:

- Thorough knowledge of radiographic equipment, safety equipment, procedures and regulations;
- A level of competency at, or above expected of a radiographer; and
- Knowledge and responsibility to apply appropriate radiation protection rules and implement the terms and conditions of the license and registration.
- Ensure compliance with all components of the radiation protection program, the terms and conditions of the license and certificate of registration and all applicable requirements of Chapter 64E-5, F.A.C.
- Investigate incidents and direct corrective actions, including halting operations when necessary.
- Serve as liaison with regulatory authorities on license or registration matters, and in the event of loss, theft or damage to sources of radiation.
- Ensure radiation safety activities are performed using approved procedures and in accordance with applicable requirements in Chapter 64E-5, F.A.C., in the daily operation of the radiation protection program.

RSO Designees

Senior radiographers designated to perform the RSO's duties in his absence are responsible for adhering to company procedures and full compliance with all applicable regulatory requirements.

APPENDIX B
ALARA POLICY

PURPOSE

Part III of Chapter 64E-5, Florida Administrative Code, (F.A.C.), establishes standards for protection against radiation hazards. Section 64E-5.303, F.A.C., requires licensees to use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational and public doses as low as reasonably achievable, (ALARA).

The primary concept of the ALARA philosophy is unnecessary exposure to radiation should be avoided, even though occupational exposure limits provide a very low risk of injury. The objective is to reduce radiation doses (both individual and collective) as far below regulatory limits as is reasonably achievable by means of good radiation protection planning and practice, as well as by a management commitment to policies deterring departures from good practices.

MANAGEMENT COMMITMENT

A. It will be management priority all personnel are aware of our commitment to the ALARA philosophy and they be instructed in the procedures and precautions to be used to keep their radiation doses as low as possible. In accordance with section 64E-5.303, F.A.C., management has established two Investigational Exposure Levels, (IELs) below regulatory limits, if reached, will initiate an investigation by the radiation safety officer (RSO) to determine the cause of the exposure and what actions can be taken to prevent recurrence.

B. Management has delegated authority to the RSO to ensure adherence to ALARA principles. Management will support the RSO in instances where this authority must be asserted.

C. Management will make all reasonable modifications to procedures, equipment and facilities to reduce doses, unless the cost is considered to be unjustified. We will be able to demonstrate improvements have been sought, modifications have been considered, and have been implemented where reasonable. We will be prepared to describe the reasons for not implementing modifications which have been recommended.

RADIATION SAFETY OFFICER RESPONSIBILITIES

A. The RSO will emphasize the ALARA philosophy in all training of radiographic personnel, and will encourage personnel to review current procedures and propose changes to reduce exposure levels.

B. The RSO or RSO's designee will review Individual Dosimeter Logs, (IDLs) and personnel monitoring, (PM) badge reports for all radiographic personnel to determine if unnecessary exposures are being received. The RSO or RSO's designee will sign and date each IDL/PM report following the review. Workers must submit their IDLs to the RSO or RSO's designee no later than 7 days after each month.

RADIATION SAFETY OFFICER RESPONSIBILITIES **(continued)**

C. The 5 rem/year occupational dose limit should not be reached. To ensure occupational exposures are kept to a minimum, Investigational Exposure Levels (IELs) will be established as dose monitoring tools. The RSO will investigate within 30 days, the cause of all personnel doses exceeding the IELs. The RSO will take corrective actions to ensure all unnecessary exposures are halted and recurrence is prevented. A report of each investigation and the actions taken, if any, will be recorded and maintained for inspection purposes.

D. The RSO will evaluate internal audit findings within 30 days of the audit to verify the worker's job performance exhibits diligent application of ALARA principles. The RSO will sign and date each audit form following the review (unless the RSO performed the audit). The RSO will take corrective actions (e.g., additional training, follow-up audit) to ensure deficiencies noted during the audit, which could result in unnecessary exposures, are prevented from recurring. The RSO will describe any corrective actions taken on the audit form.

E. At least annually, the RSO will conduct a formal review of the radiation protection program's content and implementation. The review will include evaluations of equipment, procedures, dosimetry records, internal audits, inspection findings, and any incidents. A principal goal of the review will be to assess trends in occupational exposures as an index of the program's success and to determine if modifications to the program are needed to maintain doses as low as reasonably achievable. A summary of the results of each review, including a description of actions proposed and taken, will be documented by the RSO, discussed with management, and signed and dated by both. A report on each review will be maintained on file for inspection purposes for 3 years from the audit date.

RADIOGRAPHIC PERSONNEL RESPONSIBILITIES

To keep exposures ALARA, all workers will minimize time, maximize distance, and maximize shielding when working with radiation sources. Workers will also maintain documentation of doses from dosimeters and PM badges in Individual Dosimeter Logs.

APPENDIX C
PERSONNEL MONITORING PROCEDURES

GENERAL INSTRUCTIONS

We shall not permit any individual to act as a radiographer or a radiographer's assistant unless the individual wears on the trunk of his or her body at all times during radiographic operations a NVLAP-approved personnel monitoring badge; a direct reading pocket dosimeter; and an alarming ratemeter. Alarm ratemeters are not required for radiography performed in an approved permanent radiographic installation as described in 64E-5.437, F.A.C.

RECORDS OF PRIOR OCCUPATIONAL DOSE

For compliance with subsection 64E-5.308(1), F.A.C., prior to assigning a PM badge to a worker, every reasonable effort will be made to obtain records indicating the individual's dose during the current year as well as the individual's lifetime cumulative occupational radiation dose. If a worker is unable to provide the information, records from their previous employer will be requested. If no records are obtained, documentation will be maintained on file demonstrating a request for records was furnished to the worker's previous employer. Prior occupational dose records shall include all of the information required by section 64E-5.308, F.A.C., using DOH Form DH 1623 or an equivalent form.

If unable to obtain a complete record of a worker's accumulated occupational dose, the RSO must assume the worker received 1.25 rem for each quarter the worker was engaged in activities that could have resulted in occupational radiation exposure. Records used in preparing the *Cumulative Occupational Radiation Dose Record* must be retained for 3 years after the record is made. Each worker's *Cumulative Occupational Radiation Dose Record* must be retained until license termination.

RECORDS OF INDIVIDUAL MONITORING RESULTS

Records of doses received by each monitored worker will be maintained as long as the license remains in effect. Dosimetry records will be kept on DOH Form DH-1622 or an equivalent form and will contain all of the information required by section 64E-5.339, F.A.C. and subsection 64E-5.903(1), F.A.C. These records will be updated annually.

ANNUAL REPORTS

Each worker assigned a PM badge will receive a written annual exposure report describing the past year's monitoring results, as required by section 64E-5.903, F.A.C. Records documenting the reports have been furnished to monitored workers will be maintained for at least 3 years.

TERMINATION REPORTS

Within 30 days of termination of employment, or within 30 days after the individual's exposure has been determined, whichever is later, each monitored worker will receive a written exposure report summarizing the individual's occupational radiation exposure,
as required by section 64E-5.903, F.A.C. Records documenting the reports have been furnished to monitored workers will be maintained for at least 3 years.

FEMALE WORKERS & DECLARED PREGANCIES

Upon hiring, female personnel assigned to work with devices will be provided verbal instructions concerning the potential risks involved for pregnant women exposed to radiation and a copy of U.S. NRC Regulatory Guide 8.13 **"**Instruction Concerning Prenatal Radiation Exposure" – latest revision. Following receipt of the instructions and guidance, female workers will sign the *Instructions for Women Working With Radiation* or equivalent.

Declared pregnant women will be provided verbal instructions to always wear their assigned PM badge at waist level to estimate the embryo/fetus dose. She will sign an *Instructions for Declared Pregnant Women* form or equivalent and a *Declaration of Pregnancy* form or equivalent including the estimated date of conception. The forms will be retained until license termination.

Fetal doses will be kept ALARA, and will not be allowed to exceed 500 millirem during the entire pregnancy as a result of occupational exposures. Efforts will be made to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman. In addition, reasonable efforts will be made to adhere to regulatory recommendations to limit the embryo or fetus exposure to 50 millirem in any one month. Records of fetal dose will be documented in an *Occupational Radiation Dose Record* (Form DH-1623 or equivalent) and the forms, with the dose records of the declared pregnant woman, will be retained until license termination.

OFF-SCALE DOSIMETERS & LOST/DAMAGED PM BADGES

In the event of an off-scale pocket dosimeter, an electronic dosimeter exceeding 200 mrem during radiographic operations, or a lost or damaged PM badge, we will document the determination of the worker's dose and any surveys used to make the dose determination. Identify the employer and the name of the monitored worker on the report. Maintain documentation, indicating the report was furnished to the worker with the worker's PM records. Notify the PM badge processor of the calculated dose and instruct the processor to adjust the worker's dose record to reflect the calculated dose.

WORKER OVEREXPOSURE REPORTS

When required to report an individual's radiation exposure to the BRC, we will provide the same report to the exposed individual no later than when the report is sent. We will maintain documentation for at least 3 years showing the report was furnished to the worker. Include for each occupational overexposed individual, the person's name and date of birth. For events involving an embryo/fetus, this information applies to the declared pregnant woman. Prepare reports so the information on exposed individuals is stated in a separate and detachable portion of the report. When submitting a report to the BRC, also provide a copy to the exposed individual(s), no later than when submitting it to the BRC, in accordance with the provisions of Part IX of Chapter 64E-5, F.A.C. (i.e., include this statement: "This report is furnished to you under the provisions of the Florida Department of Health regulation entitled Chapter 64E-5, Control of Radiation Hazards. You should preserve this record for future reference.").

OCCUPATIONAL DOSE LIMITS FOR MINORS

Minors will not exceed an annual occupational dose of 500 millirem.

APPENDIX D
RECORD RETENTION PROCEDURE

Records pertaining to licensed operations will be maintained in accordance with the requirements specified in Chapter 64E-5, Florida Administrative Code, which are described below.

GENERAL RADIATION SAFETY PROGRAM RECORDS

DOCUMENT	RETENTION INTERVAL	REFERENCE
Parts I – IV, IX & XV of Chapter 64E-5, FAC	Until license termination	64E-5.901(1)
Florida radioactive materials license (all active amendments & supporting documents)	Until license termination	64E-5.901(1)
Florida x-ray machine registration	Until license termination	64E-5.901(1)
Records demonstrating compliance with radiation dose limits for members of the public	Until license termination	64E-5.313(5)
Provisions of radiation protection program	Until license termination	64E-5.335(2)
Copy of current operating and emergency procedures	Until license termination	64E-5.440(2)(h)
Copy of superseded O&E procedures	3 yrs. after procedures have been superseded	License condition
Records of surveys performed to evaluate radiation levels or radiation hazards	Until license termination	64E-5.336(2)
Radiation protection program/ALARA reviews	3 yrs. after record is made/ until license termination	64E-5.335(2) 64E-5.440(2)(g)
Internal performance audit records	3 yrs. after audit	64E-5.440(1)(g)
Individual Dosimeter Logs	3 yrs. after recorded event	64E-5.440(2)(a)
Equipment inspection and maintenance records	3 yrs. after I&M	64E-5.440(1)(e)
Operation tests of entrance controls/alarm system for permanent radiographic installation	3 yrs. after test	64E-5.440(1)(f)
Calibration records for survey meters, alarm ratemeters & pocket dosimeters	3 yrs. after calibration date	64E-5.440(1)(a)
Leak test records	3 yrs. after test date	64E-5.337, 64E-5.440(1)(b)
Quarterly inventories	3 yrs. after inventory	64E-5.440(1)(c)
Source Movement Logs & Daily Survey Reports	3 yrs. after recorded event	64E-5.440(1)(d)
Records of rad. material transfers/disposal	Until license termination/ 3 yrs. after calibration date	64E-5.340(2) 64E-5.440(1)(h)
Records of doses received during rad. accidents	Until license termination	64E-5.339(1), (5)
Transportation incident reports	2 yrs. from date of report	49 CFR 171.16

RECORD RETENTION PROCEDURE

PERSONNEL MONITORING RECORDS

DOCUMENT	RETENTION INTERVAL	REFERENCE
Personnel monitoring (PM) results & records of pocket dosimeter readings	Until license termination	64E-5.339(1), (5)
Records of personnel exposure investigations (doses exceeding ALARA Policy IELs)	Until license termination	64E-5.440(2)(e)
Records of dose determinations/surveys associated w/ off-scale dosimeters or lost/damaged PM badges	Until license termination	64E-5.440(2)(f)
Records of declared pregnancy	Until license termination	64E-5.339(4), (5)
Prior occupational dose history records	3 yrs. after record is made	64E-5.308(7)
Records of surveys/measurements used to determine external/internal doses	3 yrs. after survey/measurement	64E-5.336(1)
Annual PM exposure notification reports & individual PM reports following employee termination	3 yrs. after report is made	64E-5.903(2)

TRAINING RECORDS

DOCUMENT	RETENTION INTERVAL	REFERENCE
Radiation safety training and test records	Until license termination	64E-5.440(2)(b)
Verification of previous radiography experience	Until license termination	64E-5.440(2)(c)
Radiographer certification documentation	Until license termination	64E-5.440(2)(d)
Verification of radiographer certification status	Until license termination	64E-5.440(2)(d)
Hazmat employee training records	90 days after worker termination	49 CFR 172.704(d)

APPENDIX E
NOTIFICATION AND REPORTING PROCEDURES

LICENSE-RELATED NOTIFICATIONS

Change of RSO

Notify the FL Bureau of Radiation Control (BRC) in writing within 30 days of a change of RSO. Include documentation of the new RSO's qualifications for the position.

Vacating Premises

Notify the FL BRC in writing no less than 30 days before vacating or relinquishing possession or control of the permanent storage facility listed in the license. Have the notification dated and signed by a certifying official, and describe the relocation of all radioactive material previously located at the facility. Documentation of transferred material may be required, and radiation surveys of storage facilities may also be required.

Change of Ownership

A license is only valid for the legal entity to whom it was issued; it may not be transferred, directly or indirectly. Should a change of ownership or a change in majority of controlling interests occur, immediately notify the FL BRC in writing, and submit an application for a new license. A certifying official representing the original licensee must submit a termination request to terminate the previous license.

Bankruptcy

Immediately notify the FL BRC in writing following the filing of a voluntary or involuntary petition for bankruptcy under any chapter of Title 11 of the U.S. Code by or against the licensee, a controlling entity, or an affiliate of the licensee. Identify the bankruptcy court and the date of the petition's filing in the notification.

License Termination

Immediately notify the FL BRC in writing of a decision to terminate licensed activities. DOH Form DH-1059 (Certificate of Disposition) should be used when submitting a termination request. The notification must be dated and signed by a certifying official, and must describe the disposition of all radioactive material possessed under the license. Documentation of radioactive material transfers may be required, and radiation surveys of storage facilities may also be required.

Locations not listed on the license

Any licensee conducting radiographic operations or storing radioactive material at any location not listed on the license for a period in excess of 180 days in a calendar year, shall notify the department prior to exceeding the 180 days.

REPORTS OF STOLEN, LOST OR MISSING SOURCES OF RADIATION

Telephone Reports

Immediately after its occurrence becomes known, report to the FL BRC by phone a stolen, lost or missing radiation source.

Written Reports

Follow telephone reports of stolen, lost or missing radiation sources with a written report to the FL BRC within 30 days after making the report. Include the following information:

- A description of the radiation source; for radioactive material, the kind, quantity, and chemical and physical form; for x-ray machines, the manufacturer, model and serial number, type and maximum energy of radiation emitted.
- A description of the circumstances under which the loss or theft occurred.
- A statement of disposition or probable disposition of the radiation source involved.
- Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible doses received by persons in unrestricted areas.
- Actions have been or will be taken to recover the source.
- Procedures or measures have been or will be adopted to prevent recurrence.

INCIDENT NOTIFICATIONS

Incidents involving radiation sources require different types of notifications. Reports may be made by phone or fax; names of individuals who have received radiation exposures must be stated in a separate and detachable portion of the report.

Immediate Notifications

Immediately notify the FL BRC of any event involving a source of radiation which might have caused or threatens to cause any of the following: an individual to receive a total dose of 25 rem or more, a lens dose of 75 rem or more, or a skin, extremity or total organ dose of 250 rad.

Notify the BRC as soon as possible, but not later than 4 hours after the discovery of an event, such as a fire, explosion, or toxic gas release.

24-Hour Notifications

Notify the FL BRC within 24 hours of discovery of an event involving loss of control of a radiation source which might have caused or threatens to cause any of the following: an individual to receive in a period of 24 hours a dose greater than 5 rem, a lens dose greater than 15 rem, or a skin, extremity or total organ dose greater than 50 rem.

INCIDENT NOTIFICATIONS (continued)

24 Hour Notifications (continued)

Notify the FL BRC within 24 hours of discovery of:

- An unplanned contamination event requiring access to the contaminated area to be restricted for more than 24 hours;
- An event in which equipment is disabled or fails to function as designed when the equipment is required to prevent exposures exceeding regulatory limits or to mitigate the consequences of an accident, the equipment is required to be available and operable when it is disabled or fails to function, and no redundant equipment is available and operable to perform the required safety function;
- An event requiring unplanned medical treatment at a medical facility of an individual with radioactive contamination on the individual's clothing or body; or
- An unplanned fire or explosion damaging radioactive material or the device, container or equipment containing radioactive material when the damage affects the integrity of the radioactive material or its container.

Information Required for Immediate/24-Hour Notifications

Make reports to the FL BRC of events requiring immediate or 24-hour notification by phone, and if available at the time of notification, include the following information:

- The caller's name and call back phone number;
- A description of the event, including date and time;
- The exact location of the event;
- The isotopes, quantities and chemical/physical forms of the radioactive material involved; and
- Any personnel radiation exposure data available.

REPORTABLE EVENTS

All events requiring immediate or 24-hour notification are classified as reportable events, and require a written report to be submitted to the FL BRC within 30 days after learning of the event's occurrence. The following occurrences are also classified as reportable events and require written reports to the BRC within 30 days:

- Dose exceeding the occupational dose limits for adults (total dose > 5 rem, organ dose > 50 rem, lens dose > 15 rem, or shallow dose > 50 rem);
- Dose exceeding the occupational dose limits for minors (total dose > 500 mrem, organ dose > 5 rem, lens dose > 1.5 rem, or shallow dose > 5 rem);
- Dose exceeding limit for an embryo or fetus of a declared pregnant woman (500 mrem);
- Dose exceeding limits for members of the public (2 mrem in any one hour or 100 mrem in one year); or
- Radiation levels greater than 20 mrem/hr in unrestricted areas.

REPORTABLE EVENTS (continued)

Reports must describe the extent of exposure of individuals, including:

- Estimates of each individual's dose;
- The levels of radiation and activities of radioactive material involved;
- The causes of the elevated exposures or dose rates; and
- The corrective steps taken or planned to prevent recurrence, including a schedule for achieving conformance with applicable limits, ALARA constraints, and license conditions.

REPORTS OF LEAKING/CONTAMINATED SOURCES

Immediately notify the FL BRC upon learning of any leaking or contaminated sealed source. Submit a follow up written report to the BRC within 5 days, and identify the equipment involved, the test results and the corrective action taken.

REPORTS OF HIGH RADIATION LEVELS ON PACKAGES

Immediately notify the BRC and the final delivery carrier by phone or fax upon learning of external radiation levels exceeding 200 mrem/hr at any exterior surface, or 10 mrem/hr at one meter from any exterior surface of an incoming package containing radioactive material. These limits are specified in 64E-5.1505(9) and 64E-5.327(5), F.A.C.

REPORTS OF EQUIPMENT-RELATED INCIDENTS

We shall provide a written report to the department within 30 days of the occurrence of any incident involving radiographic equipment. Such reports shall be mailed to the Bureau of Radiation Control, Radioactive Materials Section, Bin C21, 4052 Bald Cypress Way, Tallahassee, Florida 32399-1741 for incidents involving radioactive materials or to the Bureau of Radiation Control, Radiation Machine Section, 705 Wells Road, Suite 300, Orange Park, Florida 32073 for incidents involving radiation machines and/or equipment:

- Unintentional disconnection of source assembly from control cable.
- Inability to retract and secure source assembly to fully shielded position.
- Failure of any component critical to safe operation of device to perform its intended function properly.
- Description of equipment problem.
- Cause of incident if known.
- Manufacturer name and model number of equipment involved in the incident.
- Place, time and date of incident.
- Actions taken to establish normal operations.
- Corrective actions taken or planned to prevent recurrence.
- Qualifications of the personnel involved in the incident.

APPENDIX F
RADIATION SAFETY TRAINING, CERTIFICATION & AUDITS

PURPOSE & SCOPE

The handling and use of radioactive materials is restricted to trained personnel.
The training, testing, and certification requirements described below pertain to workers authorized to perform isotope radiography and/or x-radiography.

- "Instructions to workers" (radiation awareness) training for radiation workers;
- Assistant radiographer training;
- Radiographer training;
- Hazmat employee training; and
- X-ray system radiographer training.

INSTRUCTIONS TO WORKERS TRAINING

Prior to working with sources of radiation, workers will receive the training specified in section 64E-5.902, F.A.C. The following instructions will be provided:

- Information on the storage, transfer, and use of radiation sources;
- The health protection problems associated with exposure to radiation and radioactive material;
- Precautions and procedures used to minimize exposures;
- Applicable provisions of FL BRC regulations and the radioactive materials license;
- Workers' responsibility to report any unsafe conditions in the workplace;
- Appropriate responses to warnings made in the event of radiation incidents; and
- Reporting requirements for occupational radiation exposures.

Radiation awareness training is typically provided concurrently with other radiation safety classes (e.g., part of a 16-hour or 40-hour class for qualification as an assistant radiographer). If provided as a stand-alone class, the training typically lasts approximately 2 – 4 hours; the duration may vary based on attendees' comprehension of the topics covered. A question and answer session is held at the end of the training period, and attendees are encouraged to request clarification as necessary during the presentation.

ASSISTANT RADIOGRAPHER TRAINING

We will not permit any individual to act as a radiographer's assistant until such individual:

1. Receives a copy of the operating and emergency procedures;
2. Completes 8 hours of training, including instruction in our operating and emergency procedures and supervised instruction in use of radiographic equipment, related handling tools, radiation survey instruments, and personnel monitoring devices during a special training session; and
3. Successfully completes a closed-book, written examination on our operating and emergency procedures and a practical examination which is not conducted during production radiography to demonstrate competence in the use of our radiographic equipment, related handling tools, radiation survey instruments, and personnel monitoring devices.

RADIOGRAPHER TRAINING

We can allow individuals who have completed the training and testing specified below to perform industrial radiography for 12 months. We shall not permit any individual to act as a radiographer until such individual:

- Receives copies of rules contained in Chapter 64E-5, Parts I – IV, IX and XV, F.A.C., applicable USDOT regulations, the appropriate license or certificate of registration, and our operating and emergency procedures;
- For radioactive material radiographic operations, completes 320 hours of on-the-job training in industrial radiography, excluding hours as specified for machine produced radiographic operations below, as a radiographer's assistant using radioactive material;
- For machine produced radiographic operations, completes 200 hours of on-the-job training using radiation machines;

A. Receives 40 hours of formal instruction in the following subjects:

- Fundamentals of radiation safety, including characteristics of radiation, units of radiation dose, quantities of radioactivity, hazards of radiation exposure, radiation protection standards, radiation levels from sources of radiation, and methods of minimizing radiation dose.
- Radiation detection instruments including:
  a. Use, operation, calibration, and limitations of radiation survey instruments;
  b. Survey techniques; and
  c. Use of personnel monitoring equipment.
- Equipment to be used, including, as applicable:
  a. Operation and control of radiation machines, radiographic exposure equipment, remote handling equipment, source changers, storage containers, and transport containers, including pictures or models of source assemblies;
  b. Storage, control, and disposal of licensed material; and
  c. Inspection and maintenance of equipment.
- The applicable requirements of these rules and NRC and USDOT regulations.
- The licensee's or registrant's operating and emergency procedures.
- Case histories of industrial radiography accidents.

B. Receives supervised instruction during a special training session in the inspection and use of our radiographic equipment, related handling tools, radiation survey instruments, and personnel monitoring devices;

Successfully completes a closed-book, written examination on the subjects outlined above, and a practical examination to demonstrate competence in the use of our radiographic and safety equipment; and

Is certified by a certifying entity.

RADIOGRAPHER TRAINING OPTIONS

Option 1: Complete at least 16 hours of initial training covering radiation awareness, procedures/equipment use and hazmat employee training, to qualify as an assistant radiographer. After completing OJT, complete at least 32 hours of training on the subjects listed in subsection 64E-5.434(6), F.A.C. and a second round of written and practical exams to qualify as a radiographer (along with third-party certification).

Option 2: Complete at least 40 hours of initial training covering hazmat employee training, radiation awareness training and the subjects listed in subsection 64E-5.434(6), F.A.C. to qualify as an assistant radiographer. After completing OJT, complete at least 8 hours of radiation safety review and a second round of written and practical exams to qualify as a radiographer (along with third-party certification).

Both approaches require a minimum of 48 hours of formal training and testing; which option is used will be determined on a case-by-case basis.

HAZMAT EMPLOYEE TRAINING

A. Radioactive material is classified as hazardous material by the U.S. Department of Transportation (DOT). In accordance with DOT regulations (49 CFR Part 172, Subpart H), individuals must complete HAZMAT training prior to performing work which directly affects hazardous material transportation safety. (Exception: employees can work for 90 days without the training, provided a hazmat-trained employee directly supervises them.) Refresher training must be provided at least once every 3 years.

B. Hazmat training includes general awareness/familiarization, function specific, safety, and security awareness training. It will be provided in-house or by qualified third party trainers. The training may also be conducted concurrently with other radiation safety training (i.e., radiation awareness training and/or AU training).

C. Documentation of HAZMAT training will be maintained for the duration of each worker's employment, plus 90 days, and will include the following information:

- The employee's name and date of most recent training completed;
- Description, copy of training materials and their location;
- Name and address of the person providing the training; and
- Certification the employee has been trained and tested as required.

X-RAY SYSTEM RADIOGRAPHER TRAINING

Personnel using industrial cabinet x-ray systems for industrial radiography shall complete 16 hours of training and testing as described below:

- Ten hours of training and testing as described in the radiographer training, item 3, above; and
- Two hours of instruction in our operating and emergency procedures pertaining to industrial radiography using industrial cabinet x-ray systems, 2 hours of supervised instruction during a special training session in the use of our cabinet x-ray system, related handling tools, radiation survey instruments, and personnel monitoring devices, and 2 hours of testing, which shall consist of a written examination covering operating and emergency procedures and equipment use and a practical examination to demonstrate competence in the use of our cabinet x-ray system and related equipment.

TRAINING REQUIREMENTS FOR EXPERIENCED PERSONNEL

Any individual who has completed all training and testing requirements and begins work for a different Florida licensee or registrant shall complete 4 hours of additional training and testing before conducting radiographic operations. The training shall consist of instructions in the licensee's or registrant's operating and emergency procedures and supervised instruction during a special training session in the use of the licensee's or registrant's radiographic and safety equipment. The testing shall consist of successful completion of the written and practical examinations described above. The RSO shall document how the prior radiation training and experience was verified.

We shall provide 8 hours of refresher annual radiation safety training to all radiographic personnel, which can be conducted in multiple sessions.

TRAINING RECORDS

The following training records will be maintained until termination of the license:

- Initial and refresher radiation safety training including lists of the topics discussed, dates the training was conducted, names of the instructors and attendees, and written and practical examinations;
- Verification of previous radiography experience; and
- Radiographer certification documents and verification of certification status.

INTERNAL PERFORMANCE AUDITS

The RSO or the RSO's designee shall audit the job performance of each radiographer and radiographer's assistant to ensure the department's regulations, license requirements, and the licensee's or registrant's operating and emergency procedures are followed. The audits shall include observation of the performance of each radiographer or radiographer's assistant during an actual radiographic operation at intervals not to exceed 6 months. Radiographers or radiographer's assistants who have not participated in a radiographic operation for more than 6 months since the last audit shall demonstrate knowledge of the licensee's or registrant's operating and emergency procedures and safe use of radiographic and related equipment by a practical examination before participating in a radiographic operation. Audits of the RSO are not required.

Individuals conducting internal radiation safety training or audits shall meet the minimum qualifications specified in Appendix A of this guide.

Audit records will be retained on file at least 3 years beyond the date of the audit.

APPENDIX G
OPERATING PROCEDURES

Radiation Safety & Radiographic Personnel

During gamma radiography, the radiographer shall be accompanied by at least one other radiographer or radiographer's assistant whenever radiography is performed at a location other than a permanent radiographic installation. Radiography is prohibited if only one qualified individual is present. Radiography performed in an industrial cabinet x-ray system by a single individual meeting the training and testing requirements specified in 64E-5.434(5), F.A.C. is permitted. The radiographer's assistant shall be under the personal supervision of a radiographer when using a radiation machine, radiographic exposure device, source changer, or related source handling tools or conducting radiation surveys to determine the sealed source has returned to the shielded position or the radiation machine is off after an exposure. All radiographic operations conducted at our permanent facility shall be conducted in a permanent radiographic installation or an industrial cabinet x-ray system. Radiography devices and machines will be operated according to the manufacturer's operating and maintenance manual.

All isotope-related radiographic equipment (i.e., cameras, source changers, sealed sources and associated equipment) must meet the requirements specified in 64E-5.424, F.A.C., and ANSI N432-1980. Modification of radiographic equipment is prohibited unless approved by the manufacturer.

Personnel Monitoring (PM) Device Requirements

Film badge, TLD, and OSLD requirements: Each personnel monitoring badge shall be assigned to and worn by only one individual and shall be exchanged monthly. If a report is received from the badge processor indicating an individual has received a radiation exposure in excess of 5 rem (0.05 Sv), we shall notify the department within 24 hours as specified in 64E-5.344(2), F.A.C. If a personnel monitoring badge is lost or damaged, the worker shall cease work immediately until a replacement badge is provided. Badges should not be left in close proximity to a device or other radiation source. We will attempt to protect badges from moisture, intense heat or light and chemicals. When not in use, we will store badges with their control badge in a low background radiation area.

Pocket dosimeter requirements: Pocket dosimeters shall have a range from 0 to 200 millirem (2 mSv) and shall be recharged at the start of each shift and when 75% of the full scale of the dosimeter is exceeded. Initial, final, and total pocket dosimeter readings shall be recorded at the start and end of each shift. If an individual's pocket dosimeter is found to be off-scale or an electronic personal dosimeter reads more than 200 millirem (2 mSv) and the possibility of radiation exposure cannot be ruled out as the cause, the individual's personnel monitoring badge shall be sent for processing within 24 hours. The individual shall not resume radiographic operations until a determination of the individual's radiation exposure has been made by the RSO or the RSO's designee. The results of this determination shall be reported in writing to the department within 30 days of the determination.

Alarming ratemeter requirements: Each alarming ratemeter shall have a function test without being exposed to radiation to ensure the audible alarm is functioning properly before use at the start of each work shift, give an alarm at a preset dose rate of no more than 500 millirem (0.5 mSv) per hour, and require special means to change the preset alarm function.

Pocket dosimeters and alarm ratemeters requirements: Calibrated annually for correct response to radiation by a licensed entity. Acceptable dosimeters shall read within 20% of the true radiation exposure. Ion chamber dosimeters also shall be checked for response to drift by setting the dosimeter at zero and storing it in a low background area for at least 24 hours and for electrical leakage, which shall be no more than 1% of full scale for each 24 hours. Acceptable ratemeters shall alarm within 20% of the true radiation dose rate.

Use of Personnel Monitoring (PM) Devices

PM Badges

- Always wear a PM badge when handling or using sources of radiation, and only wear an assigned badge; use of another worker's assigned badge is prohibited.
- Wear the badge on the front of the torso, at or above the waist and below the shoulder, in close proximity to the pocket dosimeter and alarm ratemeter.
- When not in use, store the badge with the control badge. When not being used at field sites, store badges in a location protected from moisture, caustic chemicals, radiation, heat and light.
- At the end of each month, return the badge to the RSO for processing and obtain a replacement badge for the next monitoring period. If a replacement badge is unavailable, continue to use the ending month's badge until receipt of the replacement badge.
- Record PM badge readings in an Annual Dosimetry Log to allow comparisons between pocket dosimeter and badge readings.
- Spare badges are assigned to newly hired workers until a personalized badge arrives for the next monitoring period. A spare badge may also be used to replace a badge which is lost or damaged before the end of the monitoring period. When assigned a spare badge, it must be marked with the worker's name, initials or another form of identification. The dose recorded by the spare badge is added to the worker's occupational dose record.
- If a worker's badge is lost or damaged, the worker must cease work immediately until a replacement badge is obtained.

Pocket Dosimeters

All radiographic personnel are issued a 0 – 200 mR range direct reading pocket dosimeter. If available, we may use a high-range dosimeter as a back up. We will always take a dosimeter charger to field sites so dosimeters can be re-zeroed. We will follow the steps listed below for proper use of dosimeters.

- Do not use dosimeters unless calibrated within the last 12 months. Dosimeters lacking calibration labels cannot be used unless a valid calibration certificate is available which can be copied and taken to the field site. Remove out-of-calibration dosimeters from service and tag them with a label (e.g., "Out of cal. – do not use").
- At the start of each shift, charge dosimeters to zero (or slightly above zero, but not above 10 mR) and record the initial reading on a Daily Survey Report.
- Read dosimeters frequently during radiographic operations. If a low range dosimeter reaches 75% of full scale (i.e., 150 mR) during operations, record the reading in the Daily Survey Report and re-zero the dosimeter prior to resuming work.
- If a dosimeter goes off-scale, assume an emergency exists until a final determination can be made. Immediately cease operations and implement emergency procedures. Do not resume radiographic operations without the approval of the RSO/RSO designee.
- At the end of the shift, record the final and total readings in a Daily Survey Report. Dosimeter readings must be recorded in each worker's Individual Dosimeter Log to allow comparisons between dosimeter and badge readings.

Alarm Ratemeters

Wear an alarm ratemeter whenever handling or using sources of radiation, except when performing radiography in an approved permanent radiographic installation, such as a shooting cell. Ratemeters are preset to alarm in the presence of a 500 mR/hr radiation field; do not alter the setting under any circumstances. Prior to use, perform the checks described below to verify the meter's proper condition.

- **Calibration Check** Read the rater meter's calibration label to verify calibration within the last 12 months. If the calibration is past due, the meter cannot be used. If the calibration label is missing or illegible, check the calibration records to see if the ratemeter has been calibrated within the last 12 months. If calibrated, photocopy the calibration certification and attach it to the shipping papers (Bill of Lading).
- **Visual Check** Visually inspect the meter for damage to knobs and exterior surfaces, and verify screws are intact and tight. If any damage is identified which could compromise the instrument's ability to function properly, tag it with a note describing the problem and obtain a different ratemeter.
- **Battery Check** Turn the meter on and if the red LED is barely visible or the ticking is not heard, replace the batteries and repeat the test. If the indicators are still unsatisfactory, tag the meter with a note describing the problem and obtain a different ratemeter.
- **Function Check** Press the audio check button; if the alarm fails to sound and the batteries are charged, tag the meter with a note describing the problem and obtain a different ratemeter.

Survey Meters

Use calibrated and operable survey meters with a detection range of 2 mr/hr – 1 r/hr and perform radiation surveys according to 64E-5.426 and 64E-5.438, F.A.C. No radiographic operations shall be conducted unless at least one calibrated and operable radiation survey instrument is available for each radiographic exposure device and radiation machine in use at each site where radiographic exposures are made.

We will perform the following radiation surveys where applicable:

1. A reference survey of each radiographic exposure device or source changer immediately following removal from a storage area, including removal from storage following transportation.
2. An area survey during the first radiographic exposure to verify the posting requirements have been met and unrestricted areas do not have radiation levels in excess of the limits.
3. A survey of the radiographic exposure device and the length of the guide tube after each exposure when approaching the device or guide tube, concluding with a reference survey of the radiographic exposure device at the location established by the radiographer after each radiographic exposure. The surveys shall be performed before exchanging film, repositioning the exposure head, or dismantling equipment.
4. A reference survey of the radiographic exposure device and source changer before and after source exchanges.
5. A reference survey of the radiographic exposure device, source changer, or storage container after returning the sealed source to a storage area.
6. A survey after each radiographic exposure using radiation machines to verify the machine is off.

Prior to use, we will perform survey meter checks using guidelines described below to verify the meter's proper condition and operation.

Calibration Check Read the meter's calibration label to verify calibration within the last 6 months. If the calibration is past due, the meter cannot be used. If the calibration label is missing or illegible, photocopy the calibration certificate and attach it to the shipping papers. If not, remove the meter from service.

Visual Check Visually inspect the meter for damage to knobs, meter face, and water-tight seal. If any damage is noted which may compromise the instrument's ability to function properly, attach a tag describing the problem, set the meter apart from the functioning meters, and obtain a different meter.

Battery Check Turn the knob to the "Batt" setting; if the indicator reads above the "Batt" level, the batteries have an adequate charge. If the indicator is below the "Batt" level, replace the batteries (save old batteries for testing) and repeat the test. If the indicator is still below the "Batt" level, tag the meter with a note describing the problem and obtain a different meter.

Source Check

Test the meter's operation by measuring the radiation levels on the radiography camera to be used, following the steps listed below.

- Verify the last measured Reference Survey recorded on the device's Source Movement Log. Using the Source Decay Chart, estimate the current reference survey reading.

- Survey the camera/charger and note the Reference Survey reading – the highest contact reading taken by the exit port. If the meter reads zero, it is not working properly; tag it for repair, obtain another calibrated meter, and resurvey.

- If the reading is significantly higher or lower than the last recorded Reference Survey results or from the expected reading based on the source's activity, the meter is malfunctioning or the source is not in its shielded position.

- Using another calibrated meter, repeat the survey. If the reading remains significantly higher than expected, assume the source is exposed; immediately return the device to storage and notify the RSO. The device cannot be used until the RSO evaluates its condition.

- If the reference survey is significantly lower than expected, assume the source is not in the device, and notify the RSO. If another meter is available, resurvey. Note: Depleted uranium is used as shielding in cameras, so low radiation levels should be measured (1 – 3 mR/hour) even if the source is not present.

- If the survey reading compares favorably to the last recorded measurement or the reading derived from the source decay chart, remove the original meter from service and tag it for repair. Daily equipment checks may now be performed.

- Perform and record a final reference survey in the Source Movement Log (SML) and Daily Survey Report on the camera prior to returning it to storage in the field, and again on the SML when returning the source to storage at the permanent facility.

Source Movement Log (SML)

Each time a source is removed from storage or the X-ray machine is used, the applicable SML will be completed according to 64E-5.429, F.A.C.

Daily Survey Report

Before performing industrial radiography, leak tests, source exchanges, or quarterly inspection and maintenance of radiographic equipment, we shall prepare and maintain a daily survey report for each radiation source with the information described below as it becomes available:

- Location and date of use
- Description of device (manufacturer's name, model & serial no. of camera/source & source activity, or radiation machine being used)
- Names and titles of radiographic personnel working with the radiation source
- The serial number of the personnel monitoring badge, pocket dosimeter, and alarm ratemeter used by each of the radiography crew members.
- Initial, final & total dosimeter readings
- Survey meter and ratemeter serial nos. & calibration date
- Results of initial Reference Survey (taken immediately after removal from storage)
- Evidence of performance of daily equipment checks (use the Daily Inspection Checklist)
- Results of survey of transport vehicle (for field radiography)
- Performance of audio/visual alarm system operation test (for in-house radiography)
- Results of restricted area perimeter survey
- Total exposure time, and
- Results of final Reference Survey (taken prior to returning camera to storage).

Individual Dosimeter Log

Radiographic personnel shall maintain an individual log of their daily dosimeter totals. Each individual shall record the doses measured by his or her dosimeter at the end of each day of radiographic operations and total the recorded doses at the end of each week and at the end of each month. Copies of the individual dosimeter logs shall be provided to the radiation safety officer (RSO) or the RSO's designee no later than 7 days after each month. The RSO or the RSO's designee shall review the logs within 7 days of receipt and shall date and sign or initial the logs at the time of the review. Each log shall include the following information: The name of the individual; The dates of the monitoring periods; The daily, weekly, and monthly individual radiation dose totals as measured by the dosimeter; and the date the log was reviewed by the RSO or the RSO's designee and the signature or initials of the RSO or the RSO's designee.

Documents Required at Field Site Operations

Shipping papers; Bill of Lading/Emergency Response Information; Radiographer certification wallet card (or certificate); Operating & Emergency Procedures; Parts I – IV, IX, and XV of Chapter 64E-5, F.A.C. (Florida Administrative Code); Radioactive Materials License (last amendment in its entirety & any subsequent partial amendments); Calibration records for survey meters, dosimeters & alarm ratemeters (label or certificate); Latest leak test results for the source/camera (certificate or label); Source Movement Logs & Daily Survey Reports covering the period of operation at site.

Daily Equipment Inspection

Daily equipment inspections shall be conducted according to the device/machine manufacturer's operating and maintenance manual. Radiography cameras and sources shall be secured and transported as described in the device manufacturer's operating and maintenance manual and according to U.S. Department of Transportation, Title 49 CFR and Parts IV and XV of 64E-5, F.A.C.

Performance of visual and operability checks on survey instruments, radiation machines, radiographic exposure devices, associated equipment, transport containers, storage containers, and source changers are performed before use on each day the equipment is to be used to ensure the equipment is in good working condition, the sources are shielded adequately, and required labeling is present. All appropriate parts shall be maintained in accordance with the manufacturer's specifications.

Assistants may perform equipment checks only when directly supervised by a radiographer. Inspection results are documented on a Daily Inspection Checklist. The radiographer's signature certifies performance of the inspection. As a PRI provides additional safety measures and controls, a radiographer can perform radiography in the PRI vault alone. However, an assistant must always work under the personal supervision of a radiographer.

Security of Radiographic Equipment

(1) Each radiation machine, radiographic exposure device, source changer, and storage container shall be kept locked with the key removed from any keyed lock except when under the direct supervision of radiographic personnel.

(2) Each radiation machine, radiographic exposure device, source changer, and storage container shall be locked and the key removed from any keyed lock before being moved or transported and before being stored at a given location, except at permanent radiographic installations. Keys to radiation machines, radiographic exposure devices, source changers, storage containers, transport containers, and transport vehicles shall be maintained in the possession of the radiographer or radiographer's assistant responsible for the equipment in a manner preventing access to sources of radiation by unauthorized personnel.

(3) Locked radiographic exposure devices, source changers, storage containers, and radiation machines shall be secured physically except when under the direct surveillance of radiographic personnel to prevent tampering or removal by unauthorized personnel. We shall store licensed material in a manner minimizing danger from explosion or fire.

(4) Each sealed source shall be secured in its shielded position by locking the radiographic exposure device or source changer each time the sealed source is returned to the shielded position.

(5) Transport containers containing licensed material shall be locked and secured in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal of the licensed material from the vehicle.

(6) During each radiographic operation, the radiographer or radiographer's assistant shall maintain continuous direct visual surveillance of the operation to protect against unauthorized entry into a high radiation area, except at permanent radiographic installations where all entryways are locked.

(7) During each radiographic operation using an industrial cabinet x-ray system, direct surveillance of the operation shall be maintained to protect against unauthorized entry into a high radiation area.

Ordering, Receipt & Opening of RAM Packages

The license restricts the type, activity, quantity of RAM, and radiographic equipment which can be possessed. Therefore, only the RSO or RSO designee is authorized to order them. Packages containing RAM will be received and opened according to procedures described in the operating and maintenance manual, and the requirements of Title 49 CFR and 64E-5.327, F.A.C. The RSO will be notified if the package survey readings are significantly higher or lower than the amount documented on the transportation index (TI) label.

Transport Instructions

Wear all required dosimetry during transport. An operable, calibrated survey meter kept in the driver's compartment to monitor radiation levels during transport. When transporting cameras to and from field sites, the Bill of Lading and ERI sheet are immediately accessible to the driver, and located where they will be visible when the driver is not present or becomes incapacitated. Transportation operations and procedures will be in accordance with the U.S. Department of Transportation, Title 49 CFR and Part XV of 64E-5, F.A.C.

Vehicle Placarding

Vehicles used to transport RAM do not require DOT placards because containers labeled Rad Yellow II do not require placards, and containers labeled Rad Yellow III are transported in convenience overpacks to lower radiation levels and allow Rad Yellow II labels, eliminating the need for vehicle placards.

Post Transport Inspection & Survey

After arriving at a field site, perform a Reference Survey on the camera and compare the result with the reading recorded on the DSR; this will verify the source is secured and the meter is still functioning properly. Perform another inspection of the camera and associated equipment to verify no damage occurring during transport. Perform a final Reference Survey prior to returning the camera to storage and record the reading on the DSR and SML.

Emergency Response Information (ERI)

An ERI sheet provides information for first responders to a transportation accident involving hazardous material. The ERI sheet is kept with the shipping paper. When offering a camera to a common carrier for shipment, include a copy of the ERI sheet with the Shipper's Declaration of Dangerous Goods form.

When transporting cameras to and from field sites, keep the Bill of Lading and ERI sheet immediately accessible to the driver, located where they will be visible when the driver is not present or is incapacitated.

Removal of Camera from Storage

Before removing the camera from storage, check the source's activity using the Source Decay Chart, and look at the last Reference Survey recorded on the camera's SML; estimate what the current Reference Survey reading should be, taking into account the source's decay since the last Reference Survey was measured.

Immediately upon removal from storage, survey the complete circumference of the camera and conclude the survey with a Reference Survey reading – the highest contact reading taken near the exit port where the dot sticker is located.

To verify the source location and to check the proper operation of the survey meter, compare the Reference Survey reading with the last Reference Survey documented on the SML. Follow the instructions for completing the survey meter source check.

Record the Reference Survey reading twice: 1) in the space provided on the SML, and 2) on the DSR documenting the job being started.

Audible/Visual Alarm System Operation Test (for IR performed in the PRI)

Prior to conducting radiography in the vault, test the area monitor as described below.

- Power the unit up and verify the "power on" light is activated. If not, check the wiring connections, the AC power fuse, and the "power on" light bulb.
- Activate the monitor by exposing the unit to a radiation field of 2 mR/hour or greater; all warning devices and the panel's "radiation present" light should activate. If not, check the wiring connections, the external alarm fuse, and the "radiation present" light bulb.
- If the monitor remains inoperable, notify the RSO of the problem and use an alarm ratemeter to compensate for the lack of an alarm system.
- If the monitor is functioning, check the "Alarm Operational" box on the DSR.

Radiography Posting & Access Control

Calculate for source strength, distance, and shielding.
Barricade and post the area as described below:

- A sufficient number of signs must be used to ensure the visibility in all directions. Be sure to consider elevations above and below the level where the setup is located.
- During the initial exposure, survey the restricted area perimeter and make any adjustments needed to ensure the boundaries are properly established and controlled. To avoid unnecessary exposures, do not verify the high radiation area perimeter.
- Keep the high radiation area under constant surveillance at all times. Control access to the restricted area to the extent possible. Recruit assistance as necessary to maintain control of the area. Refer to the Emergency Procedures for instructions on handling unauthorized entries.
- Monitor radiation levels with a survey meter when first entering the shooting cell, during set-up, and after each exposure to verify the machine is turned off.
- During use, evaluate any changes in the general operating characteristics of the unit; inform the RSO of any changes are noted.
- At the end of operations, remove the X-ray machine key and store it in a secure location.

Restricted Area Access by unauthorized personnel shall be restricted. Use of direct surveillance, rope/tape barricades, and posted warning signs offer the most effective means of controlling access. Therefore, post the 2 mR/hour isodose line with signs bearing the radiation symbol with the warning "Caution (or Danger) – Radioactive Material(s)".

Radiation Area Unless already posting the 2mR/hour perimeter, post areas with radiation levels > 5 mR/hour with signs bearing the radiation symbol and the warning "Caution – Radiation Area".

High Radiation Area Post areas with radiation levels > 100 mR/hour with signs bearing the radiation symbol and the warning "Caution (or Danger) – High Radiation Area." adding the warning "Keep Out" on radiation/high radiation area signs is strongly recommended; adding "Radiography in Progress" is also advised.

Source Exchanges

Source exchanges are radiographic operations requiring full compliance with all steps taken when performing radiography – signing out the device on a SML, completing a DSR, using a two-member crew (unless performing the exchange in a PRI vault), wearing required dosimetry, using at least one operable, calibrated survey meter, and posting and controlling access to restricted area. Perform the exchange in accordance with manufacturer instructions.

Permanent Facility Postings

Emergency procedures, Notices of Violations and responses, and the FL BRC “Notice to Employees” form are conspicuously posted outside the vault where they can be viewed by workers. The “Notice to Employees” form identifies where a copy of applicable parts of Chapter 64E-5, F.A.C., the license, registration and operating procedures can be examined.

The permanent radiographic installation is posted with a sign bearing the radiation symbol and the warning "CAUTION (or DANGER), RADIOACTIVE MATERIAL(S)." During radiographic operations the entrance door is posted with a sign bearing the radiation symbol and the warning "CAUTION RADIATION AREA," and the interior door is posted with a sign bearing the radiation symbol and the warning "CAUTION (or DANGER), HIGH RADIATION AREA."

Permanent Radiographic Installations

A. Each entrance used for personnel access to a high radiation area in a permanent radiographic installation shall have either:

- An entrance control reducing the radiation level to below the level at which an individual might receive a deep dose equivalent of 0.1 rem (1 millisievert) in 1 hour at 30 centimeters from the source of radiation from any surface the radiation penetrates, or

- Have conspicuous visible and audible signals to warn of the presence of radiation. The visible signal shall be actuated by radiation. The audible signal shall be actuated when an attempt is made to enter the installation while the source is exposed or the radiation machine is activated.

B. The alarm system shall be tested for proper operation with a radiation source each day before radiographic operations. The test shall include a check of both the visible and audible signals. Entrance control devices reducing the radiation level upon entry shall be tested monthly. If an entrance control device or an alarm is operating improperly, it shall be labeled immediately as defective and repaired within 7 days. The installation can continue to be used by an unaccompanied radiographer during this 7-day period if the continuous surveillance requirements of 64E-5.425(6), F.A.C., are implemented and an alarming ratemeter is used.

APPENDIX H
INVENTORY, TRANSFER & DISPOSAL PROCEDURES

PURPOSE & SCOPE

A quarterly physical inventory to account for all sources of radiation received or possessed during the quarter will be performed. The inventory shall cover all sources of radiation requiring licensure or registration by the department, including sealed sources, radiation machines, radiographic exposure devices, and source changers containing DU. Specifically licensed RAM will be received from or transferred to another company or individual who is specifically licensed.

QUARTERLY INVENTORY PROCEDURE

Physical inventories of all radiographic equipment must be performed at intervals not to exceed 3 months to account for the RAM possessed under the company's radioactive materials license and the x-ray machines possessed under the company's certification of registration. Each inventory must account for all sources of radiation, including sealed sources, radiography cameras, source changers, x-ray machines and specifically licensed instrument calibrators. Inventories are typically performed concurrently with quarterly radiographic equipment inspection and maintenance (I&M). Records will be kept on file for 3 years.

An inventory is a radiographic operation involving exposure to radiation performed by qualified radiographic personnel wearing dosimetry and equipped with a calibrated, operable survey meter. Radiographers can perform inventories alone. An assistant can only participate if personally supervised by a radiographer, who must be in the immediate vicinity providing direct assistance and oversight.

For radiography cameras, perform a reference survey and compare the results of the reference survey with the last reference survey documented on the camera's Source Movement Log. If elevated radiation levels are noted, exit the area and immediately notify the RSO.

Evaluate each camera, source changer and x-ray machine to determine if any damage is evident. In addition, verify all of the identification and warning labels remain attached and legible. Report to the RSO any problems noted during I&M which have the potential to impair safe use of the equipment, or represents regulatory noncompliance. Attach a tag to any equipment with problems describing the equipment's status.

RAM TRANSFER/DISPOSAL PROCEDURE

When a radioactive sealed source and/or device containing depleted uranium is to be purchased, sold or transferred for disposal, we will verify the transferor's or transferee's authorization to possess the radioactive material. With the exception of manufacturers, a copy of each party's license should be exchanged and retained on file as evidence the transfer is authorized. A transfer document recording all relevant information will be generated. Transfers of x-ray equipment should be documented in a similar manner. Retain radioactive material transfer and disposal records on file for inspection purposes until license termination.

Information Required to Document Transfers

- The material being transferred (device manufacturer name, model and serial number, source manufacturer name, model and serial number, and source activity)
- The date of the transfer
- The names, addresses, and license numbers of the transferor and transferee
- The signatures of the individuals shipping and receiving the radioactive material

RAM Transfers Using Common Carriers

Common carriers are typically used to transfer RAM packages (i.e., cameras with low-activity sources being returned for reloading). Such shipments will be made in accordance with DOT regulations and Title 49 CFR.

APPENDIX I
EMERGENCY PROCEDURES

INTRODUCTION

Any situation causing or threatening to cause an excessive exposure to radiation is considered a radiological emergency. Potential emergencies include the following:

- An overexposure or potential overexposure to a worker or member of the public;
- Malfunctioning, damaged or lost camera/source changer/x-ray machine;
- Vehicle accident while transporting radioactive material.

UNAUTHORIZED ENTRIES INTO RESTRICTED AREAS

Unauthorized entries may occur due to:

- Radiography crew fails to post and barricade all access points;
- Untrained site workers disregard warning signs;
- Trained site workers intentionally disregard warning signs to retrieve their tools/lunch, read gauges, or take a shortcut.

If unauthorized personnel enter the restricted area, take the following steps:

- Immediately cease work, retract the source or turn off the x-ray machine;
- Calmly advise the individual(s) they have entered a restricted area and instruct them to return beyond the barricade so the situation can be assessed;
- Record the name, title, and phone number of the individual(s), as well as their supervisor's name and number. Estimate the dose(s) received and document the results. Workers' pocket dosimeter readings may provide dose estimates;
- If the estimated dose(s) exceed > 2 millirem in any one hour or > 100 millirem total, notify the RSO immediately; otherwise, notify the RSO of the incident at the end of the shift. Wait for instructions from the RSO before discussing the situation with the affected individuals. If a member of the public exceeds 2 millirem in an hour or 100 total millirem, the incident must be reported to the FL BRC within 30 days; refer to the notification and reporting procedures for additional guidance. Submit the incident report to RSO.

OFF-SCALE DOSIMETER

Radiography Crew

- Immediately cease work – retract the source or turn off the x-ray machine.
  If unsuccessful, follow the five key steps for responding to a radiological emergency – immediately exit the area, survey the perimeter (and expand if necessary), maintain continuous surveillance, check dosimetry, and notify the RSO. If able to secure the source, survey the guide tube and camera to verify the source is in the shielded position and the survey meter is functioning properly. Conclude the survey with a reference survey and compare results with the reference survey.
- Outside the 2 mR/hr perimeter, compare the results of the camera reference survey with the previously recorded reference survey recorded in the Daily Survey Report at the start of the shift; matching readings confirm the safe position of the source and the proper functioning of the survey meter. Also check the operation of workers' alarm ratemeters. Document all findings.
- If the individual whose dosimeter went off-scale is wearing a back-up/high range dosimeter, check the reading of the dosimeter, as well as the readings on the other worker's dosimeters. Record all readings.
- Investigate and document the possible cause of the dosimeter going off-scale by retracing each worker's prior actions. Perform calculations to determine the highest possible exposure(s) possibly received.
- Notify the RSO of the incident and the results of the investigation.
  Do not re-enter the restricted area until instructed by the RSO.
  Submit summary of findings to the RSO.

Radiation Safety Officer

Based on the information provided by the crew, decide whether to:

(1) Halt operations until a full assessment can be completed (or if a replacement worker is unavailable);

(2) Replace the worker and continue radiographic operations; or

(3) If all indications point to an accidental discharge, authorize the worker to return to work. If any doubt exists an overexposure occurred, proceed with the following steps:

- Restrict the worker to activities not involving radiation exposure.
  Notify the dosimetry processor the PM badge is being forwarded for immediate processing, and instruct the processor to phone in the reading as soon as possible.
- Document the incident, including the results of the internal investigation, and a description of actions taken; maintain the report on file.
- Notify the FL BRC if the incident requires notification. If the incident occurs outside FL BRC jurisdiction, notify the appropriate agency as required. If unsure about whether a situation requires notification, contact the department.
- Recalibrate the dosimeter, starting with a drift check. The PM badge is the definitive means of establishing dose, a faulty dosimeter may support a conclusion no overexposure has occurred.

EQUIPMENT MALFUNCTION

Notify the RSO immediately of any cases of mechanical malfunction or equipment damage. Wait for the RSO to provide further instructions.

DISCONNECTED SOURCE

If a source is disconnected, follow the steps for responding to an emergency.
Source recoveries can not be attempted without RSO supervision and specialized equipment.

BROKEN OR CRUSHED SOURCE

If the source appears broken or crushed, follow the steps for responding to an emergency. Any personnel possibly becoming contaminated must be detained just outside the restricted area until checked for contamination.

FIRE OR EXPLOSION

In the event of a firm alarm or other evidence of fire, immediately retract the source and lock the camera. Remove the camera (or x-ray machine) from the area and store it in a secure storage area. If it is not possible to secure the equipment, notify first responders (firemen, EMT, etc.) of the potential radiation hazard and provide assistance as requested. Notify the RSO and proper authorities as soon as possible.

TRANSPORTATION ACCIDENT

Immediately survey the area to verify the source's proper shielding and security.
If the meter is not working, use alarm ratemeters to monitor the camera.
Check pocket dosimeters continuously. If the camera's integrity is in question, follow the steps for responding to an emergency.
Do not leave the site unattended to get assistance.
Report all accidents to the RSO.

LOSS, THEFT OR MISSING RADIOACTIVE MATERIAL/X-RAY MACHINE

Immediately notify the RSO/designee and proper authorities for assistance.

EMERGENCY RESPONSE EQUIPMENT

The following equipment is recommended for response to a radiological emergency:

- Extra survey meters
- Extra warning signs
- Extra barricade rope/tape
- Barricade stands
- High range pocket dosimeters
- Remote handling equipment
- Lead shot bags
- Tools (knife, pliers, wrench, hammer, etc.)
- Lubricating grease
- Cleansing agents
- Adhesive tape
- Flashlights
- Emergency flashers
- First aid kit

Five Key Steps for Responding to a Radiological Emergency

- Clear all personnel from the immediate area.
- Re-survey the 2 mR/hr perimeter; expand the barricade and add additional radiation warning signs as necessary.
- Maintain continuous surveillance of the 2 mR/hr perimeter and restrict access (if needed, recruit additional personnel to assist as perimeter guards).
- Check dosimetry, if anyone has an off-scale pocket dosimeter, prohibit their re-entry into the restricted area; record dosimeter readings.
- Notify the RSO and comply with instructions provided. If the situation meets notification requirements, contact the FL Bureau of Radiation Control (if operating outside FL BRC jurisdiction, contact the appropriate radiation control agency).

EMERGENCY TELEPHONE NUMBERS

Radiation Safety Officer –	Office: Cell: Home: Pager:
FL Bureau of Radiation Control	(407) 297-2095
U.S. Nuclear Regulatory Commission	(301) 816-5100
QSA Global, Inc. (manufacturer – source retrieval assistance)	(800) 815-1383 (800) 225-1383
Industrial Nuclear Co. (manufacturer – source retrieval assistance)	(888) 353-7831
Source Production & Equipment Co. (manufacturer – source retrieval assistance)	(504) 464-9471

APPENDIX J
CALIBRATION PROCEDURES

Instrument calibrations are performed by persons licensed by the department, another Agreement State or the U.S. Nuclear Regulatory Commission. Radiation survey intruments shall be able to measure a range from 2 millirem (0.02 mSv) per hour through 1 rem (0.01 Sv) per hour.

Radiation survey instruments used to establish dose rates shall be calibrated:

1. At intervals not to exceed 6 months and after each instrument servicing other than battery replacement;

2. At energies and geometries appropriate for use;

3. To demonstrate accuracy within 20% of the true radiation level at each point checked; and

4. For linear scale instruments, at two points located approximately 1/3 and 2/3 of full-scale on each scale; for logarithmic scale instruments, at midrange of each decade and at two points at least one decade apart; and for digital instruments, at three points between 2 millirem (0.02 mSv) per hour and 1 rem (0.01 Sv) per hour.

Each instrument bears a label indicating its date of calibration and/or calibration due date and the name of the vendor/individual who performed the calibration. Instruments lacking a label showing calibration within the required frequency can not be used unless a calibration certificate is available and accompanies the instrument to the field site.

Instruments exceeding their calibration frequency are removed from service and tagged with a label identifying them as out of calibration, or stored in a location apart from calibrated instruments. Calibration records are retained for at least 3 years after the calibration date.

A sufficient number of G-M radiation survey meters are maintained to ensure at least one calibrated and operable meter is available for use with each source of radiation employed during radiographic operations. The meters are calibrated at least every 6 months and following repair.

A sufficient number of calibrated and operable alarm ratemeters are maintained to ensure each radiographer and assistant has a ratemeter available for use during radiographic operations. The meters are calibrated at least every 12 months and following repair.

A sufficient number of 0 – 200 mR range direct reading pocket dosimeters are maintained to ensure each radiographer and assistant has a calibrated and operable dosimeter available for use during radiographic operations. Dosimeters are calibrated at least every 12 months. High range dosimeters may also be used as back-ups.

APPENDIX K
INSPECTION & MAINTENANCE PROCEDURES

PURPOSE & SCOPE

Inspection and maintenance of survey instruments, radiation machines, radiographic exposure devices, associated equipment, source changers, storage containers, and transport containers shall be performed quarterly to assure proper functioning of components important to safety.
All appropriate parts shall be inspected and maintained in accordance with the manufacturer's specifications and manuals. Verification of compliance with radiation limits shall be included in each quarterly inspection.

If equipment problems are found, the equipment shall be labeled as defective and removed from service until repaired. Replacement components shall meet manufacturer's specifications.
Inspection and maintenance of Type B packages used to transport radioactive materials shall be performed quarterly in accordance with each package's certificate of compliance or other approval.

Radiographic equipment I&M can only be performed by the RSO, radiographers, assistants directly supervised by a radiographer, or specifically licensed third parties.

PERSONNEL MONITORING (PM) EQUIPMENT

Wear PM badge, zeroed dosimeter and tested alarm ratemeter (unless I&M is performed in a PRI, where use of an alarm ratemeter is not required), and record dosimetry data in a Daily Survey Report (DSR). Use at least one calibrated and operable survey meter (a backup meter is recommended). Perform meter checks per instructions and document performance of checks in the DSR.

STORAGE/TRANSPORT CONTAINER I&M

Document the container information on the I&M form. All parts must be maintained in accordance with manufacturer's specifications to ensure package integrity. I&M procedure as follows:

- Inspect container interior and exterior surfaces for cleanliness; remove any dirt, grease, or chemicals with cloth and a mild-cleansing solution.
- Check condition of hardware (hinges, braces, bolts, rings, etc.)
- Inspect carrying features (straps, handle, etc.) for signs of wear/damage.
- Verify ease of operation of locking mechanism.
- Inspect for proper and legible labels:
    1. Trefoil radiation symbol (magenta/purple/black on yellow background)
    2. Warning: "Caution (or Danger) Radioactive Material – Do Not Handle – Notify Civil Authorities (or company)"
    3. U.S. DOT markings and labels
    4. Container manufacturer name, model and serial no. (if available; not required).

APPENDIX L
LEAK TESTING PROCEDURES

PURPOSE AND SCOPE

Sealed sources contained in radiographic exposure devices, source changers and instrument calibrators shall be leak tested at regular intervals to ensure the integrity of the capsule containing the radioactive material is intact and no leakage of radioactive material has occurred. In addition, radiography cameras containing depleted uranium (DU) shielding and having an "S" tube configuration must be tested for DU contamination. Leak test samples are collected by the radiation safety officer (RSO), radiographers, assistants directly supervised by a radiographer, or specifically licensed third parties.

The replacement, leak testing, leak test sample analysis, repair, tagging, opening, or any other modification of any sealed source shall be performed only by persons authorized specifically to do so by the department, another agreement state, licensing state, or the NRC.

Each sealed source shall be tested for radioactive contamination leakage at intervals not to exceed 6 months. In the absence of a certificate from a transferor indicating a test has been made within the 6 months before the transfer, the sealed source shall not be used until tested. Sealed sources which are listed for storage only do not require leak testing during storage but shall be tested before use or transfer to another person if the interval of storage exceeds 6 months.

Each exposure device using depleted uranium (DU) shielding and an S-tube configuration shall be tested for DU contamination at intervals not to exceed 12 months. DU shielded devices do not have to be tested for DU contamination while in storage and not in use. However, the DU devices shall be tested for DU contamination before use or transfer if the interval of storage exceeds 12 months.

Leak testing shall be capable of detecting the presence of 0.005 microcurie (185 Bq) of removable contamination on the test sample. The wipe sample shall be taken from the nearest accessible point to the sealed source where contamination could accumulate.

If any test conducted reveals the presence of 0.005 microcurie (185 Bq) or more of removable radioactive material, we shall withdraw the equipment from use and cause it to be decontaminated and repaired or disposed of in accordance with Rule 64E-5.1303, F.A.C., and the applicable sections of rules contained in Parts III and XV of Chapter 64E-5, F.A.C. If DU leak testing reveals the presence of 0.005 microcurie (185 Bq) or more of removable DU contamination, the exposure device shall be removed from use until an evaluation of the wear on the S-tube has been made. If the evaluation reveals the S-tube is worn through, the device shall not be used. We shall file a report with the department describing the equipment involved, the test results, and the corrective action taken within 5 days after obtaining results of the test.

Leak test result records shall contain the manufacturer's name, model, and serial number of each sealed source or device tested, including the device the source was stored in, the identity of each radionuclide, the estimated activity of each sealed source, the measured activity of each test sample expressed in microcuries (becquerels), the date of the test, and the signature or initials of the RSO or the RSO’s designee;

LEAK TESTING INSTRUCTIONS

Personnel Monitoring (PM) Equipment

A PM badge, zeroed dosimeter and alarm ratemeter, unless the sample is collected in a permanent radiographic installation where use of an alarm ratemeter is not required, will be worn during leak testing. We will use at least one calibrated and operable survey meter during leak testing.

Collecting the Sample

Preparation of leak test samples will be performed in accordance with the manufacturer's instructions included with the leak test kit.

Analysis

Leak test samples are analyzed by a specifically licensed vendor. Contaminated equipment must be decontaminated and repaired or disposed in accordance with 64E-5.348, F.A.C.

APPENDIX M
MEMBER OF THE PUBLIC
DOSE COMPLIANCE STUDY

I. *Introduction*

Section 64E-5.312, Florida Administrative Code (F.A.C.), requires operations to be conducted so the below limits are met:

- Radiation doses in unrestricted areas do not exceed **2 millirem (0.02 mSv) in any one hour**
- Doses to members of the public do not exceed **100 millirem (1 mSv) in a year**

Section 64E-5.313, F.A.C., requires surveys, calculations and/or environmental monitoring to be used to demonstrate compliance with the dose limits. A member of the public (MOP) dose compliance study ("MOP study") provides documentation of compliance with both regulatory limits. This procedure describes methodologies developed by the Florida Bureau of Radiation Control (bureau) for license applicants and license holders conducting MOP studies.

This procedure applies to our application for **(Select one box):**

☐	**New license**:	This procedure describes the methods to be used to demonstrate compliance with the individual MOP dose limits. Supporting data, measurements and/or calculations will be maintained on file once licensed activities begin.
☐	**Renewal**:	The procedure describes the methods to be used to demonstrate compliance with the individual MOP dose limits. Applicable data, measurements and/or calculations included as attachments.

II. *Dose Limit for Unrestricted Areas*

For operations, there are three situations which must be addressed in order to demonstrate compliance with the 2 millirem in any one hour dose limit for unrestricted areas:

- Storage in transport vehicles;
- Use and storage at temporary job sites; and
- Storage at the permanent facility.

Section A demonstrates compliance with the unrestricted area dose limit for shipment to and from temporary job sites and their use and storage at job sites.

Section B's Method 1 describes the procedure followed when a survey meter is available to conduct radiation measurements. Compliance with the unrestricted area dose limit can also be demonstrated without direct measurements. Section B's Method 2 describes the procedure followed when a survey meter is unavailable. The selected box indicates the method used.

II. *Dose Limit for Unrestricted Areas*

A. Transport Vehicles and Temporary Job Sites

Security procedures, approved by the bureau and incorporated into the license, describe the measures taken by operators to restrict public access while in transport vehicles or at temporary job sites. During transport and storage at temporary job sites, the procedures require a minimum of two independent physical controls, which comprise tangible barriers, must be used to prevent public access to the device. While in use, the device must always be under the direct supervision of the operator to prevent unauthorized access. Adherence to these procedures ensures compliance with the 2 mrem in any one hour public dose limit.

B. Permanent Facility

☐ **Method 1. Physical Surveys**

Procedures approved by the bureau prevent unauthorized public access at the permanent facility. Devices are stored in an approved storage area and are kept locked in their transport cases and secured using a minimum of two independent physical controls, comprising of tangible barriers. All devices will be appropriately secured from public access, unless they are kept under the physical control and personal supervision of an operator.

A radiation detection instrument was used to measure ambient radiation levels in the unrestricted areas around the permanent storage area while all possessed devices were in storage. This survey evaluated the "worst case scenario" – where radiation emitted by the devices(s) are at their highest levels. Survey results revealing dose rates below 2 millirem per hour demonstrate compliance.

The following information is attached:

- Date of the survey and the name of the individual(s) performing the measurements
- Information about the instrument used to perform the survey (manufacturer and model number, the types of radiation detected by the instrument, its minimum and maximum range, and the date it was last calibrated)
- Diagram of the permanent facility identifying the restricted area, adjacent unrestricted areas, nearby MOP workstations, and the locations where all recorded measurements were taken
- Information about the type and number of devices present during the survey and a description of their placement within the storage area (e.g., contained in transport cases, stacked against back wall, etc.)
- Results of survey(s) of unrestricted area radiation levels, with results keyed to facility diagram

Note: If surveys note radiation levels > 2 mR/hr, attach a description of controls in place to further restrict access to the storage area (e.g., establishment of expanded restricted area around the storage area, using barricades and/or posted notices).

II. *Dose Limit for Unrestricted Areas*

B. Permanent Facility

☐ **Method 2. Calculations**

Radiation levels in unrestricted areas can be calculated using information provided by device manufacturers. Prior to shipment, the manufacturer lists the Transport Index (TI) number on the RADIOACTIVE YELLOW II label on the transport case's exterior surface. The TI indicates the radiation levels at 1 meter (3.3 feet) from the case when it contains a device. The TI value was used as the basis for the calculations. If the TI is less than 2, then radiation levels in all directions around the device when it is stored in its transport case are 2 millirem per hour (or less) at 1 meter, which is the boundary of the restricted area. Additional distance and shielding provided by the storage area lower the dose rate even further. Storing the device in its case, then storing the case in a cabinet, locker, room, etc. prevents unauthorized access to within a meter or more, so no MOP can receive 2 millirem in any one hour.

When calculating for two or more stored devices, each case's TI is added together; this method is overly conservative, but should not cause the 2 mrem limit to be exceeded.

The following information is attached:

- Diagram of the permanent facility identifying the restricted area, adjacent unrestricted areas, and distance to MOP workstations
- Information about the type and number of devices present and a description of their placement within the storage area (e.g., contained in transport cases, stacked by wall)
- Copies of manufacturer-provided documentation providing information on device dose rates and/or TI numbers for the devices being evaluated
- Results of calculations demonstrating estimated radiation levels in unrestricted areas, with results keyed to the facility diagram

Note: If calculations note radiation levels > 2 mR/hr, attach a description of controls in place to further restrict access to the storage area (e.g., establishment of expanded restricted area around the storage area, using barricades and/or posted notices).

III. ***Annual Public Dose Limit***

"Total effective dose equivalent" (TEDE) describes the dose from summation of internal and external radiation doses. However, there is little possibility of internal exposures during routine operations so internal doses can be ignored for device MOP studies. Thus, for device licensees demonstrating compliance with the 100 mrem annual MOP dose limit, the individual's external dose ("deep dose equivalent" or DDE) is equal to the total dose (TEDE).

Paragraph 64E-5.313(2)(a), F.A.C., states licensees can demonstrate compliance with the annual dose limit with measurements or calculations showing the MOP likely to receive the highest dose from the licensed operations does not exceed the 100 millirem limit. Different methods of using this regulatory approach are described below. The selected box indicates the method used in this study.

☐ **Method 1. Radiation Level Data**

Survey measurements and calculations can be used to demonstrate the radiation levels resulting from licensed operations are not likely to cause any MOP to exceed the annual public dose limit.

Radiation levels generated by RAM present in the workplace can be determined by direct measurement with survey instruments, or from indirect information, such as radioactive material package transport index values (describing radiation levels at 1 meter from a package's exterior surface). The radiation level data can then be used with the inverse square law to calculate the DDE.

In Table 1, check to indicate use of either rad. survey instrument measurements (Box A-1) or RAM package Transport Index (TI) values (Box B-1) with the inverse square law to calculate the DDE.

The issue of occupancy factors is addressed by selecting one of two options provided in Table 1. Check off the Box A-2 to indicate use of the most conservative scenario -- assuming a MOP is continuously present in the unrestricted area (24 hours/day, 365.25 days/year = 8766 hours). Check Box B-2 to indicate use of a more realistic (but still very conservative) assumption -- the individual located in the unrestricted area is present during all business hours (8 hours/day x 40 hours/week x 50 weeks/year = 2,000 hours).

Inverse Square Law: $I_2 = \frac{I_1 R_1^2}{R_2^2}$

Where: I_1 = intensity (radiation dose rate) at distance R_1
I_2 = intensity (radiation dose rate) at distance R_2.
R_1 = distance from RAM with dose rate I_1
R_2 = distance from RAM where dose rate I_2 is calculated

Notes:
A. This formula has two limitations: (a) it only applies to gamma-emitters; and (b) the closest distance should be at least five source diameters.
B. If using transport package exterior radiation levels, set R_1 = 1 inch.

III. *Annual Public Dose Limit*

Method 1: Radiation Level Data (Continued)

Example of an Inverse Square Law Calculation Using Survey Meter Measurements

A lab contains a variety of sealed sources. The sources may be treated as a single point source by positioning them together for the measurement. Assuming a collective source diameter of 12 inches, a radiation measurement (I_1) is taken at a distance equal to at least five source diameters from the grouped sources, which serves as R_1 in the inverse square formula. The intensity at 10 feet is the unknown value being sought (the distance to the nearest unrestricted area).

I_1 = 0.1 mR/hr
I_2 = ? mR/hr
R_1 = 60 in. (5 x 12 in.)
R_2 = 120 in. (10 ft.)

$$I_2 = \frac{0.1 \times (60)^2}{(120)^2}$$

I_2 = .025 mR/hr

A 2,000 hour occupancy factor yields:
.025 mR/hr x 2,000 hours
= 50 mrem = DDE

Example of an Inverse Square Law Calculation Using a Package Transport Index

A shipping case used to store a device bears a Radioactive Yellow II label shows its TI = 0.6. The nearest MOP workstation is located 24 feet away.

I_1 = 0.6 mR/hr
I_2 = ? mR/hr
R_1 = 3.3 ft. (1 meter)
R_2 = 24 ft.

$$I_2 = \frac{0.6 \times (3.3)^2}{(24)^2}$$

I_2 = .011 mR/hr

A 2,000 hour occupancy factor yields:
.011 mR/hr x 2,000 hours
= 22 mrem = DDE

Table 1.	**Radiation Level Data**	
☐	DDE (millirem)	☐ **A-1.** Check to indicate use of radiation survey instrument measurements and the inverse square law to calculate the DDE **OR** ☐ **B-1.** Check to indicate use of RAM package Transport Index (TI) values or RAM package surface radiation levels and the inverse square law to calculate DDE ********** ☐ **A-2.** Check if dose is based on continuous year-round occupancy (8766 hours) in unrestricted areas **OR** ☐ **B-2.** Check if dose has been adjusted for workplace occupancy factors (e.g., 2000 hours for a work year) in unrestricted areas ********** ☐ Check to indicate documentation of all calculations is attached, along with instrument identification, specifications and calibration information ☐ Check to indicate a facility diagram showing restricted and unrestricted areas is attached ← Enter the calculated DDE in the space provided to the left; use this value in App. A

III. *Annual Public Dose Limit*

☐ **Method 2. Dosimetry Data for the Maximally Exposed Individual MOP**

If annual occupational doses for workers exceed 100 millirem, the MOP which is likely to receive the highest dose from the licensed operations may be used to demonstrate compliance with the annual public dose limit. The "maximally exposed individual MOP" may be a person who does not operate devices but works at the same site where they are used or stored. It could also be an employee working in a management, clerical, or maintenance position at the permanent facility, or an employee or a regular customer who has routine contact with the operators when they are working.

Justification for how the maximally exposed individual was identified must be documented; i.e., why the person is likely to receive the highest radiation dose compared to other members of the public. Next, assign the individual a personnel monitoring device (film badge, TLD or OSLD). Provide instructions on when (during working hours) and where (on the torso, waist or chest level) the badge must be worn, and on proper use (protect badge from excessive heat, light, moisture or chemicals, store with control badge in low background area when not being worn). In general, at least one year of monitoring should be conducted to provide adequate measurement data and to account for seasonal fluctuations in work loads. If the dosimetry reports show the monitored person received < 100 millirem for the year, compliance with the annual public dose limit has been demonstrated, because if the MOP likely to receive the highest dose from the licensed operations is receiving < 100 millirem, then so are all other members of the public. It is not necessary to wait for a full year of dosimetry records to begin drawing conclusions from the collected data. As dosimetry reports arrive, the recorded dose can be multiplied to gain an estimate of the annual exposure, which can serve as a MOP study "in-progress" until the year of monitoring is completed. The study can then be updated to reflect the results of a full year of monitoring.

If this method is employed, complete Table 2 and attach the following:

- Description of the maximally exposed individual MOP (name, title) and justification for why the individual was selected
- Facility diagram identifying all restricted areas, adjacent unrestricted areas, and where the monitored MOP's workstation is located
- Copies of the dosimetry reports used in the study. Prior to submitting the reports, be sure to delete all personal information (e.g., social security numbers, last names, birth dates).

Table 2. Dosimetry Data for the Maximally Exposed Individual MOP

	DDE = TEDE (millirem)	
☐		Monitoring Period (*dates*): _____ to _____ ← Enter the highest individual cumulative external dose for the monitoring period in the space provided to the left. A dose ≤ 100 mrem demonstrates compliance with the annual MOP dose limit specified in 64E-5.312(1)(a), F.A.C.

III. *Annual Public Dose Limit*

☐ **Method 3. Environmental Monitoring Data**

If the maximally exposed individual MOP is a worker at the permanent facility, a third approach is available. A film badge/TLD/OSLD can be mounted at the person's work station to record radiation levels, which can then be related to the dose received by the person working in the area.
If environmental monitoring demonstrates the annual workplace continuous exposure to the ambient radiation levels results in a total dose less than 100 mrem, then it can be concluded no MOP would be likely to exceed the annual public dose limit from the licensed operations.
If environmental monitoring indicates continuous occupancy would result in exposures would exceed the public dose limit, then the use of realistic occupancy factors might be used to demonstrate compliance. The maximally exposed individual MOP's annual occupancy time can be determined by review of the person's time cards, interviews of the person and his/her co-workers, etc. Note: An environmental badge is not the same type of badge used for personnel monitoring, so it is important to specify to the dosimetry supplier what type of monitoring is planned when ordering badges. In addition, posted badges must be protected from adverse environmental conditions such as excessive heat, light and moisture.

One or more badges should be posted in the unrestricted areas adjacent to restricted areas (or in the restricted area on a wall adjacent to unrestricted areas) for at least 12 months. Badges should be posted where the highest radiation exposure is expected and where exposure to non-regulated sources of radiation (e.g., medical patients injected with radionuclides) will not contribute to the measurements. If the results for the monitoring period total < 100 mrem, use continuous occupancy for the dose determination; check Box A and enter the total value in the box provided in Table 3. If the results for the monitoring period exceed 100 mrem, it may be possible to demonstrate compliance with the annual dose limit by applying a more realistic (but still very conservative) occupancy factor, such as 2,000 hours for a work year. Box B should be checked if using a normal work week occupancy factor to calculate the TEDE.

Example: The total dose measured by the environmental badge = 280 mrem; the dose received by a MOP working 2,000 hours in the area the badge was posted is

280 mrem/8,766 hrs = .032 mrem/hr x 2,000 hrs = 64 mrem

Using a 2,000 hour occupancy factor means any annual dose from environmental monitoring totals < 438 mrem will demonstrate compliance

Example: 438 mrem/8,766 hrs = .049 mrem/hr x 2,000 hrs = 99.9 mrem

If the results for the 12 month monitoring period total > 438 mrem, compliance may still be demonstrated by using an even more realistic occupancy factor, provided the number can be legitimized by supporting documentation (e.g., employment records).

Example: Environmental badges total 680 mrem for the 12 month monitoring period; time sheets indicate a conservative estimate of the most time spent by any MOP in the monitored area is 25 hours a week, 50 weeks a year = 1,250 hours.

680 mrem/8,766 hrs = .078 mrem/hr x 1,250 hrs = 97 mrem

In each case, attach an annotated diagram of the facility identifying restricted areas, adjacent unrestricted areas, and the location of posted badges.

III. *Annual Public Dose Limit*

Method 3: Environmental Monitoring Data (Continued)

Table 3. Environmental Monitoring Data		
☐	DDE = TEDE (millirem)	Monitoring Period (*dates*): _____ to _____ ☐ **A.** Check if calculations are based on continuous year-round occupancy (8766 hours) in unrestricted areas ☐ **B.** Check if calculations are adjusted for workplace occupancy factors (e.g., 2,000 hours for a work year) in unrestricted areas ← Enter the highest individual cumulative external dose for the monitoring period in the space provided to the left. A dose ≤ 100 mrem demonstrates compliance with the annual MOP dose limit specified in 64E-5.312(1)(a), F.A.C.

☐ **Method 4. Occupational Worker Dosimetry Data**

If measurements show all of a licensee's device operators receive < 100 millirem annually, then by extrapolation, no MOP receives 100 millirem annually, because operators receive higher exposures from devices than any MOPs. If a review of monitored workers' dosimetry reports verifies none have received annual doses exceeding 100 mrem, completion of Table 4 and attachment of the referenced reports finishes the study. Prior to submitting the reports, be sure to delete all personal information (e.g., social security numbers, last names, birth dates). Note the evaluation period should cover at least 12 continuous months of operations.

Table 4. Occupational Worker Dosimetry Data		
☐	DDE = TEDE (millirem)	Monitoring Period (*dates*): _____ to _____ ← Enter the highest individual cumulative external dose for the monitoring period in the space provided to the left. A dose ≤ 100 mrem demonstrates compliance with the annual MOP dose limit specified in 64E-5.312(1)(a), F.A.C.

APPENDIX N
INCREASED CONTROLS PROCEDURES

The purpose of the Increased Controls for radioactive sources is to enhance security of radioactive material in risk significant quantities (i.e. quantities of concern). The U.S. Nuclear Regulatory Commission document titled "Increased Controls For Licensees Possessing Sources Containing Radioactive Material Quantities Of Concern" shall be used to guide the development of our program.

Increased Controls Procedures shall comply with the requirements described in NRC Order EA-07-305 (the Order) dated December 5, 2007, and its attachments titled "Table1: Radionuclides of Concern" and "Attachment 3: Specific Requirements Pertaining to Fingerprinting and Criminal Records Checks." Implementation of EA-07-305 shall be completed by the first day radionuclides in quantities of concern are possessed at or above the limits specified in "Table 1: Radionuclides of Concern".

The Florida Bureau of Radiation Control (BRC) – Radioactive Materials Section will be provided a certification the Trustworthiness and Reliability (T&R) Official (and any subsequent T&R Official) is themselves deemed trustworthy and reliable by us as required in B.2., of the Order.
The NRC's Headquarters Operations Office shall be notified at 301-816-5100 and the FL BRC at 407-297-2095, within 24 hours, if the results from a criminal history records check indicate an individual is identified on the FBI's Terrorist Screening Data Base.

Our T & R official will be: _____

Access to the details and documents concerning our security system for our radioactive material/s and/or device/s will be restricted to individuals who have been deemed trustworthy and reliable and who have completed the FBI's fingerprinting and criminal records review.

Some of the documents concerning our IC program will contain security sensitive information. Sensitive documents will not be posted. We will endeavor to identify documents with sensitive information describing our security measures and all sensitive diagrams by prominently marking each with the phrase:

"**Security System Plan, Withhold from Public Disclosure under 119.071(3), *Florida Statutes***."

IC Program Parameters

In order to ensure the safe handling, use, and control of licensed material in use and in storage, we have a documented program to monitor and immediately detect, assess, and respond to unauthorized access to radioactive material quantities of concern and devices.

1. Access to radioactive materials is controlled at all times. Methods used to control access may include barriers, personnel, and/or entry control devices.
2. Trustworthy and Reliability determinations are established and documented.
   A. Personnel who require access to the radioactive material to perform job duties who are not approved for unescorted access are escorted by an approved individual.
   B. Only trustworthy and reliable individuals, approved in writing shall have unescorted access to radioactive material in quantities of concern and devices containing such radioactive material.
   C. Documentation of the basis for concluding there is reasonable assurance an individual granted unescorted access is trustworthy and reliable, and does not constitute an unreasonable risk for unauthorized use of radioactive material in quantities of concern, shall be maintained.
3. Methods shall be implemented to monitor and immediately detect, assess, and respond to unauthorized access to radioactive material.
   A. Security monitoring shall be enhanced during periods of source delivery or shipment.
   B. Methods shall be implemented to establish the capability to immediately respond to any actual or attempted theft, sabotage, or diversion of radioactive material.
      (1) Methods shall include a pre-arranged response plan established with the appropriate Local Law Enforcement Agency (LLEA), for their assistance in response to any actual or attempted theft, sabotage, or diversion of radioactive material.
      (2) The pre-arranged response plan shall be consistent in scope and timing with a realistic potential vulnerability of the radioactive material.
      (3) The pre-arranged response plan shall be updated when changes to the facility design or operation affect the potential vulnerability of the sources.
4. A dependable means shall be established to transmit information between and among the various security system components which are used to detect and identify an unauthorized intrusion, to inform the assessor, and to summon the appropriate responder.
5. Loss of primary power will be a consideration used in the development of security and communications systems.
6. A process shall be established to notify the Florida Bureau of Radiation Control and the United States Nuclear Regulatory Commission in the event of any actual or attempted theft, sabotage, or diversion of radioactive material.
7. Documentation describing each instance of unauthorized access and any necessary corrective actions to prevent future instances of unauthorized access, shall be maintained.

Nationally Tracked Sources

Upon receipt of nationally tracked sources, we shall complete and submit a National Source Tracking Transaction Report. The report must include the following information:

1. Our name, address, and radioactive materials license number;
2. The name of the individual preparing the report;
3. The name, address, and license number of the person who provided the source;
4. The manufacturer, model, and serial number of each source or, if not available, other information to uniquely identify the sources;
5. The radioactive material in the source;
6. The initial or current source strength in Becquerels (Curies);
7. The date for which the source strength is reported; and
8. The date of receipt.

Upon disposal of a nationally tracked source, we shall complete and submit a National Source Tracking Transaction Report. The report must include the following information:

1. The name, address, and license number of the reporting licensee;
2. The name of the individual preparing the report;
3. The waste manifest number;
4. The container identification with the nationally tracked source;
5. The date of disposal; and
6. The method of disposal.

The National Source Tracking Transaction Report required for receipt or disposal of sources must be submitted to the NRC by the close of the next business day after the transaction. A single report may be submitted for multiple sources and transactions. The reports must be submitted to the National Source Tracking System by using:

- The on-line National Source Tracking System;
- Electronically using a computer-readable format;
- By facsimile;
- By mail to the address on the NRC Form 748 National Source Tracking Transaction Report Form; or
- By telephone with follow-up by facsimile or mail.

Any error in previously filed reports shall be corrected or we will file a new report for any missed transaction within 5 business days of the discovery of the error or missed transaction. Every year we shall reconcile the inventory of nationally tracked sources we possess against our data in the National Source Tracking System.

The reconciliation is conducted during January, of each year, and must resolve any discrepancies between the National Source Tracking System and the actual inventory. To reconcile each transaction, we shall file a report for missed transactions or file a corrected report for previously submitted reports containing inaccuracies. By January 31 of each year, we will submit confirmation to the National Source Tracking System the data in the National Source Tracking System is correct.

Exhibit A: **Occupational Radiation Dose Record**
(DOH Form DH-1622)

Exhibit B: **Cumulative Occupational Radiation Dose Record**
(DOH Form DH-1623)

FLORIDA DEPARTMENT OF HEALTH

OCCUPATIONAL DOSE RECORD FOR A MONITORING PERIOD

1. NAME (Last, First, M.I.)	2. IDENTIFICATION NO.	3. ID TYPE	4. SEX ☐ MALE ☐ FEMALE	5. DATE OF BIRTH

6. MONITORING PERIOD	7. LICENSEE OR REGISTRANT NAME	8. LICENSE OR REGISTRATION NO.	9.A. ☐ RECORD ☐ ESTIMATE	9.B. ☐ ROUTINE ☐ PSE

INTAKES

10.A. RADIONUCLIDE	10.B. CLASS	10.C. MODE	10.D. INTAKE (µCi)

DOSE (rem)

DEEP DOSE EQUIVALENT	(DDE)	11.
LENS (EYE) DOSE EQUIVALENT	(LDE)	12.
SHALLOW DOSE EQUIVALENT, WHOLE BODY	(SDE, WB)	13.
SHALLOW DOSE EQUIVALENT, MAX EXTREMITY	(SDE, ME)	14.
COMMITTED EFFECTIVE DOSE EQUIVALENT	(CEDE)	15.
COMMITTED DOSE EQUIVALENT, MAXIMALLY EXPOSED ORGAN	(CDE)	16.
TOTAL EFFECTIVE DOSE EQUIVALENT	(BLOCKS 11+15) (TEDE)	17.
TOTAL ORGAN DOSE EQUIVALENT, MAXIMALLY EXPOSED ORGAN	(BLOCKS 11+16) (TODE)	18.

19. COMMENTS

20. SIGNATURE -- LICENSEE OR REGISTRANT	21. DATE PREPARED

Instructions for Completing Form DH-1622 "Occupational Dose Record for a Monitoring Period"

Note: This form is equivalent to NRC Form 5.

1. Type or print the full name of the monitored individual in the order of last name (include "Jr.", "Sr.", III", etc.), first name, and middle initial (if applicable).
2. Enter the individual's identification number, including punctuation. This number should be the 9-digit social security number (SSN). If the individual has no SSN, enter the number from another official identification such as a passport or work permit.
3. Enter the code for the type of identification used as shown below:

CODE	ID TYPE
U.S.	Social Security No.
PPN	Passport No.
CSI	Canadian Social Insurance No.
WPN	Work Permit No.
IND	INDEX Identification No.
OTH	Other

4. Check the box that denotes the sex of the individual being monitored.
5. Enter the date of birth of the individual being monitored in the format MM/DD/YYYY.
6. Enter the monitoring period for which this report is filed. The format should be MM/DD/YYYY - MM/DD/YYYY.
7. Enter the name of the licensee or registrant.
8. Enter the department license or registration number(s).

9.A. Place an "X" in Record or Estimate. Choose "Record" if the dose data listed represent a final determination of the dose received to the best of the licensee's or registrant's knowledge. Choose "Estimate" only if the listed dose data are preliminary and will be superseded by a final determination resulting in a subsequent report. An example of such an instance would be dose data based on self-reading dosimeter results and the licensee intends to assign the record dose on the basis of the personnel monitoring badge results that are yet available.

9.B. Place an "X" in either Routine or PSE. Choose "Routine" if the data represent the results of monitoring for routine exposures. Choose "PSE" if the dose data represents the results of monitoring of planned special exposures received during the monitoring period. If more than one PSE was received in a single year, the licensee or registrant should sum them and report the total of all PSEs.

10.A. Enter the symbol for each radionuclide that resulted in an internal exposure recorded for the individual in the format "Xx-###x"; for instance, Cs-137 or Tc-99m.

10.B. Enter the lung clearance class as listed in Chapter 64E-5, Florida Administrative Code, "State of Florida Bureau of Radiation Control ALIs, DACs, and Effluent Concentrations," July 1993 (D, W, Y, V, or O for other) for all intakes by inhalation.

10.C. Enter the mode of intake. For inhalation, enter "H." For absorption through the skin, enter "B." For oral ingestion, enter "G." For injection, enter "J."

10.D. Enter the intake of each radionuclide in µCi.

11. Enter the deep dose equivalent (DDE) to the whole body.
12. Enter the lens dose equivalent (LDE) recorded for the lens of the eye, or "NR" for "Not Required" or "NC" for "Not Calculated."
13. Enter the shallow dose equivalent recorded for the skin of the whole body (SDE, WB), or "NR" for "Not Required" or "NC" for "Not Calculated."
14. Enter the shallow dose equivalent recorded for the skin of the extremity receiving the maximum dose (SDE, ME), or "NR" for "Not Required" or "NC" for "Not Calculated."
15. Enter the committed effective dose equivalent (CEDE), or "NR" for "Not Required" or "NC" for "Not Calculated."
16. Enter the committed dose equivalent (CDE) recorded for the maximally exposed organ, or "NR" for "Not Required" or "NC" for "Not Calculated."
17. Enter the total effective dose equivalent (TEDE). The TEDE is the sum of Items 11 and 15.
18. Enter the total organ dose equivalent (TODE) for maximally exposed organ. The TODE is the sum of Items 11 and 16.
19. COMMENTS. In the space provided, enter additional information that might be needed to determine compliance with limits. An example might be to enter the note that the SDE, ME was the result of exposure from a discrete hot particle. Another possibility would be to indicate that an overexposed report has been sent to the Agency in reference to the exposure report.
20. Signature of the person designated to represent the licensee or registrant.
21. Enter the date this form was prepared.

FLORIDA DEPARTMENT OF HEALTH

CUMULATIVE OCCUPATIONAL DOSE HISTORY

1. NAME (LAST, FIRST, M.I.)	2. IDENTIFICATION NUMBER	3. ID TYPE	4. SEX MALE ☐ FEMALE ☐	5. DATE OF BIRTH

6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE

19. SIGNATURE OF MONITORED INDIVIDUAL	20. DATE	21. CERTIFYING ORGANIZATION	22. SIGNATURE OF DESIGNEE	23. DATE

DOH Bureau of Radiation Control **Form DH-1623**, Edition 05/2001 (replaces previous editions)

Instructions for Completing DOH Form DH-1623 "Cumulative Occupational Dose History"

Note: This form is equivalent to NRC Form 4.

1. Type or print the full name of the monitored individual in the order of last name (include "Jr.", "Sr.", III", etc.), first name, and middle initial (if applicable).
2. Enter the individual's identification number, including punctuation. This number should be the 9-digit social security number (SSN). If the individual has no SSN, enter the number from another official identification such as a passport or work permit.
3. Enter the code for the type of identification used as shown below:

CODE	ID TYPE
SSN	U.S. Social Security No.
PPN	Passport No.
CSI	Canadian Social Insurance No.
WPN	Work Permit No.
PADS	PADS Identification No.
OTH	Other

4. Check the box that denotes the sex of the individual being monitored.
5. Enter the date of birth of the individual being monitored, in the format MM/DD/YYYY.
6. Enter the monitoring period for which this report is filed. The format should be MM/DD/YYYY – MM/DD/YYYY.
7. Enter the name of the licensee, registrant, or facility not licensed by the department.
8. Enter the department license or registration number(s).
9. Place an "X" in Record, Estimate or No Record. Choose "Record" if the dose data listed represents a final determination of the dose received to the best of the licensee's or registrant's knowledge. Choose "Estimate" only if the listed dose data are preliminary and will be superseded by a final determination resulting in subsequent record. An example of such an instance would be dose data based on self-reading dosimeter results and the licensee/registrant intends to assign the record dose on the basis of the personnel monitoring badge results that are yet available.
10. Place an "X" in either Routine or PSE. Choose "Routine" if the data represent the results of monitoring for routine exposures. Choose "PSE" if the dose data represents the results of monitoring of planned special exposures received during the monitoring period. If more than one PSE was received in a single year, the licensee or registrant should sum them and report the total of all PSEs.
11. Enter the deep dose equivalent (DDE) to the whole body.
12. Enter the lens dose equivalent (LDE) recorded for the lens of the eye, or "NR" for "Not Required" or "NC" for "Not Calculated."
13. Enter the shallow dose equivalent recorded for the skin of the whole body (SDE, WB), or "NR" for "Not Required" or "NC" for "Not Calculated."
14. Enter the shallow dose equivalent recorded for the skin of the extremity receiving the maximum dose (SDE, ME), or "NR" for "Not Required" or "NC" for "Not Calculated."
15. Enter the committed effective dose equivalent (CEDE), or "NR" for "Not Required" or "NC" for "Not Calculated."
16. Enter the committed dose equivalent (CDE) recorded for the maximally exposed organ, or "NR" for "Not Required" or "NC" for "Not Calculated."
17. Enter the total effective dose equivalent (TEDE). The TEDE is the sum of Items 11 and 15.
18. Enter the total organ dose equivalent (TODE) for maximally exposed organ. The TODE is the sum of Items 11 and 16.
19. Signature of the monitored individual, which indicates that the information contained in the form is complete and correct to the best of his or her knowledge.
20. Enter the date this form was signed by the monitored individual.
21. [OPTIONAL]. Enter the name of the licensee, registrant, or facility not licensed by the department, providing monitoring for exposure to radiation (such as a DOE facility) or the employer if the individual is not employed by the licensee or registrant and the employer chooses to maintain exposure records for its employees.
22. [OPTIONAL]. Signature of the person designated to represent the licensee, registrant or employer entered in Item 21. The licensee, registrant or employer who chooses to countersign the form should have on file documentation of all the information on the Form DH-1623 being signed.
23. [OPTIONAL]. Enter the date this form was signed by the designated representative.

INDIVIDUAL DOSIMETER LOG

Employee Information	
Name:	**PM Badge No.:**

Monitoring Period		
Year:	**Month:**	**Quarter:**

Dosimeter Readings (mR)															
Monday		**Tuesday**		**Wednesday**		**Thursday**		**Friday**		**Saturday**		**Sunday**		**Weekly Total**	
													Total for Month:		

Total for 1st Month of This Quarter:	**mrem**	**Total for This Month:**	**mrem**
Total for 2nd Month of This Quarter:	**mrem**	**Total for This Quarter:**	**mrem**
Total for 3rd Month of This Quarter:	**mrem**	**Total for This Year:**	**mrem**

Notify RSO if dose approaches or exceeds either the monthly or quarterly IELs listed below.

Investigational Exposure Levels (IELs)	
Month	**Quarter**
300 mrem	600 mrem

Annual Occupational Exposure Levels		
Whole Body	**Skin & Extremities**	**Lens of Eye**
5,000 mrem	50,000 mrem	15,000 mrem

I certify that the above records are accurate and complete.	
Employee Signature	Date log turned in to RSO

I certify that the above records have been reviewed and appropriate actions have been taken in accordance with the company's radiation safety program and applicable regulatory requirements.	
RSO Signature:	Date:

ANNUAL DOSIMETRY LOG

Employee Information	
Name:	**PM Badge No.:**

Dosimetry Results for Year –

Pocket Dosimeter Reading Totals			
January	**mR**		
February	**mR**	**1st**	
March	**mR**	**Quarter:**	**mR**
April	**mR**		
May	**mR**	**2nd**	
June	**mR**	**Quarter:**	**mR**
July	**mR**		
August	**mR**	**3rd**	
September	**mR**	**Quarter:**	**mR**
October	**mR**		
November	**mR**	**4th**	
December	**mR**	**Quarter:**	**mR**

Total:	**mR**

PM Badge Totals			
January	**mrem**		
February	**mrem**	**1st**	
March	**mrem**	**Quarter:**	**mrem**
April	**mrem**		
May	**mrem**	**2nd**	
June	**mrem**	**Quarter:**	**mrem**
July	**mrem**		
August	**mrem**	**3rd**	
September	**mrem**	**Quarter:**	**mrem**
October	**mrem**		
November	**mrem**	**4th**	
December	**mrem**	**Quarter:**	**mrem**

Total:	**mrem**

Investigational Exposure Levels (IELs)	
Month	**Quarter**
300 mrem	600 mrem

Annual Occupational Exposure Levels		
Whole Body	**Skin & Extremities**	**Lens of Eye**
5,000 mrem	50,000 mrem	15,000 mrem

I certify that the above records have been reviewed and appropriate actions have been taken in accordance with the company's radiation safety program and applicable regulatory requirements.	
RSO Signature:	Date:

INSTRUCTIONS FOR WOMEN WORKING WITH RADIATION

I have received instructions concerning the potential risks for pregnant women exposed to radiation, including a copy of U.S. Nuclear Regulatory Commission Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure" (Rev. 3, 6/99). A declaration of pregnancy is voluntary, must be in writing, and must include the estimated date of conception.

I am aware that the radiation safety officer (RSO) is available to answer any questions I may have regarding risks associated with radiation exposures during pregnancy. The RSO has encouraged me to request additional information if needed.

_____

Signature

_____

Printed Name

_____

Date

_____ _____

RSO Signature Date

DECLARATION OF PREGNANCY

To: _____

In accordance with Florida regulations, section 64E-5.311, Fla. Administrative Code ("Dose to an Embryo or Fetus"), I am declaring that I am pregnant. I believe that I became pregnant in

_____ _____
Month Year

I understand that the radiation dose to my embryo/fetus during my entire pregnancy will not be allowed to exceed 500 millirem (unless that dose has already been exceeded between the time of conception and submitting this declaration). I also understand that meeting the lower dose limit may require a change in job or job responsibilities during my pregnancy.

_____
Signature

_____
Printed Name

_____
Date

INSTRUCTIONS FOR DECLARED PREGNANT WOMEN

I have received verbal instructions on personnel monitoring (PM) requirements for declared pregnant women conducting activities involving sources of radiation, in accordance with the requirements of my employer's radiation safety program, the terms and conditions of the radioactive materials license (and/or certification of registration, as applicable), and Chapter 64E-5, Florida Administrative Code.

I have been instructed to always wear my assigned PM badge at waist level to estimate the embryo/fetus dose. I am aware that the fetal dose is not allowed to exceed 500 millirem during the entire pregnancy as a result of occupational radiation exposures (unless that dose has already been exceeded between the time of conception and submitting my declaration of pregnancy), and that meeting the lower dose limit may require a change in job or job responsibilities during my pregnancy. I must make every effort to maintain the fetal dose as low as reasonably achievable (ALARA), and I am also aware that the Florida Bureau of Radiation Control recommends that an embryo/fetus not receive more than 50 millirem in any one month. I understand that records of fetal dose will be maintained with my occupational dose records.

The radiation safety officer has encouraged me to ask for additional information if needed, and to review information on risks associated with concerning the potential risks involved for pregnant women exposed to radiation, particularly U.S. Nuclear Regulatory Commission Regulatory Guide 8.13.

_____

Signature

_____

Printed Name

_____

Date

_____ _____

RSO Signature Date

SOURCE MOVEMENT LOG

EXPOSURE DEVICE/SOURCE CHANGER
MANUFACTURER & MODEL:
DEVICE SERIAL NO.:

SEALED SOURCE	
MANUFACTURER & MODEL:	SERIAL NO.:
ISOTOPE:	ACTIVITY (on date of receipt): Curies

DATE OUT	CLIENT	LOCATION	DATE IN	RADIOGRAPHER ID NO.	RADIOGRAPHER SIGNATURE	RADIOGRAPHER INITIALS	ACTIVITY (Ci)	REFERENCE SURVEY (mR/hr)
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:
					OUT:	IN:		OUT: IN:

Source Leak Test Date:

Source Leak Test Due Date:

SOURCE MOVEMENT LOG – X-RAY MACHINE

X-RAY MACHINE SPECIFICATIONS		
MANUFACTURER:		MODEL NO.:
MAX: VOLTAGE (kVp):	MAX. AMPERAGE (mA):	SERIAL NO.:

DATE OUT	JOB/CLIENT	LOCATION	DATE IN	RADIOGRAPHER SIGNATURE	RAD. INITIALS
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:
				OUT:	IN:

DAILY SURVEY REPORT

DATE: _____ CLIENT: _____ LOCATION: _____

RADIOGRAPHER: _____ BADGE NO.: _____ RATEMETER SN: _____

DOSIMETER SN: _____ PD READINGS: START: _____ END: _____ TOTAL: _____ mR

RAD./RAD. ASST.: _____ BADGE NO.: _____ RATEMETER SN: _____

DOSIMETER SN: _____ PD READINGS: START: _____ END: _____ TOTAL: _____ mR

RAD./RAD. ASST.: _____ BADGE NO.: _____ RATEMETER SN: _____

DOSIMETER SN: _____ PD READINGS: START: _____ END: _____ TOTAL: _____ mR

CAMERA MODEL: _____ CAMERA SN: _____ X-RAY MACHINE SN: _____

SOURCE MODEL: _____ SOURCE SN: _____ SOURCE ACTIVITY: _____ Ci

SURVEY METER MODEL: _____

SURVEY METER SN: _____

SM CAL. DATE: _____

SURVEY METER MODEL: _____

SURVEY METER SN: _____

SM CAL. DATE: _____

INITIAL REFERENCE SURVEY: _____ mR/hr

FINAL REFERENCE SURVEY: _____ mR/hr

AREA SURVEYS

____ mR/hr @ ____ ft.

ABOVE: _____ mR/hr

____ mR/hr @ ____ ft.

____ mR/hr @ ____ ft.

____ mR/hr @ ____ ft.

BELOW: _____ mR/hr

TOTAL EXPOSURE TIME: _____

ACCESS CONTROLS

- ☐ SIGNS
- ☐ BARRICADE ROPE/TAPE
- ☐ DIRECT SURVEILLANCE
- ☐ AUDIO/VISUAL ALARM OPERATIONAL
- ☐ OTHER: _____

_____

VEHICLE SURVEYS

DRIVER COMPARTMENT: _____ mR/hr

VEHICLE EXTERIOR: _____ mR/hr

☐ RADIOGRAPHIC & SAFETY EQUIPMENT INSPECTED PER OPERATING PROCEDURES

RADIOGRAPHER'S SIGNATURE: _____

– DAILY EQUIPMENT CHECKLIST –

Inspect radiographic equipment after removal from storage & again before use.
If satisfactory, check box by item. Report any equipment problems to the RSO.

Survey Meters

Serial No.:	Serial No.:	Serial No.:
☐ Calibration Check	☐ Calibration Check	☐ Calibration Check
☐ Visual Check	☐ Visual Check	☐ Visual Check
☐ Battery Check	☐ Battery Check	☐ Battery Check
☐ Source Check	☐ Source Check	☐ Source Check

Alarm Ratemeters

SN:	☐ Cal. Check	☐ Visual Check	☐ Batt. Check	☐ Function Check
SN:	☐ Cal. Check	☐ Visual Check	☐ Batt. Check	☐ Function Check
SN:	☐ Cal. Check	☐ Visual Check	☐ Batt. Check	☐ Function Check

Radiography Camera & Associated Equipment

Projector

- ☐ All labeling visible and legible:
  - Trefoil radiation symbol and CAUTION (or DANGER) RADIOACTIVE MATERIAL warning
  - Camera manufacturer name, model and serial no.
  - Source ID tag (lists manufacturer, model/serial no., isotope & date/activity when loaded)
  - Company name, address and phone number
- ☐ Selector ring & lock plunger operate easily
- ☐ Source outlet shipping plug screw & nut turn freely & threads undamaged
- ☐ Overall condition of projector acceptable

Outer Drive Cable & Drive Control Unit (Crank)

- ☐ Cable free of cuts, breaks & broken fittings
- ☐ ~1 ft. of outer drive cable next to male connector free of excessive/uneven wear, fraying, unraveling, nicks, kinks, bends; no loss of flexibility (abnormal stiffness), dirt/grit
- ☐ Optional check for QSA Global, Inc. cameras: Male connector ball: with Model 550 No-Go gauge, ball connector ***will not go*** into gauge hole & ball connector shank ***will not go*** into small gauge notch
- ☐ Crank unit: no signs of damage/loose hardware; controls: freedom of drive cable movement
- ☐ Connections are tight & free of breaks/bends

Source Connector & Guide Tube

- ☐ Source connector: spring-loaded safety latch opens smoothly & snaps back into position when opened & released; Optional check for QSA Global, Inc. cameras: Model 550 No-Go gauge ***will not go*** into drive cable connector slot; connect drive cable to source connector & check gap with gauge; gauge ***will not go*** in gap between male & female connection
- ☐ Guide tube free of crimps, deformed threads, obstructions or cuts in sheath

Storage/Transport Container

- ☐ Container & fasteners are undamaged & container has not been modified in a manner that would compromise its integrity & compliance with regulatory requirements
- ☐ Container labels are present and legible

BILL OF LADING

Date: _____

Shipper: _____

Address: _____

RQ, Radioactive Material, Type B(U) Package
Hazard Class 7, Special Form, UN2916
USA/9283/B(U)-85

Package contains:

Radionuclide:

_____

_____ **TBq (** _____ **Ci)**

RADIOACTIVE YELLOW II Label

Transport Index (TI) =

_____

EMERGENCY RESPONSE INFORMATION
PHONE NO.:

_____

EMERGENCY RESPONSE INFORMATION

POTENTIAL HAZARDS

1) IMMEDIATE HAZARDS TO HEALTH

- External radiation hazard from unshielded radioactive material.
- Potential internal radiation hazard from inhalation, ingestion, or breaks in skin, but only if special form capsule is breached.
- Radioactive material; degree of hazard will vary greatly, depending on type and quantity of radioactive material.
- Materials in special form or in Type B packaging are not expected to cause contamination in accidents.

2) FIRE OR EXPLOSION

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

EMERGENCY ACTION

3) IMMEDIATE PRECAUTIONS

- Isolate hazard area to at least a 150 foot radius and restrict access; greater distances may be necessary if advised by the qualified Radiation Control Authority.
- Enter hazard area only to save life; limit entry to shortest possible time.
- Emergency response actions may be performed prior to any measurement of radiation.
- Notify local authorities and Radiation Control Authority of accident conditions.
- Detain uninjured persons, isolate equipment with suspected contamination, and delay cleanup until instruction from the Radiation Control Authority.

4) FIRE

- Do not move damaged containers; move undamaged containers out of fire zone.
- Fight fire from maximum distance.
- Small fire: Dry chemical, CO2, Halon, water spray, or standard foam
- Large fire: 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 radioactive material.
- If not affecting injury, remove and isolate potentially contaminated clothing and shoes. Wrap victim in blanket before transporting.
- Except for the injured, detain persons exposed to radioactive material until arrival or instruction of the Radiation Control Authority.

RADIOACTIVE MATERIAL RECEIPT REPORT

Date of Receipt: _____ **Receipt Time:** _____

Location: _____ **Received From:** _____

Carrier: _____ **Received By:** _____
Signature

Packages containing radioactive material can only be opened by radiographic personnel wearing dosimetry & equipped with an operable, calibrated survey meter; refer to operating procedures for additional instructions.

RADIOGRAPHY CAMERA ☐ **SOURCE CHANGER ☐**

Manufacturer & Model No.	Serial No.	Rad Yellow II/III Labels (2)	Date of Last I&M	Date of Last Annual DU Leak Test
		Yes ☐ No ☐		

SEALED SOURCE

Manufacturer & Model No.	Serial No.	Isotope	Activity (Ci)	Date of Last Leak Test

Survey Meter Serial No.: SM Calibration Date:

☐ Radiation Response Check ☐ Battery Check ☐ Visual Check

Radiation Levels	• Survey package as soon as possible after receipt & no later than 3 hrs. after receipt if during normal work hours or not later than 3 hrs. from the beginning of the next working day if received after working hrs.	
• Highest reading at surface:	mR/hr	• **Notify FL BRC if > 200 mR/hr at surface**
• Highest reading @ 1 meter:	mR/hr	• **Notify FL BRC if > 10 mR/hr at 1 m)**

⮜⮜⮜ Notify RSO of presence of abnormal radiation levels anywhere on camera ⮞⮞⮞

SAT/UNSAT	
☐ ☐	Shipping papers (Bill of Lading/Dangerous Goods Declaration)
☐ ☐	Emergency response information
☐ ☐	Source decay chart/leak test certification
☐ ☐	Source size certificate
☐ ☐	No evidence of damage that could impair safe operation

ASSISTANT RADIOGRAPHER OJT RECORD – ISOTOPE RADIOGRAPHY

A prerequisite for qualification as a radiographer is on-the-job training (OJT) as an assistant radiographer. In addition to demonstrating the ability to perform industrial radiography safely under production conditions, OJT also allows experienced radiographers to share the knowledge they have acquired. Radiographers are required to instruct their assistants on the topics listed below while performing radiography, with special attention given to emergency procedures.

A. Introduction – Purpose of OJT

B. Company Organization

1. Levels of authority
2. Degrees of responsibility

C. Equipment

1. Radiography equipment
2. Safety equipment

D. Operating Procedures

1. Radiographic equipment operating procedures
2. Safety equipment operating procedures
3. Survey procedures
4. Area posting and control

E. Emergency Procedures

1. Unauthorized entries
2. Equipment malfunctions
3. Overexposures
4. Lost or damaged sources

F. Records Relating to Radiation Protection Program

1. Source decay curve charts
2. Source Movement Logs
3. Daily Survey Reports
4. Individual Dosimeter Logs
5. Annual Dosimetry Logs
6. Receipt, shipping and disposal records
7. Leak test records
8. Calibration records
9. Quarterly inventory records
10. Equipment inspection & maintenance forms

The above subjects were addressed during at least 320 hours of isotope radiography OJT for:

_____

conducted from: _____ to: _____

_____ _____

Asst. Radiographer Signature RSO Signature

ASSISTANT RADIOGRAPHER OJT RECORD – X-RAY RADIOGRAPHY

A prerequisite for qualification as a radiographer is on-the-job training (OJT) as an assistant radiographer. In addition to demonstrating the ability to perform industrial radiography safely under production conditions, OJT also allows experienced radiographers to share the knowledge they have acquired. Radiographers are required to instruct their assistants on the topics listed below while performing x-radiography, with special attention given to emergency procedures.

A. Introduction – Purpose of OJT

B. Company Organization

1. Levels of authority
2. Degrees of responsibility

C. Equipment

1. Radiography equipment
2. Cabinet systems
3. Safety equipment

D. Operating Procedures

1. X-ray machine operating procedures
2. Safety equipment operating procedures
3. Survey procedures
4. Area posting & control

E. Emergency Procedures

1. Unauthorized entries
2. Equipment malfunctions
3. Overexposures

F. Records Relating to Radiation Protection Program

1. Source Movement Logs
2. Daily Survey Reports
3. Individual Dosimeter Logs
4. Annual Dosimetry Logs
5. Calibration records
6. Quarterly inventory records
7. Equipment inspection & maintenance forms

The above subjects were addressed during at least 200 hours of x-ray radiography OJT for:

_____

conducted from: _____ to: _____

_____ _____

Asst. Radiographer Signature RSO Signature

PERFORMANCE AUDIT FORM

DATE: _____ LOCATION: _____

AUDITOR NAME/TITLE: _____
Signature

WORKER NAME/TITLE: _____
Signature

WORKER NAME/TITLE: _____
Signature

WORKER NAME/TITLE: _____
Signature

RSO REVIEW DATE: _____ _____
RSO Signature (N/A if RSO performed audit)

MANAGEMENT REVIEW DATE: _____ _____
Management Representative Signature

	SAT.	UNSAT.
DOSIMETRY		
• Assigned PM badge, pocket dosimeter(s) & alarm ratemeter worn on front of torso	☐	☐
• Pocket dosimeter(s) zeroed at start of shift & re-zeroed if indicator reaches 3/4 scale	☐	☐
• Function test performed on alarm ratemeter at start of shift	☐	☐
• Pocket dosimeter(s) & alarm ratemeter calibrated within past 12 months & bear calibration labels (or calibration records available on site)	☐	☐
SURVEY METERS		
• At least one calibrated & operable meter in use, & cal./op. backup meter on site (recommended: two meters in use, with third meter available on site as back-up)	☐	☐
• Four meter checks (cal., visual, battery & rad. response) performed at start of shift	☐	☐
RADIOGRAPHIC EQUIPMENT		
• Camera radiation levels match reference survey results recorded in Daily Survey Report	☐	☐
• Camera labels legible, visible & complete	☐	☐
• Daily equipment checks performed per operating procedures/manufacturer instructions	☐	☐
• Camera & associated equipment show no signs of modification or damage	☐	☐
TRANSPORTATION		
• Dosimetry worn & survey meter kept with driver during transport	☐	☐
• Shipping papers (Bill of Lading) available & properly completed	☐	☐
• Emergency Response Information (ERI) available & kept with Bill of Lading	☐	☐
• Bill of Lading & ERI kept within arm's length of driver during transport	☐	☐
• Rad. levels < 2 mR/hr in driver compartment & on all exterior vehicle surfaces	☐	☐
• Transport container properly marked & labeled (two completed Rad. Yellow II labels, rad. symbol, Caution – RAM – Do Not Handle – Notify Civil Authorities/company)	☐	☐
• Transport container properly blocked & braced to prevent movement	☐	☐
• Transport container double-locked to prevent theft or tampering	☐	☐
• Post-transport surveys of transport container & camera performed	☐	☐

REMARKS:

PERFORMANCE AUDIT FORM

	SAT.	UNSAT.
SAFE WORK PRACTICES DURING RADIOGRAPHIC OPERATIONS		
• Site conditions evaluated & protective measures taken to ensure safe operations (ex.: lighting, scaffolding, electrical/fire/explosive/chemical/low O_2 hazards, etc.)	☐	☐
• OSHA-approved safety equipment appropriate to site properly worn & used (ex.: hardhat, eye & ear protection, steel-toe boots, safety harness/lanyards, etc.)	☐	☐
• 2 mR/hr isodose perimeter properly established with rope/tape	☐	☐
• Survey of 2 mR/hr isodose perimeter matches results recorded on Daily Survey Report	☐	☐
• 2 mR/hr isodose perimeter properly posted with Caution – Radiation Area signs	☐	☐
• 100 mR/hr isodose line properly posted w/ Caution (or Danger) – High Rad. Area signs	☐	☐
• Restricted area perimeter properly monitored to prevent unauthorized access	☐	☐
• Collimator used whenever practical & guide tube positioned without sharp bends	☐	☐
• After each exposure, crew verifies source is properly secured in shielded position per manufacturer & regulatory requirements (4 steps: listen for lock engaging, turn crank handle back 1/4 turn to verify lock has engaged, perform full survey of camera & guide tube, concluding with reference survey, visually verify that safety tab is visible)	☐	☐
• Time/distance/shielding used as practical to keep doses ALARA (minimize time spent near source, maximize distance from source, use available shielding)	☐	☐
• Crew changes duties as practical to prevent one worker from receiving majority of dose	☐	☐
• Camera kept locked when not under direct surveillance of radiographic personnel	☐	☐
• At end of operations, equipment properly disassembled and secured in transport case	☐	☐
• Knowledge of emergency procedures demonstrated	☐	☐
RADIOGRAPHY AT PERMANENT RADIOGRAPHIC INSTALLATION		
• Visible/audible alarm system tested at beginning of shift & documented in DSR	☐	☐
• Positive control over entrance maintained during radiographic operations	☐	☐
RAM STORAGE AREA		
• Storage container posted with Caution (or Danger) – Radioactive Material(s) sign	☐	☐
• Radiation levels are < 2 mR/hr at exterior surfaces of RAM storage area	☐	☐
• When in storage, camera is locked & at least 2 more locks used to prevent access	☐	☐
RECORDS		
• Current FL rad. control regs (Chapter 64E-5, F.A.C., Parts I – IV, IX & XV)	☐	☐
• Current copy of radioactive materials license (or registration cert. for x-ray machine)	☐	☐
• Current operating & emergency procedures	☐	☐
• Current leak test label/tag/record for source & camera's depleted uranium shielding	☐	☐
• Calibration labels/records for survey meters, dosimeters & alarm ratemeters	☐	☐
• Radiographer certification card (isotope/x-ray or combination cert., as applicable)	☐	☐
• Daily Survey Report available & properly completed	☐	☐
• Source Movement Log (if source stored overnight) available & properly completed	☐	☐
• Individual Dosimeter Log up-to-date for each worker (recommended)	☐	☐

REMARKS:

INVENTORY OF RADIOGRAPHIC EQUIPMENT

Company: _____ **License No.:** _____ **Date of Inventory:** _____

Performed by: **RSO (or designee) Signature:**

#	DEVICE MANUFACTURER & MODEL NO.	DEVICE SERIAL NO.	SOURCE MANUFACTURER	SOURCE SERIAL NO.	ISOTOPE & ACTIVITY	LOCATION	CONDITION

NOTE: Quarterly inventories must include all regulated radiation sources, including sealed sources, radiography cameras, source changers calibrators and x-ray machines.

RADIOGRAPHIC EQUIPMENT I&M FORM

Date of I&M: ____________ **I&M Performed by:** ______________________________
Signature

RSO (or RSO Designee): ______________________________ **Date:** ____________
Signature

I. Survey Meters

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Model:	Serial No.:
SAT/UN SAT ☐ ☐ Calibration Check	Notes:
☐ ☐ Visual Check	
☐ ☐ Battery Check	
☐ ☐ Source Check	

Notes:

RADIOGRAPHIC EQUIPMENT I&M FORM

II. Radiography Camera & Associated Equipment

Radiographic Exposure Device				
Camera Manufacturer/Model	Camera Serial No.	Source Manufacturer/Model	Source Serial No.	Activity (Ci)

SAT/UNSAT

☐ ☐ No abnormal radiation levels anywhere on camera

- Highest reading at surface: mR/hr • Notify FL BRC if > 200 mR/hr at surface
- Highest reading @ 1 meter: mR/hr • Notify FL BRC if > 10 mR/hr at 1 m)

☐ ☐ General condition of exterior surfaces (clean with cloth and mild cleansing solution)

☐ ☐ Condition of safety plugs (clean as necessary)

☐ ☐ Operation of locking mechanism/plunger/selector ring/source position indicator

☐ ☐ Condition of pigtail connector

☐ ☐ Condition of carrying features (straps, handle, etc.)

☐ ☐ Proper and legible labeling

- Trefoil radiation symbol and CAUTION (or DANGER) RADIOACTIVE MATERIAL warning
- Camera manufacturer name, model and serial no.
- Source isotope (i.e., Ir-192), manufacturer name, model no., serial no., activity when loaded and date loaded)
- Company name, address and phone number

Notes:

Control Cables & Drive Mechanisms

SAT/UNSAT

☐ ☐ Proper drive mechanism with camera

☐ ☐ General condition of exterior surfaces (clean with cloth and mild cleansing solution)

☐ ☐ Changes in general operating characteristics

☐ ☐ Condition of connector on drive cable

☐ ☐ Drive cable flexibility, wear and rust

☐ ☐ No excessive wear or damage to crank assembly parts

☐ ☐ No damage to drive cable conduit that could prevent cable from moving freely

☐ ☐ Proper connector mating between drive cable and pigtail (source assembly)

☐ ☐ No evidence of radioactive contamination (verify with survey)

Notes:

II. Radiography Camera & Associated Equipment (contd.)

Guide Tube	
SAT/UNS AT	
☐ ☐	General condition of exterior surfaces (clean with cloth and mild cleansing solution)
☐ ☐	Damage (e.g., crimps, deformed threads, obstructions or cuts in sheath (cable conduit) that could prevent cable from moving freely
☐ ☐	Drive cable flexibility, wear and rust
☐ ☐	Condition of source tube connector
☐ ☐	Condition of source stop
☐ ☐	Interior rust, dirt, or sludge buildup (clean as needed)
☐ ☐	No evidence of radioactive contamination (verify with survey)

Notes:

III. X-Ray Machine

Manufacturer/Model:	Serial No.:	Max. Voltage (kVp)	Max. Amperage (mA):

SAT/UNS AT	
☐ ☐	Proper console with machine
☐ ☐	Legible required labeling of console • Trefoil radiation symbol • CAUTION – PRODUCES IONIZING RADIATION WHEN ENERGIZED or similar language
☐ ☐	General condition of exterior surfaces (clean with cloth and mild cleansing solution)
☐ ☐	Condition of carrying features (handle, etc.)
☐ ☐	Proper operation of locking mechanism
☐ ☐	Proper operation of timer run-down cutoff
☐ ☐	Wear of electrical cables and connectors
☐ ☐	High voltage cable (inspect & clean per RSM-14.8 instructions)
☐ ☐	Damage to tube head housing that might result in excessive radiation levels
☐ ☐	Change in the general operating characteristics of the unit

Notes:

RADIOGRAPHIC EQUIPMENT I&M FORM

IV. Storage/Transport Container
Container Manufacturer/Model:
Container Design/Description:

USDOT Package Type (check boxes that apply):

Type A ☐ Type B ☐ Overpack ☐ Strong/Tight Package ☐

SAT/UNSAT	
☐ ☐	General condition of exterior surfaces (clean with cloth and mild cleansing solution)
☐ ☐	Operation of locking mechanism
☐ ☐	Condition of hardware (hinges, braces, bolts, rings, etc.)
☐ ☐	Condition of carrying features (straps, handle, etc.)
☐ ☐	Proper and legible labels for overpacks • Trefoil radiation symbol • CAUTION (or DANGER) RAM – DO NOT HANDLE – NOTIFY CIVIL AUTHORITIES (or NDE) • Manufacturer name, model and serial no. (if available; not required) • If used as overpack: INNER PACKAGE COMPLIES WITH PRESCRIBED SPECIFICATIONS

Notes:

Source Changer

Changer Manufacturer/Model	Serial No.	Source Manufacturer/Model	Serial No.	Activity (Ci)

SAT/UNSAT		
☐ ☐	No abnormal radiation levels anywhere on changer	
	• Highest reading at surface: mR/hr	• Notify FL BRC if > 200 mR/hr at surface
	• Highest reading @ 1 meter: mR/hr	• Notify FL BRC if > 10 mR/hr at 1 m)
	Note: depleted uranium shielding will produce 1 – 2 mR/hr at surface	
☐ ☐	General condition of exterior surfaces (clean with cloth and mild cleansing solution)	
☐ ☐	Condition of safety plugs (clean as necessary)	
☐ ☐	Proper operation of locking mechanism	
☐ ☐	Condition of pigtail connectors	
☐ ☐	Condition of carrying features (handle, etc.)	
☐ ☐	Proper and legible labeling • Trefoil radiation symbol and "CAUTION (or DANGER) RADIOACTIVE MATERIAL" warning • Changer manufacturer name, model and serial no. • Source isotope, manufacturer name, model & serial no., activity when loaded and date loaded)	

Notes:

ANNUAL RADIATION PROTECTION PROGRAM/ALARA AUDIT

I. INTRODUCTION

This form documents performance of the annual radiation safety program (RSP) audit required by subsection 64E-5.303(3) and paragraph 64E-5.432(4)(c), Florida Administrative Code (F.A.C.). The audit consists of a review of the RSP's content and implementation, and an evaluation of its effectiveness in complying with regulatory requirements and keeping radiation doses to workers and the general public as low as reasonably achievable (ALARA). Records of annual audits are maintained on file for at least 3 years beyond the date of the audit for inspection by the Florida Bureau of Radiation Control (FL BRC).

License Name: _____

License No.: _____ Date of Audit: _____

Auditor: _____
Name & Title

_____
Signature

Management Representative: _____
Name & Title

_____
Signature

AUDIT HISTORY

A. Last RSP/ALARA audit conducted on (date): _____

B. Any deficiencies noted? Yes _____ No _____

C. Were corrective actions taken? Yes _____ No _____ N/A _____

D. Describe prior deficiencies, corrective actions taken, and current status of corrective actions:

_____

_____

_____

_____

_____

_____

ANNUAL RADIATION PROTECTION PROGRAM/ALARA AUDIT

III. INDEPENDENT AUDITS/INSPECTIONS

A. Any independent audits/inspections conducted since last internal audit (e.g., consultant or FL BRC inspection)? Yes ____ No ____

B. Describe any deficiencies identified, corrective actions taken, and current status:

IV. ORGANIZATION AND SCOPE OF PROGRAM

A. Current RSP organization matches description in license (if not, amend license to reflect changes in organizational structure; e.g., new RSO)? Yes ____ No ____

B. Management actively involved in RSP and oversight of RSO activities? Yes ____ No ____

C. RSO provided sufficient time and support to fulfill responsibilities? Yes ____ No ____

D. Has RSO been able to fulfill duties on a timely basis? Yes ____ No ____
If no, describe hindrances limiting RSO's ability to fulfill duties:

E. Has scope of operations covered by RSP changed (new equipment, increased no. of personnel, etc.)? If so, describe: Yes ____ No ____

F. All temporary job sites (TJS) meet regulatory definition (serve only one contract, active for less than 2 years); if not, submit application for a separate license for job sites failing TJS criteria Yes ____ No ____

V. FACILITIES AND EQUIPMENT

A. Tampa facility correctly described in license (i.e., any changes impacting radiographic operations have been submitted to and approved by FL BRC)? Yes ____ No ____

B. Facility's RAM storage area adequate to hold all authorized RAM? Yes ____ No ____

C. Explosion and fire risks evaluated and addressed to minimize hazard? Yes ____ No ____

V. FACILITIES AND EQUIPMENT *(contd.)*

D. Shooting cell satisfies requirements for a perm. radiographic installation – (adequate shielding, functioning visible/audible alarm, with visible alarm activating if source is exposed & audible alarm activating if door is opened when source is exposed, locking door allows escape from inside)? Yes ____ No ____

E. Company registered with the NRC as a Type B package user for all Type B models in use, and documentation of registration on file? Yes ____ No ____

VI. POSTING AND LABELING

A. Following documented posted at permanent facility:

1. Emergency procedures Yes ____ No ____

2. FL BRC "Notice to Employees" form (3/01 edition) Yes ____ No ____

3. FL BRC Notice of Violations (NOVs) posted within 5 working days after receipt, & responses to NOV posted within 5 working days after dispatch; all posted at least 5 days or until corrective actions completed Yes ____ No ____

4. Other documents listed in 64E-5.901(1), F.A.C. posted, unless posted notice identifies where documents can be viewed Yes ____ No ____

B. Above documents posted in conspicuous location(s) to permit workers to observe them on way to/from work? Yes ____ No ____

C. Radiation signs

1. "Caution (or Danger), Radioactive Material" sign(s) posted at permanent facility & job sites where RAM is stored? Yes ____ No ____

2. "Caution (or Danger), Radiation Area" signs posted? Yes ____ No ____ N/A ____

D. Rad. cameras bear legible labels (rad. symbol, "Caution (or Danger), RAM – Do Not Handle – Notify Civil Authorities (or company)" warning, camera man., model & serial no., source man., model no., serial no., isotope, & activity when loaded & date loaded, & co. name, address & phone no.)? Yes ____ No ____

E. Storage/transport containers & source changers bear legible labels (rad. symbol, "Caution (or Danger), RAM" warning, camera manufacturer, model & serial no., source man., model no., serial no., isotope, & activity when loaded & date loaded, & company name, address & phone no.)? Yes ____ No ____

F. X-ray machines bear legible labels (radiation symbol, "Caution – Produces Ionizing Radiation When Energized" or similar language)? Yes ____ No ____

ANNUAL RADIATION PROTECTION PROGRAM/ALARA AUDIT

VII. SECURITY

A. RAM kept locked (with at least two locks used) and secured against unauthorized access/removal when not under direct surveillance? Yes ____ No ____

B. Minimum of two locks used to prevent access to radiographic devices? Yes ____ No ____

C. Camera, vault & x-ray machine keys controlled by authorized personnel? Yes ____ No ____

D. Extra precautions used to deter theft (e.g., concealing cameras from view during transport/storage, maintaining elevated level of awareness in high crime areas)? Yes ____ No ____

VIII. COMPLIANCE WITH PUBLIC DOSE LIMITS

A. Public dose compliance study submitted to & approved by FL BRC? Yes ____ No ____

B. Have licensed activities changed during the year to increase potential for public dose limits being exceeded? Yes ____ No ____

C. If yes to B., has study been updated to demonstrate compliance with public dose limits is still being achieved? Yes ____ No ____

IX. TRAINING, CERTIFICATION AND INTERNAL AUDITS

A. Rad. safety training/audit procedures unchanged since approved by state? Yes ____ No ____

If no, describe changes: _____

B. All radiation workers have received rad. awareness/instructions to workers training per 64E-5.902, F.A.C.? Yes ____ No ____

C. All workers with duties affecting transportation safety have received USDOT hazmat employee training per 49 CFR? Yes ____ No ____

D. All radiographic personnel have been provided copies of required documents per 64E-5.434(1) and (2), F.A.C.? Yes ____ No ____

E. All rad. personnel have received radiation safety training per license? Yes ____ No ____

F. All radiographic personnel have received at least 8 hours of rad. safety refresher training annually? Yes ____ No ____

G. All radiographers certified? Yes ____ No ____

H. Field audits demonstrate workers' use of ALARA/safe work practices and compliance with procedures and regulatory requirements? Yes ____ No ____

X. PERSONNEL MONITORING (PM)

A. All radiographic personnel have assigned PM badges? Yes ____ No ____

B. PM badges worn properly by workers and protected from heat, light, moisture and chemicals when not being worn? Yes ____ No ____

C. PM badges stored with control badge in a protected location? Yes ____ No ____

D. Badges exchanged and processed in a timely fashion (i.e., sent to processor within 14 days of end of monitoring period)? Yes ____ No ____

E. Any badges lost or damaged? Yes ____ No ____

F. If yes to E., was RSO timely notified and record of worker's estimated dose provided to badge vendor and kept on file? Yes ____ No ____

G. Any spare badges assigned to workers since last RSP audit? Yes ____ No ____

H. If yes to G., were spare badges marked to identify workers they were assigned to, and badge vendor notified to add doses from spare badges to workers' occupational exposure totals? Yes ____ No ____

I. If yes to G. and spare badges used for newly hired workers, were assigned badges ordered and used during the next monitoring period? Yes ____ No ____

If no to I., describe why, and corrective measures taken to prevent recurrence:

_____

_____

J. If yes to E. and spare badge(s) used to replace lost/damaged badge(s), were incidents investigated and documented? Yes ____ No ____

If yes to J., describe investigation; if no, describe measures taken to prevent recurrence:

_____

_____

_____

K. Are dosimetry reports reviewed by RSO within 7 days of receipt? Yes ____ No ____

L. Cumulative Occupational Exposure History (FL DOH Form DH-1623 or equivalent) completed for each monitored worker? Yes ____ No ____

M. Annual Occupational Exposure Record (FL DOH Form DH-1622 or equivalent) completed for each monitored worker? Yes ____ No ____

N. Female workers advised on risks to embryo/fetus, provided instructions for declaring pregnancy and receipt of instructions documented? Yes ____ No ____ N/A ____

_____

_____

X. ***PERSONNEL MONITORING (PM)*** *(contd.)*

O. If female worker declared pregnancy, was declaration documented, workers provided instructions for limiting dose during pregnancy, and receipt of instructions documented? Yes ___ No ___ N/A ___

P. For declared pregnant workers, records kept that show embryo/fetus dose <50 mrem for gestation period? Yes ___ No ___ N/A ___

Q. Annual and termination reports provided to workers per 64E-5.903, F.A.C.? Yes ___ No ___

R. PM records reviewed from (*dates*): _____ to _____

1. Highest dose for a monitoring period: _____ mrem Date: _____

2. Highest dose for a quarter: _____ mrem Date: _____

3. Highest annual dose: _____ mrem Date: _____

S. Describe (or attach) results of review of PM badge results, including any corrective actions taken or planned to address program deficiencies:

T. Occupational exposures within regulatory limits? Yes ___ No ___

U. Any workers' doses exceed Investigational Exposure Levels (IELs) – 300 mrem/month or 600 mrem/quarter? Yes ___ No ___

If yes, describe (or attach description of) each IEL exceedence (worker name, title, dose & monitoring period), cause & corrective actions taken to prevent recurrence:

V. Do PM records indicate that worker doses are being kept ALARA? Yes ___ No ___

If no, describe corrective actions taken to minimize unnecessary doses:

XI. POCKET DOSIMETERS (PDs)

A. Adequate number of 0 – 200 R/hr range calibrated/operable PDs available? Yes ____ No ____

B. Adequate number of high-range cal./operable PDs available? Yes ____ No ____

C. Dosimeters calibrated at 12-month intervals? Yes ____ No ____

D. Dosimeters bear calibration labels and calibration records maintained? Yes ____ No ____

E. Dosimeters checked on days of use? Yes ____ No ____

F. Out-of-service dosimeters tagged or stored to prevent use? Yes ____ No ____ N/A ____

XII. ALARM RATEMETERS (ARMs)

A. Adequate number of calibrated/operable ARMs available? Yes ____ No ____

B. Ratemeters set to alarm at 500 mR/hr? Yes ____ No ____

C. Ratemeters calibrated at 12-month intervals and after repair? Yes ____ No ____

D. Ratemeters bear calibration labels and calibration records maintained? Yes ____ No ____

E. Ratemeters checked on days of use and receive quarterly I&M? Yes ____ No ____

F. Out-of-service ratemeters tagged or stored to prevent use? Yes ____ No ____ N/A ____

XIII. SURVEY METERS (SMs)

A. Adequate number of 0 – 1 R/hr range calibrated/operable SMs available? Yes ____ No ____

B. Meters calibrated at 6-month intervals and after repair? Yes ____ No ____

C. Meters bear calibration labels and calibration records maintained? Yes ____ No ____

D. Meters checked on days of use and receive quarterly I&M? Yes ____ No ____

E. Out-of-service meters tagged or stored to prevent use? Yes ____ No ____ N/A ____

XIV. PROCEDURES

A. Procedures compatible with current rules and approved by FL BRC? Yes ____ No ____

B. Procedures list correct phone numbers for RSO, FL BRC, NRC regional offices and Agreement State radiation control programs? Yes ____ No ____

C. RT crews take all required documents to field sites [64E-5.440(3), F.A.C.] and maintain copies of all required documents on site for duration of job? Yes ____ No ____

XV. TRANSPORTATION

A. RAM ordered, received and opened per procedures and 49 CFR? Yes ____ No ____

B. Only DOT-authorized transport containers used? Yes ____ No ____

C. Co. registered with NRC as a user of all Type B packages in use? Yes ____ No ____

D. Shipments to field sites and common carrier shipments performed in accordance with procedures and 49 CFR? Yes ____ No ____

E. Shipping papers kept on file for 375 days after shipment? Yes ____ No ____

XVI. GENERAL RULES OF USE/ALARA

A. Management/RSO emphasize to workers the importance of maintaining occupational radiation doses ALARA? Yes ____ No ____

B. Good work practices used by workers to minimize doses (i.e., time, distance, shielding, diligent use of survey meter, etc.)? Yes ____ No ____

XVII. MATERIAL RECEIPT AND ACCOUNTABILITY

A. RAM receipt and transfer/disposal records maintained to show “cradle to grave” accountability? Yes ____ No ____

B. RAM/x-ray machines physically inventoried at 3-month intervals? Yes ____ No ____

C. Inventory records document all information per 64E-5.440(1)(c), F.A.C.? Yes ____ No ____

XVIII. LEAK TESTING

A. Sources leak tested at 6-month intervals per 64E-5.440(1)(c), F.A.C.? Yes ____ No ____

B. Radiography cameras/source changers leak tested for DU contamination at 12-month intervals? (Note: DU LT requirement became effective 3/02) Yes ____ No ____

C. LT records include all required information [refer to 64E-5.440(1)(b), F.A.C.] and maintained on file? Yes ____ No ____

D. LT records include all information required by 64E-5.440(1)(b), F.A.C.? Yes ____ No ____

E. Any sources found leaking, and if so, was FL BRC notified? Yes ____ No ____

XIX. EQUIPMENT INSPECTION AND MAINTENANCE (I&M)

A. Copies of the manufacturer's operation/maintenance manuals maintained on file for reference? Yes ____ No ____

B. Radiographic equipment I&M performed quarterly per procedures and documented? Yes ____ No ____

C. Manufacturer's procedures referenced and followed during quarterly I&M, including use of recommended cleaners and lubricants? Yes ____ No ____

XX. RECORD-KEEPING, NOTIFICATIONS AND REPORTS

A. All required documents maintained at permanent facility for duration specified by Chapter 64E-5, F.A.C.? Yes ____ No ____

B. Did any incidents/emergencies occur since last audit? Yes ____ No ____

C. If yes to B., was the response appropriate? (i.e., workers followed emergency procedures, required notifications/reports timely filed, cause of incident investigated, corrective actions taken and documented) Yes ____ No ____ N/A ____

D. If no to C., describe what corrective actions taken or planned to address deficiencies:

XIX. AUDIT DEFICIENCIES AND CORRECTIVE ACTIONS

A. Summary of deficiencies identified by audit:

B. Description of corrective actions planned or taken:

C. Description of other recommendations for improvement:

16-Hour Radiation Safety Class

This course outline is used for initial training of assistant radiographers followed by on-the-job training & the 32-hour radiographer radiation safety training class

Subjects		Duration
I.	**Company Organization**	1 hr.
	A. Radiation control regulations (64E-5, F.A.C., 10 CFR and 49 CFR)	
	B. Radioactive materials license and certificate of registration	
	C. Radiation protection program organizational structure	
	D. Responsibilities of management and workers	
	E. Training requirements for radiographic personnel	
II.	**Radiation Awareness (General Awareness/Familiarization Training)**	2 hrs.
	A. Storage, transfer, and use of radiation sources	
	B. Health protection problems associated with radiation exposure	
	C. Reporting requirements for occupational radiation exposures	
III.	**Operating Procedures (Function-Specific Training)**	7 hrs.
	A. Use of personnel monitoring devices and survey meters	
	B. Inspection, maintenance and safe use of radiographic equipment	
	C. Transportation	
	D. Radiographic operations (isotope and x-ray), including ALARA principles	
	E. Leak testing, inventories and source exchanges	
	F. Instrument calibration	
	G. Record-keeping	
IV.	**Emergency Procedures (Safety Training)**	1 hr.
	A. Unauthorized entries	
	B. Lost/stolen sources	
	C. Equipment malfunctions/source disconnects	
	D. Notification & reporting requirements	
V.	**Practical (Hands-on) Training**	2 hrs.
	A. Use of personnel monitoring equipment and survey meters	
	B. Control of operations – signs, barricades and surveillance	
	C. Inspection, maintenance and use of radiographic and associated equipment	
	D. Emergency response	
	Review/Q&A Session	1 hr.
	Testing	1 hr.
	Exam Review	1 hr.
	Total:	**16 hrs.**

32-Hour Radiation Safety Class

This course outline is used for training provided following completion of the initial 16-hour assistant radiographer radiation safety training class and on-the-job training

Subjects	Duration	4 Day Class	3 Day Class
I. Fundamentals of Radiation Safety **A.** Characteristics of radiation **B.** Units of radiation dose **C.** Quantities of radioactivity **D.** Hazards of radiation exposure **E.** Radiation protection standards **F.** Radiation levels from sources of radiation **G.** Methods of minimizing radiation dose	10 hrs.	Day 1	Day 1
II. Safety Equipment **A.** Survey meters (use, operation, calibration and limitations) **B.** Use of personnel monitoring equipment	2 hrs.	Day 2	Day 2
III. Radiographic Equipment **A.** Design & operation of x-ray machines, radiography cameras, source assemblies, remote handling equipment, source changers, and storage/transport containers **B.** Storage, control and disposal of radioactive material **C.** Inspection and maintenance of equipment	8 hrs.	Day 3	
IV. Licensing and State/Federal Regulatory Requirements	3 hrs.		Day 3
V. Operating and Emergency Procedures	4 hrs.		
VI. Practical (Hands-on) Training	1 hr.	Day 4	
Review/Q&A Session	1 hr.		
Testing	2 hr.		Day 4
Exam Review	1 hr.		
Total:	**32 hours**		

40-Hour Radiation Safety Class

This course outline may be used for initial training of assistant radiographers in lieu of the 16-hour radiation safety training class

Subjects	Duration	5 Day Class	4 Day Class
I. Company Organization **A.** Radiation control regulations (64E-5, F.A.C., 10 CFR and 49 CFR) **B.** Radioactive materials license and certificate of registration **C.** Radiation protection program organizational structure **D.** Responsibilities of management and workers **E.** Training requirements for radiographic personnel	1 hr.	Day 1	Day 1
II. Fundamentals of Radiation Safety **A.** Storage, transfer, and use of radiation sources **B.** Characteristics of radiation **C.** Units of radiation dose **D.** Quantities of radioactivity **E.** Hazards of radiation exposure **F.** Radiation protection standards **G.** Radiation levels from sources of radiation **H.** Methods of minimizing radiation dose	9 hrs.		
III. Safety Equipment **A.** Survey meters (use, operation, calibration and limitations) **B.** Use of personnel monitoring equipment	4 hrs.	Day 2	Day 2
IV. Radiographic Equipment **A.** Design and operation of x-ray machines, radiography cameras, source assemblies, remote handling equipment, source changers and storage/transport containers **B.** Storage, control and disposal of radioactive material **C.** Inspection & maintenance of equipment	10 hrs.	Day 3	Day 3
V. Licensing and State/Federal Regulatory Requirements	2 hrs.	Day 4	
VI. Operating & Emergency Procedures	4 hrs.		
VII. Case Histories of Radiography Accidents	2 hrs.		Day 4
VIII. Practical (Hands-on) Training	3 hrs.	Day 5	
Review/Q&A Session	1 hrs.		
Testing	2 hrs.		
Exam Review	2 hrs.		
Total:	**40 hrs.**		

8-Hour Radiation Safety Review Class

This course outline is used to qualify as a radiographer following completion of the initial 40-hour training class for assistant radiographers and on-the-job training

Subjects		Duration
I.	**Fundamentals of Radiation Safety**	2 hrs.
II.	**Safety Equipment**	1 hr.
III.	**Radiographic Equipment**	1.5 hrs.
IV.	**Licensing and State/Federal Regulatory Requirements**	1/2 hr.
V.	**Operating and Emergency Procedures**	1 hr.
	Review/Q&A Session	1/2 hr.
	Testing	1 hr.
	Exam Review	1/2 hr.
	Total:	**8 hours**

RADIATION SAFETY TRAINING REFERENCE MATERIALS

The following materials may be used as references for radiation training of radiographic personnel.

- Company Radiation Safety Program manual (including O&E procedures)
- Chapter 64E-5, Florida Administrative Code, Parts I – IV, IX, XIII & XV
- Title 10, Code of Federal Regulations, Parts 2, 19, 20, 30, 34, 40, 71, 150, 170 & 171
- Title 29, Code of Federal Regulations, Part 1910
- Title 49, Code of Federal Regulations, Parts 171 – 173 & 177
- CRCPD Suggested State Regulations for the Control of Radiation, Part E
- General Dynamics Convair Division Vol. I – *Origin & Nature of Radiation*
  Vol. II – *Radiation Safety*
- *Gamma Radiation Study Guide* (American Society of Nondestructive Testing, 1999)
- *Gamma Radiography Radiation Safety Handbook* (QSA Global, Inc.)
- *Industrial Radiography Manual* (U.S. AEC/U.S. DHE&W, 1968)
- *Lessons Learned From Accidents in Industrial Radiography* (IAEA Safety Series No. 7, 1998)
- U.S. NRC NUREGs
  - NUREG/BR-0024 Working Safely in Gamma Radiography (1982)
  - NUREG/BR-0001 Case Histories of Radiography Events (1980)
  - NUREG-1405 Inadvertent Shipment of a Radiographic Source from Korea to Amersham Corporation, Burlington, Massachusetts (1990)
  - NUREG-1556, Vol. 2 Program-Specific Guidance About Industrial Radiography Licenses (1998)
  - NUREG-1631 Source Disconnects Resulting From Radiography Drive Cable Failures (1998)
- U.S. NRC videotape: Taking Control: Safety Procedures for Industrial Radiography (1994)
- U.S. NRC Reg. Guide 8.29 Instruction Concerning Risks From Occupational Radiation Exposure (1996)
- U.S. NRC Information Notices
  - IN 87-31 Blocking, Bracing and Securing of Rad. Materials Packages in Transportation (7/10/87)
  - IN 87-45 Recent Safety-Related Violations of NRC Requirements by Ind. Rad. Licensees (9/25/87)
  - IN 87-47 Transportation of Radiography Devices (10/5/87)
  - IN 88-66 Industrial Radiography Inspection and Enforcement (8/22/88)
  - IN 91-23 Accidental Rad. Overexposures to Personnel Due to IR Acces. Equip. Malfunctions (3/26/91)
  - IN 91-39 Compliance with 10 CFR Part 21, “Reporting of Defects and Noncompliance” (6/17/91)
  - IN 91-49 Enforcement of Safety Requirements for Radiographers (8/15/91)
  - IN 96-04 Incident Reporting Requirements for Radiography Licensees (1/10/96)
  - IN 96-20 Demonstration of Associated Equipment Compliance with 10 CFR 34.20 (4/4/96)
  - IN 96-53 Retrofit to Amersham 660 Posilock Radiography Camera to Correct Inconsistency in 10 CFR Part 34 Compatibility (10/15/96)
  - IN 97-35 Retrofit to Industrial Nuclear Company (INC) IR-100 Radiography Camera to Correct Inconsistency in 10 CFR Part 34 Incompatibility (6/18/97)
  - IN 97-91 Recent Failures of Control Cables Used on Amersham Model 660 IR Systems (12/31/97)
  - IN 97-86 Additional Controls for Transport of the Amersham Model No. 660 Series Radiographic Exposure Devices (12/12/97)
  - IN 97-87 Second Retrofit to Industrial Nuclear Company (INC) IR-100 Radiography Camera to Correct Inconsistency in 10 CFR Part 34 Incompatibility (12/12/97)
  - IN 98-16 Inadequate Operational Checks of Alarm Ratemeters (4/30/98)
  - IN 99-04 Unplanned Radiation Exposures to Radiographers, Resulting From Failures to Follow Proper Radiation Safety Procedures (3/1/99)
  - IN 00-15 Recent Events Resulting in Whole Body Exposures Exceeding Regulatory Limits (9/29/00)
  - IN 01-01 The Importance of Accurate Inventory Controls to Prevent the Unauthorized Possession of Radioactive Material (3/26/01)
  - IN 01-03 Incident Reporting Requirements for Radiography Licensees (4/6/01)

GUIDE TO SI UNITS FOR RADIATION PROTECTION

I. *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 Florida Bureau of Radiation Control 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.

II. *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

III. *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	=	0.0254 m		
1 foot (ft)	=	30.48 cm	=	0.3048 m		

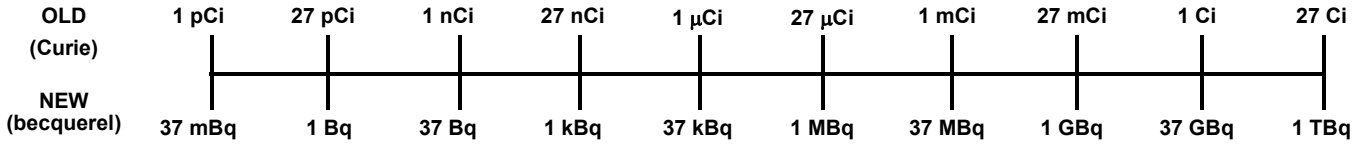
IV. *Activity*

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

FLORIDA DEPARTMENT OF HEALTH
RADIOACTIVE MATERIALS PROGRAM
APPLICATION FOR RADIOACTIVE MATERIALS LICENSE
NON-HUMAN USE

INSTRUCTIONS - Complete Items 1 – 15 as applicable. Item 15 must be completed on all applications. Use supplemental sheets where necessary. **Mail the original and one copy to:** Department of Health, Bureau of Radiation Control, Radioactive Materials Program, 4052 Bald Cypress Way, Bin #C21, Tallahassee, FL 32399-1741. *Regulatory Guidance Documents are available from the Bureau of Radiation Control to assist in completing this application.*

1.a. LEGAL NAME, MAILING ADDRESS (Include ZIP code), FEI #, Phone & Fax Numbers:

FEI #_____

Telephone # _____

Fax # _____

1.b. STREET ADDRESS WHERE RADIOACTIVE MATERIALS WILL BE USED OR STORED (Include ZIP Code)

☐ Same as 1.a.

2.a. LICENSE APPLICATION FEE CATEGORY
(See 64E-5.204, F.A.C., for license descriptions)

_____

b. LICENSE FEE ENCLOSED: $_____

3. THIS IS AN APPLICATION FOR:

☐ **a.** New License

☐ **b.** Amendment To License Number:_____

☐ **c.** Renewal Of License Number:_____

4. INDIVIDUAL USERS & REQUESTED USES
(Name all individuals who may receive, possess, prepare, use or transfer radioactive materials or directly supervise others in these activities.)

☐ SEE ATTACHED LIST

5.a. RADIATION SAFETY OFFICER (RSO):
(Name and Contact Information)

Name: _____

RSO Phone #:_____

RSO E-Mail: _____

5.b. ALTERNATE EMERGENCY CONTACT:

Name: _____

Contact Phone #: _____

Contact E-Mail: _____

6. TRAINING AND EXPERIENCE IN RADIATION SAFETY

a. FORMAL TRAINING IN RADIATION SAFETY: Describe the formal training for each individual named in Items 4 and 5, including principles and practices of radiation protection, radioactivity measurement, monitoring techniques and the use of instruments, mathematics and calculations basic to the use and measurement of radioactivity, and biological effects of radiation. Include the name of the person or institution providing the training, duration of training and when training was received. Attach a copy of any training certificate received if applicable.

☐ **SEE ATTACHED LIST**

b. EXPERIENCE: Describe the radiation work experience for each individual named in Items 4 and 5, including where the experience was obtained or attach a copy of a radioactive materials license that identifies them by name as an authorized user. Include a list of radioisotopes and the maximum activity of each use. Work experience or on-the-job training should be commensurate with the proposed use.

☐ **SEE ATTACHED LIST**

7. RADIOACTIVE MATERIAL

a. Isotope	b. Chemical or Physical Form (If sealed sources, include manufacturer name and model numbers)	c. Maximum Amount Or Activity Possessed At Any One Time. (If sealed source, state the number of sources, maximum activity per source and total activity)
Ex. Co-60	Sealed source XYZ Corp. Model XYZ for use in XYZ Corp Model AAA therapy device or liquid/gas/powder.	30 sources, 2 curies each for a total of 60 curies.
☐ SEE ATTACHED LIST		

8. DESCRIBE THE PURPOSE FOR WHICH EACH RADIOACTIVE MATERIAL LISTED IN ITEM 7, ABOVE WILL BE USED.

(For each sealed source, include the manufacturer's name and model number of the device, gauge or storage container where the source will be used or stored. List a line item for each different type of use for the same or different isotopes.

Ex. Co-60 to be used in a xyz corporation model AAA device in a BBB source holder for the measuring of density of materials in a process vessel.

☐ SEE ATTACHED LIST

9. LIST EACH TYPE OF RADIATION DETECTION INSTRUMENT (i.e., survey meters, counters, etc.)

TYPE OF INSTRUMENTS (include manufacturer and model number of each)	**USE** (e.g., monitoring, surveying, measuring)	**RADIATION DETECTED** (beta, gamma, alpha, neutrons)	**SENSITIVITY RANGE Low –High** (mR/hr)	**NUMBER AVAILABLE**
Ex. XYX Co. Model 1 survey meter with Model 33 probe	Monitoring & surveying for removable contamination	Beta & Gamma	0.1 mR/hr – 1 R/hr	2
☐ SEE ATTACHED LIST				

10. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 9 ABOVE.

a. ☐ **Calibration by Licensed Service Company**
Calibration Frequency will be at Intervals Not to Exceed: _____ months

b. ☐ **Calibration by Applicant** (Attached is a separate sheet describing procedures, frequency and standards used for calibration of instruments.)

11. PERSONNEL MONITORING DEVICES. Complete Items a, b, & c. (Check all that are applicable)

a. ☐ Film ☐ OSLD ☐ TLD ☐ Other (See attached) (Provider Must be NVLAP Certified)

b. ☐ Whole Body: Exchange Frequency Not to Exceed: _____ Months
☐ Extremity: Exchange Frequency Not to Exceed: _____ Months

c. Radiation Detected: ☐ Beta ☐ Gamma ☐ Neutron

12. FACILITIES AND EQUIPMENT. Attach a description of facilities where radioactive material, including waste, will be used or stored. **Attach an annotated diagram of the areas of use and/or storage, including adjacent areas.** Describe equipment such as remote handling devices, storage containers, shielding, fume hoods, etc. Describe security at your facility such as locks, chains, alarms, security camera, security services, etc.

☐ Description of facilities and equipment also attached with annotated diagram of the areas of use or storage, including adjacent areas.

☐ Attached is a description of security at facilities of the areas of radioactive materials are used or stored to prevent theft or unauthorized access to radioactive materials.

13. RADIATION PROTECTION PROGRAM. Attach a radiation protection program as appropriate for the material to be used, including general radiation safety procedures, emergency procedures, security, and bioassay procedures, etc. (Note that possession of large quantities of certain isotopes, such as those used in fixed gauges, industrial radiography, or irradiators for use in research or blood products, may require additional increased controls for security measures or national source tracking as required by 64E-5.350 and 64E-5.351, FAC.)

☐ Radiation Protection Program Details Attached

14. WASTE DISPOSAL. Describe the procedures for handling, storing and disposing of radioactive wastes (solid, liquid and/or gas). Name the commercial waste disposal service employed, if applicable. If sealed sources and/or devices will be returned to the manufacturer, so state.

☐ See Attached for Details on Radioactive Waste Disposal

15. CERTIFICATE

The applicant and any official executing this certificate on behalf of the applicant named in Item 1, certify that this application has been prepared in accordance with Chapter 64E-5, Florida Administrative Code, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief. *In addition, the applicant or executing official is acknowledging that they are aware that knowingly making false statements to a public servant is a violation of section 837.06, Florida Statutes, and is punishable by fine or imprisonment*

Certifying Official (Signature)

Name (typed or printed)

Title

Date

Warning: KNOWINGLY MAKING FALSE STATEMENTS TO A PUBLIC SERANT IS A VIOLATION OF SECTION 837.06, FLORIDA STATUTES, AND IS PUNISHABLE BY FINE OR IMPRISONMENT