R4 **Sections 64E-5.401 - 64E-5.422 repealed September 11, 2001 and replaced with**
R4 **sections 64E-5.423 - 64E-5.441.**

PART IV

RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS

R4 **64E-5.423 Definitions.** As used in this part, the following definitions apply:

R4 (1) "Associated equipment" means equipment, such as guide tubes, control tubes, control cables, removable source stops, J-tubes, and collimators, used in conjunction with a radiographic exposure device that drives, guides, or comes in contact with the sealed source.

R4 (2) "Certifying entity" means:

R4 (a) For radiographic operations using radioactive materials, an independent certifying organization that meets the requirements of Appendix A of 10 CFR Part 34, which is herein incorporated by reference and which is available from the department, or an agreement state that meets the requirements of Appendix A, Parts II and III of 10 CFR Part 34.

R4 (b) For radiographic operations using radiation machines, any agreement state or organization approved by the Conference of Radiation Control Directors, Inc.

R4 (3) "Collimator" means a radiation shield that is placed on the end of the guide tube or directly onto a radiographic exposure device to restrict the size of the radiation beam when the sealed source is cranked into position to make a radiographic exposure.

R4 (4) "Control cable" means the cable that is connected to the source assembly and used to drive the source from and return it to the shielded position. It also is known as a drive cable.

R4 (5) "Control drive mechanism" means a device that enables the source assembly to be moved to and from the shielded position. It also is known as a crank assembly.

R4 (6) "Control tube" means a protective sheath for guiding the control cable. The control tube connects the control drive mechanism to the radiographic exposure device.

R4 (7) "Exposure head" means a device that locates the sealed source in the selected position. It also is known as a source stop.

R4 (8) "Guide tube" means a flexible or rigid tube for guiding the source assembly and the attached control cable from the radiographic exposure device to the exposure head and includes the connections to attach to the radiographic exposure device and to the exposure head. It also is known as a projection sheath or source tube.
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R4 (9) “Industrial cabinet x-ray system” means a cabinet x-ray system used to perform
R4 industrial radiography excluding baggage x-ray systems.

R4 (10) "Lay-barge radiography" means industrial radiography performed on any water
R4 vessel used for laying pipe.

R4 (11) “Platform radiography” means industrial radiography performed on an offshore
R4 platform or other structure over a body of water.

R4 (12) "Radiographer certification" means a written document received from a certifying
R4 entity stating that an individual has met radiation safety training, testing, and
R4 experience criteria satisfactorily.

R4 (13) “Radiographic operations” means all activities including surveys that involve the
R4 use or transport of radiation machines, radiographic exposure devices, source
R4 changers, or industrial cabinet x-ray systems to conduct industrial radiography.

R4 (14) “Radiographic personnel” means radiographers and radiographer’s assistants.

R4 (15) “Reference survey” means a survey made with a radiation survey instrument
R4 within 6 inches (15 cm) of the surface of a radiographic exposure device or
R4 source changer at a location established by the licensee. The reference survey
R4 is used to verify that the sealed source is located properly in the shielded position
R4 and to establish a radiation level for reference before, during, and after
R4 radiographic operations.

R4 (16) “S-tube” means a tube through which the radioactive source travels inside a
R4 radiographic exposure device.

R4 (17) “Source assembly” means a set of assembled parts consisting of a sealed source
R4 and a connector that attaches the source to the control cable. The source
R4 assembly sometimes includes a stop ball used to secure the source in the
R4 shielded position. It also is known as a pigtail.

R4 (18) “Special training session” means training not conducted during production
R4 radiography.

R4 (19) “Transport container” means a package that is designed to provide radiation
R4 safety and security when sealed sources are transported and that meets all
R4 applicable requirements of the U.S. Department of Transportation (USDOT).

R4 (20) “Underwater radiography” means industrial radiography performed when the
R4 radiation machine, radiographic exposure device, or related equipment are
R4 beneath the surface of the water.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.031, 404.051(1), (4), (6), F.S.
R4 History: New September 11, 2001.

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SUBPART D
(Formerly Subpart A)
EQUIPMENT CONTROL

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64E-5.424 Requirements for Industrial Radiography Equipment Using Sealed Sources.

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(1) Equipment used in radiographic operations shall meet the criteria specified below.

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(a) Each radiographic exposure device, source assembly or sealed source, and all associated equipment shall meet the requirements specified in American National Standards Institute (ANSI) N432-1980 “Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography,’’ published as National Bureau of Standards Handbook 136, January 1981, which is herein incorporated by reference and which is available from the department. Engineering analyses that demonstrate that the radiography equipment components are equivalent are an acceptable alternative to actual testing of the component.

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(b) Equipment used in radiographic operations is not required to comply with section 8.9.2(c) of the Endurance Test in ANSI N432-1980 if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment realistically can exert on the lever or crankshaft of the drive mechanism.

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(2) In addition to the requirements specified in 64E-5.424(1), F.A.C., radiographic exposure devices, source changers, source assemblies, and sealed sources must meet the requirements specified below.

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(a) Each radiographic exposure device shall have a durable, legible, clearly visible label attached that specifies:

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1. The chemical symbol and mass number of the radionuclide in the radiographic exposure device;

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2. The activity of the sealed source and the date on which this activity was last measured;

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3. The manufacturer’s name and the model and serial number of the sealed source; and

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4. The name, address, and telephone number of the licensee.

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(b) Each radiographic exposure device, source changer, storage container, and transport container shall have a durable, legible, clearly visible marking or label attached that includes the standard radiation symbol as specified in 64E-5.322, F.A.C., in conventional colors of magenta, purple, or black on a yellow background, has a minimum diameter of 25 millimeters, and has the following wording:

R4 CAUTION (or DANGER)
R4 RADIOACTIVE MATERIAL – DO NOT HANDLE
R4 NOTIFY CIVIL AUTHORITIES (or NAME OF COMPANY)

R4 (c) Modification of radiographic exposure devices, source changers, source assemblies, and associated equipment is prohibited unless the design of any replacement component, including source holder, source assembly, controls, or guide tubes will not compromise design safety features.

R4 (3) Radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the radiographic exposure device for radiographic operations or to source changers must meet the requirements specified below.

R4 (a) The coupling between the source assembly and the control cable shall be designed so that the source assembly will not become disconnected if cranked outside the guide tube. The coupling shall be designed so that it cannot be disconnected unintentionally under normal and reasonably foreseeable abnormal conditions.

R4 (b) The radiographic exposure device shall secure the source assembly automatically when it is cranked back into the fully shielded position within the device. This securing system shall be able to be released only by a deliberate operation on the exposure device.

R4 (c) The outlet fittings, lock box, and drive cable fittings on each radiographic exposure device shall be equipped with safety plugs or covers that are installed during storage and transportation to protect the source assembly from water, mud, sand, or other foreign matter.

R4 (d) 1. Each sealed source or source assembly shall have attached to it or engraved on it a durable, legible, visible label with the words: “DANGER – RADIOACTIVE.”

R4 2. The label cannot interfere with the safe operation of the radiographic exposure device, source changer, or associated equipment.

R4 (e) The guide tube shall be able to withstand a crushing test that approximates closely the crushing forces that are likely to be encountered during use and be able to withstand a kinking resistance test that approximates closely the kinking forces that are likely to be encountered during use.

R4 (f) Guide tubes shall be used when moving the source out of the device.

R4 (g) An exposure head or similar device designed to prevent the source assembly from passing out of the end of the guide tube shall be attached to the outermost end of the guide tube during radiographic operations.

R4 (h) The guide tube exposure head connection shall be able to withstand the
R4 tensile test for control units specified in ANSI N432-1980.

R4 (i) Source changers shall have a system to ensure that the source will not be
R4 withdrawn from the changer accidentally when connecting or
R4 disconnecting the drive cable to or from a source assembly.

R4 (4) The maximum exposure rate limits for storage containers and source changers
R4 are 200 millirem (2 mSv) per hour at any exterior surface and 10 millirem (0.1
R4 mSv) per hour at 1 meter from any exterior surface with the sealed source in the
R4 shielded position.

R4 (5) Each radiographic exposure device, source changer, and storage container shall
R4 have a lock or outer locked container designed to prevent unauthorized or
R4 accidental removal of the sealed source from its shielded position.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), (6), F.S.
R4 History: New September 11, 2001.

R4 **64E-5.425 Locking of Sources of Radiation, Storage Precautions, and Surveillance.**

R4 (1) Each radiation machine, radiographic exposure device, source changer, and
R4 storage container shall be kept locked with the key removed from any keyed lock
R4 except when under the direct supervision of radiographic personnel or as
R4 specified in section (6), below.

R4 (2) Each radiation machine, radiographic exposure device, source changer, and
R4 storage container shall be locked and the key removed from any keyed lock
R4 before being moved or transported and before being stored at a given location,
R4 except at permanent radiographic installations as specified in 64E-5.431, F.A.C.
R4 Keys to radiation machines, radiographic exposure devices, source changers,
R4 storage containers, transport containers, and transport vehicles shall be
R4 maintained in the possession of the radiographer or radiographer's assistant
R4 responsible for the equipment in a manner that prevents access to sources of
R4 radiation by unauthorized personnel.

R4 (3) Locked radiographic exposure devices, source changers, storage containers, and
R4 radiation machines shall be secured physically except when under the direct
R4 surveillance of radiographic personnel or as specified in section (6), below, to
R4 prevent tampering or removal by unauthorized personnel. The licensee shall
R4 store licensed material in a manner that minimizes danger from explosion or fire.

R4 (4) Each sealed source shall be secured in its shielded position by locking the
R4 radiographic exposure device or source changer each time the sealed source is
R4 returned to the shielded position.

R4 (5) Transport containers containing licensed material shall be locked and secured in
R4 the transporting vehicle to prevent accidental loss, tampering, or unauthorized
R4 removal of the licensed material from the vehicle.

R4 (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 and the requirements of 64E-5.431, F.A.C., are met.

R4 (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.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), (6), F.S.
R4 History: New September 11, 2001.

R4 **64E-5.426 Radiation Survey Instruments.**

R4 (1) The licensee or registrant shall maintain enough calibrated and operable radiation survey instruments to make physical radiation surveys as required by the rules contained in this part and Chapter 64E-5, Part III, F.A.C. Such instrumentation shall be able to measure a range from 2 millirem (0.02 mSv) per hour through 1 rem (0.01 Sv) per hour.

R4 (2) Radiation survey instruments used to establish dose rates shall be calibrated:

R4 (a) At intervals not to exceed 6 months and after each instrument servicing other than battery replacement;

R4 (b) At energies and geometries appropriate for use;

R4 (c) To demonstrate accuracy within 20% of the true radiation level at each point checked;

R4 (d) 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; and

R4 (e) By a person licensed by the department, another agreement state, licensing state or the NRC.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), F.S.
R4 History: New September 11, 2001.

R4 **64E-5.427 Leak Testing, Repairing, Tagging, Opening, Modifying, and Replacing Sealed Sources and Devices.**

R4 (1) 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.

R4 (2) 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 that a test has been made within the 6 months before the transfer, the sealed source shall not be used until tested. Sealed sources that are listed in a department license 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.

R4 (3) 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. Licensees must comply with the DU leak testing requirements of this section within 6 months after the effective date of this rule.

R4 (4) Leak testing as specified in 64E-5.427(2) and (3), F.A.C., 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.

R4 (5) If any test conducted pursuant to this section reveals the presence of 0.005 microcurie (185 Bq) or more of removable radioactive material, the licensee immediately 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 that the S-tube is worn through, the device shall not be used. The licensee 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.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), (6), F.S.
R6 History: New September 11, 2001, Amended September 28, 2006.

R4 **64E-5.428 Quarterly Inventory**. Each licensee or registrant shall conduct a quarterly physical inventory to account for all sources of radiation received or possessed during the quarter. 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.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.081(1), F.S.
R4 History: New September 11, 2001.

R4 **64E-5.429 Source Movement Logs, Daily Survey Reports, and Individual Dosimeter Logs.**

R4 (1) Each time a radiation source is removed from storage, the licensee or registrant shall complete and maintain source movement logs for each radiation source with the following information, as applicable:

R4 (a) The locations where used, the names of the jobs or clients, and the dates of use including the dates removed and returned to storage ;

R4 (b) The manufacturer's name, model, and serial number of the radiographic exposure device, source changer, or radiation machine used;

R4 (c) The sealed source manufacturer's name, model, and serial number, activity in curies (becquerels) on the date of receipt and each date of use, and the due date of the next leak test;

R4 (d) The results of the reference survey of the radiographic exposure device or source changer performed upon removal and return to storage; and

R6 (e) The identity and signature or initials of the radiographer to whom the radiation source has been assigned.

R4 (2) Before performing industrial radiography, leak tests, source exchanges, or quarterly inspection and maintenance of radiographic equipment, the licensee or registrant shall prepare and maintain a daily survey report for each radiation source with the information described below as it becomes available:

R4 (a) The location where used, the name of the job or client, and the date of use;

R4 (b) The manufacturer's name, model, and serial number of the radiographic exposure device, source changer, or radiation machine used;

R4 (c) The sealed source manufacturer's name, model, and serial number and activity in curies (becquerels) for the date of use;

R4 (d) The names and titles of the radiographic personnel working with the radiation source;

R4 (e) The serial number of the personnel monitoring badge, pocket dosimeter, and alarm ratemeter used by each of the radiography crew members;

R4 (f) The manufacturer's name, model, serial number, and date of calibration or calibration due date for each survey meter used;

R4 (g) The results of the reference survey performed when the radiographic exposure device or source changer is removed from or returned to storage;

(h) Evidence of performance of the equipment checks described in 64E-5.430(1), F.A.C.;

(i) The results of the survey of the posted perimeter in mR/hr (mSv/hr) and feet (meters);

(j) The total exposure time; and

(k) The start, end, and total pocket dosimeter readings for all radiographic personnel.

(3) 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:

(a) The name of the individual;

(b) The dates of the monitoring periods;

(c) The daily, weekly, and monthly individual radiation dose totals as measured by the dosimeter; and

(d) 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.

Specific Authority: 404.051, F.S.
Law Implemented: 404.022, 404.051(1), (4), 404.081(1), F.S.
History: New September 11, 2001, Amended September 28, 2006.

64E-5.430 Inspection and Maintenance.

(1) Each licensee or registrant shall perform visual and operability checks on survey instruments, radiation machines, radiographic exposure devices, associated equipment, transport containers, storage containers, and source changers 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. Each radiation survey instrument shall be visually inspected, have its batteries checked, and have its operability checked with a radiation source at the beginning of each day of use and at the beginning of each work shift. If equipment problems are found, the equipment shall be removed from service until repaired.

R8 (2) Each licensee or registrant shall have written procedures and perform equipment inspection and maintenance as described below. (Pursuant to 120.54(6) Florida Statutes, 64E-5.430(2) is substantively identical to 10 CFR 34.31(b) published on 01/01/2007.)

R4 (a) 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 maintained in accordance with the manufacturer's specifications. Verification of compliance with radiation limits specified in 64E-5.424(4), F.A.C., 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.

R4 (b) 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.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.081(1), F.S.
R8 History: New September 11, 2001, Amended February 28, 2008.

R4 **64E-5.431 Permanent Radiographic Installations.**

R4 (1) Each entrance used for personnel access to a high radiation area in a permanent radiographic installation shall have either:

R4 (a) An entrance control that reduces 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

R4 (b) 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.

R4 (2) 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 that reduce 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.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), F.S..
R4 History: New September 11, 2001.

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SUBPART E
(Formerly Subpart B)
RADIATION SAFETY REQUIREMENTS

R4 **64E-5.432 Radiation Protection Program.** The radiation protection program
R4 specified in 64E-5.303, F.A.C., for registrants performing radiography and license
R4 applications, renewals, and requests for amendments for licensees performing radiography
R4 shall include the components specified below and the location of all records required.

R4 (1) A description of the overall organizational structure pertaining to the licensee's or
R4 registrant's radiation protection program, including specific delegation of authority
R4 and responsibility, the name of the RSO, and the minimum qualifications of the
R4 RSO and the RSO's designees.

R4 (2) A radiation safety training program for radiographic personnel that meets the
R4 requirements of 64E-5.434, F.A.C., and includes the components described
R4 below.

R4 (a) Initial, periodic, and on-the-job training.

R4 (b) Written and practical examinations to determine knowledge, understanding
R4 of, and ability to comply with department and applicable USDOT rules,
R4 licensee or registrant requirements, operating and emergency procedures,
R4 and use of radiographic and related equipment.

R4 (3) Procedures to verify the certification of radiographers and to ensure that the
R4 certification remains valid.

R4 (4) A written policy to maintain radiation doses as low as reasonably achievable as
R4 specified in 64E-5.303, F.A.C. The policy shall include:

R4 (a) A commitment by management to keep radiation doses as low as
R4 reasonably achievable and a description of the participation of
R4 management, the RSO, and radiographic personnel in the implementation
R4 of the policy;

R4 (b) Investigation within 30 days by the RSO of any exposure level that
R4 exceeds established monthly and quarterly levels and implementation of
R4 corrective actions to halt unnecessary exposures and prevent recurrence;
R4 and

R4 (c) An audit of the program to evaluate its effectiveness in minimizing
R4 exposures in conjunction with the annual review of the radiation protection
R4 program specified in 64E-5.303(3), F.A.C. A summary of the results of
R4 each audit, including a description of corrective actions taken, shall be
R4 prepared by the RSO and approved by the licensee or registrant.

R4 (5) An auditing program for internal inspections of the job performance of all
R4 radiographic personnel at intervals not to exceed 6 months as described in 64E-
R4 5.434, F.A.C.

R4 (6) Written operating and emergency procedures as described in 64E-5.436, F.A.C.
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R4 (7) Leak testing procedures, including a description of:

R4 (a) The method of taking wipes and preparing samples for analysis using only
R4 radiographers or radiographer's assistants working under the personal
R4 supervision of a radiographer or persons specifically licensed by the
R4 department, another agreement state, licensing state, or the NRC to
R4 perform such services; and

R4 (b) The method of performing leak test sample analyses, including
R4 instrumentation to be used and experience of the individuals who will
R4 perform the analyses or a commitment to use vendors specifically licensed
R4 to perform such analyses by the department, another agreement state,
R4 licensing state, or the NRC.

R4 (8) Procedures for the semiannual calibration of survey instruments and the annual
R4 calibration of alarm ratemeters, including a description of the calibration
R4 instrumentation and the experience of the person who will perform the
R4 calibrations or a commitment to use persons specifically licensed to perform such
R4 calibrations by the department, another agreement state, licensing state, or the
R4 NRC. All survey instrument calibrations shall be performed in accordance with
R4 64E-5.426(2), F.A.C.

R4 (9) Procedures for quarterly inspection and maintenance of survey instruments,
R4 radiation machines, radiographic exposure devices, associated equipment,
R4 source changers, storage containers, and transport containers to assure proper
R4 function of components important to safety, performed in accordance with 64E-
R4 5.430, F.A.C.

R4 (10) Procedures for annual calibration of pocket or electronic dosimeters, including a
R4 description of the calibration instrumentation and the experience of the person
R4 who will perform the calibrations or a commitment to use persons specifically
R4 licensed to perform such calibrations by the department, another agreement
R4 state, licensing state, or the NRC.

R4 (11) Procedures for lay-barge, offshore platform and underwater radiography if
R4 conducting such activities.

R4 Specific Authority: 404.051, 404.061, F.S.
R4 Law Implemented: Implemented 404.022; 404.051(1), (4), (6), (9), (10), 404.061(2); 404.081(1); 404.141, F.S.
R4 History: New September 11, 2001.

R4 **64E-5.433 Radiation Safety Officer.**

R4 (1) The licensee or registrant shall appoint an RSO and delegate the authority needed to fulfill the duties of the position. Except as specified in 64E-5.433(2), F.A.C., below, the minimum qualifications, training, and experience for the RSO shall be:

R4 (a) One year of documented industrial radiography experience as a radiographer; and

R4 (b) 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. Individuals identified as an RSO on an industrial radiography license or registration before the effective date of this rule are not required to comply with the training requirements of this paragraph.

R4 (2) 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 specified in 64E-5.433(1)(a) and (b), F.A.C., above.

R4 (3) In addition to other duties specified in this part, the RSO shall:

R4 (a) Ensure compliance with all components of the licensee's or registrant's radiation protection program as specified in 64E-5.432, F.A.C., the terms and conditions of the license, and this rule;

R4 (b) Investigate incidents and direct corrective actions, including halting operations when necessary;

R4 (c) Serve as the licensee's or registrant's contact with the department; and

R4 (d) Ensure that radiation safety activities are performed using approved procedures and requirements in Chapter 64E-5, F.A.C., in the daily operation of the licensee's program.

R4 Specific Authority: 404.051, 404.061, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.061(2), F.S.
R4 History: New September 11, 2001.

R4 **64E-5.434 Training, Testing, Certification, and Audits.**

R4 (1) The licensee or registrant shall not permit any individual to act as a R4 radiographer's assistant until such individual:

R4 (a) Receives a copy of the licensee's or registrant's operating and emergency R4 procedures;

R4 (b) Completes 8 hours of training, including instruction in the licensee's or R4 registrant's operating and emergency procedures and supervised R4 instruction in use of the licensee's or registrant's radiographic equipment, R4 related handling tools, radiation survey instruments, and personnel R4 monitoring devices during a special training session; and

R4 (c) Successfully completes a closed-book, written examination on the R4 licensee's or registrant's operating and emergency procedures and a R4 practical examination that is not conducted during production radiography R4 to demonstrate competence in the use of the licensee's or registrant's R4 radiographic equipment, related handling tools, radiation survey R4 instruments, and personnel monitoring devices.

R4 (2) Licensees and registrants can allow individuals who have completed the training R4 and testing specified in 64E-5.434(2)(a) – (d), F.A.C., below, to perform industrial R4 radiography for 12 months after the effective date of these rules. The licensee or R4 registrant shall not permit any individual to act as a radiographer until such R4 individual:

R4 (a) Receives copies of rules contained in Chapter 64E-5, Parts I – IV, IX and R4 XV, F.A.C., applicable USDOT regulations, the appropriate license or R4 certificate of registration, and the licensee's or registrant's operating and R4 emergency procedures;

R4 (b) 1. For radioactive material radiographic operations, completes R4 320 hours of on-the-job training in industrial radiography, excluding R4 hours as specified in 64E-5.434(2)(b)2., F.A.C., below, as a R4 radiographer's assistant using radioactive material; or

R4 2. For machine produced radiographic operations, completes R4 200 hours of on-the-job training using radiation machines;

R4 (c) Receives 40 hours of formal instruction in the subjects outlined in R4 64E-5.434(6), F.A.C., and supervised instruction during a special training R4 session in the inspection and use of the licensee's or registrant's R4 radiographic equipment, related handling tools, radiation survey R4 instruments, and personnel monitoring devices;

R4 (d) Successfully completes a closed-book, written examination on the subjects R6 outlined in subsection 64E-5.434(6), F.A.C., and a practical examination to R4 demonstrate competence in the use of the licensee's or registrant's R4 radiographic and safety equipment; and

R4 (e) Is certified by a certifying entity.

R4 (3) Radiographers who work for an out-of-state radioactive materials license under reciprocal recognition are authorized to conduct radiographic operations within the state if they have a valid certification from a certifying entity for the activities being conducted before entering the state.

R4 (4) Any individual who has completed all requirements specified in 64E-5.434(2), F.A.C., above, 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 in 64E-5.434(1)(c), F.A.C. The RSO shall document how the prior radiation training and experience was verified.

R4 (5) Personnel using industrial cabinet x-ray systems for industrial radiography shall complete 16 hours of training and testing as described below:

R4 (a) Ten hours of training and testing as described in 64E-5.434(6), F.A.C.; and

R4 (b) Two hours of instruction in the registrant's 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 the registrant's industrial 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 the registrant's industrial cabinet x-ray system and related equipment.

R4 (6) The subjects to be covered during the instruction of radiographers shall include:

R4 (a) 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.

R4 (b) Radiation detection instruments, including:

R4 1. Use, operation, calibration, and limitations of radiation survey instruments;

R4 2. Survey techniques; and

R4 3. Use of personnel monitoring equipment.

R4 (c) Equipment to be used, including, as applicable:

R4 1. 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;

R4 2. Storage, control, and disposal of licensed material; and

R4 3. Inspection and maintenance of equipment.

R4 (d) The applicable requirements of these rules and NRC and USDOT regulations.

R4 (e) The licensee's or registrant's operating and emergency procedures.

R4 (f) Case histories of industrial radiography accidents.

R6 (7) Each licensee or registrant shall provide 8 hours of refresher annual radiation safety training to all radiographic personnel, which can be conducted in multiple sessions.

R4 (8) The RSO or the RSO's designee shall audit the job performance of each radiographer and radiographer's assistant to ensure that 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.

R4 (9) Individuals conducting internal radiation safety training or audits shall meet the minimum qualifications specified in 64E-5.433(1), F.A.C., for the RSO.

R4 Specific Authority: 404.051404.061, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.061(2), F.S.
R6 History: New September 11, 2001, Amended September 28, 2006.

R4 **64E-5.435 Conducting Industrial Radiographic Operations.**

R4 (1) With the exception of industrial cabinet x-ray systems, the radiographer shall be R4 accompanied by at least one other radiographer or radiographer's assistant R4 whenever radiography is performed at a location other than a permanent R4 radiographic installation. The additional qualified individual shall observe the R4 radiographic operations and be capable of providing immediate assistance to R4 prevent unauthorized entry. Radiography is prohibited if only one qualified R4 individual is present. Radiography performed in an industrial cabinet x-ray R4 system by a single individual meeting the training and testing requirements R4 specified in 64E-5.434(5), F.A.C., is permitted.

R4 (2) The radiographer's assistant shall be under the personal supervision of a R4 radiographer when using a radiation machine, radiographic exposure device, R4 source changer, or related source handling tools or conducting radiation surveys R4 to determine that the sealed source has returned to the shielded position or that R4 the radiation machine is off after an exposure.

R4 (3) All radiographic operations conducted at a licensee's or registrant's permanent R4 facility shall be conducted in a permanent radiographic installation or an industrial R4 cabinet x-ray system or using equipment, facilities, and procedures that are R4 adequate to protect public health, safety, and property and included in the R4 radiation protection program specified in 64E-5.432, F.A.C.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), (11), 404.081(1), F.S.
R4 History: New September 11, 2001.

R4 **64E-5.436 Operating and Emergency Procedures.** The licensee's or registrant's R4 procedures shall include instructions in the following:

R4 (1) Handling and use of sources of radiation to be used so that exposures are R4 maintained as low as reasonably achievable and no individual is likely to be R4 exposed to radiation doses in excess of the limits established in rules contained R4 in Part III of Chapter 64E-5, F.A.C.;

R4 (2) Methods and occasions to conduct radiation surveys;

R4 (3) Methods to control access to radiographic areas;

R4 (4) Methods and occasions to lock and secure sources of radiation;

R4 (5) Personnel monitoring and the use of personnel monitoring equipment, including R4 steps to be taken immediately by radiography personnel when a pocket R4 dosimeter is found off-scale, an alarm ratemeter alarms unexpectedly, or a R4 personnel monitoring badge is damaged or lost;

R4 (6) Transportation of licensed material to field locations and preparation of packages R4 for shipment by common or contract carriers, including packaging, marking, R4 labeling, shipping papers, emergency response information, blocking and R4 bracing, security, surveys, and vehicle placarding in accordance with applicable R4 requirements of the USDOT;

R4 (7) Leak testing, quarterly inventories, and equipment inspection, maintenance and operability checks, and disposal of licensed material;

R4 (8) Source exchanges for licensees who perform source exchanges;

R4 (9) Calibration of survey instruments, dosimeters, and alarm ratemeters for licensees who perform calibrations;

R4 (10) Emergency response, including response to loss, damage, or theft of sources of radiation, unauthorized entries into restricted areas, notifications, exposure minimization, and source recovery;

R4 (11) Identifying and reporting equipment defects and noncompliance issues; and

R4 (12) Maintenance of records.

R4 Specific Authority: 404.051, 404.20, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), (6), 404.081, 404.20(1), F.S..
R4 History: New September 11, 2001.

R4 **64E-5.437 Personnel Monitoring.**

R4 (1) The licensee or registrant 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:

R4 (a) A NVLAP-approved personnel monitoring badge such as a film badge, thermoluminescent dosimeter (TLD) or optically stimulated luminescent device (OSLD);

R4 (b) A direct reading pocket dosimeter, which can be either an ion chamber or electronic personal dosimeter; and

R4 (c) An alarming ratemeter. Alarm ratemeters are not required for radiography performed in an approved permanent radiographic installation meeting the requirements of 64E-5.431, F.A.C.

R4 (2) Each personnel monitoring badge shall be assigned to and worn by only one individual and shall be exchanged monthly. After exchange each badge shall be processed as soon as possible. If a report is received from the badge processor that indicates an individual has received a radiation exposure in excess of 5 rem (0.05 Sv), the licensee or registrant 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 and the exposure is calculated by the RSO or the RSO’s designee for the time period from issuance to loss or damage of the badge. The results of the calculated exposure and the time period for which the personnel monitoring badge was lost or damaged shall be provided to the processor to adjust the individual’s occupational exposure record.

R4 (3) 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.

R4 (4) If an individual's pocket dosimeter is found to be off-scale or if an individual's 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. In addition, 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.

R4 (5) Each alarming ratemeter shall:

R4 (a) Have a function test without being exposed to radiation to ensure that the audible alarm is functioning properly before use at the start of each work shift;

R4 (b) Give an alarm at a preset dose rate of no more than 500 millirem (0.5 mSv) per hour; and

R4 (c) Require special means to change the preset alarm function.

R4 (6) Pocket dosimeters and alarm ratemeters shall be calibrated annually for correct response to radiation by a person licensed by the department, another agreement state, licensing state, or the NRC. 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.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.081(1), (2), F.S.
R4 History: New September 11, 2001.

R4 R4 # SUBPART F
(Formerly Subpart C)
PRECAUTIONARY PROCEDURES IN RADIOGRAPHIC OPERATIONS

R4 **64E-5.438 Radiation Surveys.**

R4 R4 R4 R4 R4 R4 (1) No radiographic operations shall be conducted unless at least one calibrated and operable radiation survey instrument meeting the requirements of 64E-5.426, F.A.C., is available for each radiographic exposure device and radiation machine in use at each site where radiographic exposures are made. All radiation surveys shall be performed with a calibrated and operable radiation survey instrument meeting the requirements of 64E-5.426, F.A.C.

R4 R4 (2) The surveys described below shall be performed by the licensee or registrant where applicable.

R4 R4 R4 (a) A reference survey of each radiographic exposure device or source changer immediately following removal from a storage area, including removal from storage following transportation.

R4 R4 R4 R4 (b) An area survey during the first radiographic exposure to verify that the posting requirements specified in 64E-5.439(1), F.A.C., have been met and that unrestricted areas do not have radiation levels in excess of the limits specified in 64E-5.312(1)(c), F.A.C.

R4 R4 R4 R4 R4 R4 (c) 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 licensee after each radiographic exposure. The surveys shall be performed before exchanging film, repositioning the exposure head, or dismantling equipment.

R4 R4 (d) A reference survey of the radiographic exposure device and source changer before and after source exchanges.

R4 R4 (e) A reference survey of the radiographic exposure device, source changer, or storage container after returning the sealed source to a storage area.

R4 R4 (f) A survey after each radiographic exposure using radiation machines to verify that the machine is off.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.081(1), F.S.
R4 History: New September 11, 2001.

R4 **64E-5.439 Posting.** In addition to the posting requirements specified in R4 64E-5.901, F.A.C., the licensee or registrant shall comply with the requirements described R4 below.

R4 (1) Radiation areas and high radiation areas created by radiographic operations shall R4 be posted conspicuously as specified in 64E-5.323(1) and (2), F.A.C. Areas or R4 rooms in which licensed material is used or stored shall be posted as specified in R4 64E-5.323(5), F.A.C. The exceptions to posting specified in 64E-5.324(1), R4 F.A.C., do not apply to industrial radiography.

R4 (2) Source movement logs specified in 64E-5.429, F.A.C., that document the current R4 location of each source of radiation and source movements for the previous 30 R4 days shall be posted conspicuously adjacent to the area where the source of R4 radiation is stored.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.081(1), 404.20, F.S.
R4 History: New September 11, 2001.

R4 **64E-5.440 Records.**

R4 (1) Each licensee or registrant shall maintain the following records for 3 years after R4 the event at the location specified in 64E-5.432, F.A.C., for inspection by the R4 department:

R4 (a) Survey instrument, dosimeter, and alarm ratemeter calibrations specified R4 in 64E-5.426 and 64E-5.437(5) – (6), F.A.C.;

R4 (b) Leak test results specified in 64E-5.427, F.A.C., which shall contain the R4 manufacturer's name, model, and serial number of each sealed source or R4 device tested, including the device the source was stored in, the identity of R4 each radionuclide, the estimated activity of each sealed source, the R4 measured activity of each test sample expressed in microcuries R4 (becquerels), the date of the test, and the signature or initials of the RSO R4 or the RSO’s designee;

R4 (c) Quarterly inventories specified in 64E-5.428, F.A.C., which shall include R4 the name of the person conducting the inventory, the radionuclide, number R4 of curies (becquerels) or mass in each device, location of each sealed R4 source, device, and machine, the manufacturer, model, and serial number R4 of each sealed source, device, and machine, the date of the inventory, and R4 the signature or initials of the RSO or the RSO’s designee;

R4 (d) Source movement logs and daily survey reports specified in 64E-5.429, R4 F.A.C.

R4 (e) Quarterly equipment inspection and maintenance specified in 64E- R4 5.430(2), F.A.C., including the date of the inspection, the name of R4 inspector, the equipment involved, any problems found, and what repair or R4 maintenance was done;

(f) Operation tests on permanent radiographic installation entrance controls and audible and visual alarms specified in 64E-5.431, F.A.C.;

(g) Records of internal audits specified in 64E-5.434(8), F.A.C., including lists of audit items checked and any violations observed;

(h) Records showing receipts and transfers of sealed sources and devices using DU for shielding, including the date, the name of the individual making the record, radionuclide, number of curies (becquerels) or mass, manufacturer, model, and serial number of each sealed source and device, as appropriate.

(i) Records of annual ALARA audits specified in paragraph 64E-5.432(4)(c), F.A.C.

(2) Each licensee or registrant shall maintain the following records until the department terminates the license or registration requiring the record:

(a) Individual dosimeter logs specified in 64E-5.429, F.A.C.;

(b) Initial and refresher radiation safety training specified in 64E-5.434, F.A.C., including lists of the topics discussed, dates the training was conducted, names of the instructors and attendees, and written and practical examinations;

(c) Verification of previous radiography experience;

(d) Radiographer certification documents specified in 64E-5.434(2)(d), F.A.C., and verification of certification status;

(e) Records of personnel exposure investigations specified in 64E-5.432(4)(b), F.A.C., including the names of the individuals involved, the exposures received, the dates the exposures were received, a description of the cause of the exposures, the corrective actions taken, and the signature of the RSO;

(f) Records of estimates of exposures as a result of off-scale dosimeters or lost or damaged personnel monitoring badges, including records of surveys used to determine an individual's exposure and reports submitted to the department as specified in 64E-5.437(3), F.A.C.;

(g) Personnel monitoring badge records from the accredited NVLAP processor as specified in subsection 64E-5.437(2), F.A.C.; and

(h) Operating and emergency procedures. Licensees shall retain superseded material for 3 years after making changes to operating or emergency procedures.

(3) Each licensee or registrant conducting industrial radiography at a temporary job site shall have the following records available at that site for inspection by the department:

R4 (a) Appropriate license or registration;

R4 (b) Certification by a certifying entity;

R4 (c) Operating and emergency procedures;

R4 (d) Rules contained in Chapter 64E-5, Parts I – IV, IX, and XV, F.A.C.;

R4 (e) Calibration records for the survey instruments, pocket dosimeters, and alarm ratemeters used at the site or calibration tags or labels that are affixed to the devices;

R4 (f) Records of the latest leak test results for the specific devices in use at the site or leak test tags or labels that are affixed to the devices; and

R4 (g) Source movement logs and daily survey reports for the period of operation at the site.

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.081(1), 404.20, F.S.
R8 History: New September 11, 2001, Amended September 28, 2006, Amended February 28, 2008.

R4 **64E-5.441 Reporting Requirements.**

R4 (1) In addition to the reporting requirements specified in rules contained in Chapter R6 64E-5, Parts III and IX, F.A.C., and other sections of this part, each licensee shall R4 provide a written report to the department within 30 days of the occurrence of any R4 of the incidents involving radiographic equipment described below. Such reports R4 shall be mailed to the Bureau of Radiation Control, Radioactive Materials R4 Section, Bin C21, 4052 Bald Cypress Way, Tallahassee, Florida 32399-1741 for R4 incidents involving radioactive materials or to the Bureau of Radiation Control, R4 Radiation Machine Section for incidents involving radiation machines.
R4

R4 (a) Unintentional disconnection of the source assembly from the control cable.
R4

R4 (b) Inability to retract and secure the source assembly to the fully shielded R4 position.

R4 (c) Failure of any component critical to safe operation of the device to perform R4 its intended function properly.

R4 (2) The licensee shall include the information described below in each report R4 submitted as specified in this section.

R4 (a) A description of the equipment problem.

R4 (b) Cause of each incident if known.

R4 (c) Manufacturer name and model number of the equipment involved in the R4 incident.

R4 (d) Place, time, and date of the incident.

R4 (e) Actions taken to establish normal operations.

R4 (f) Corrective actions taken or planned to prevent recurrence.

R4 (g) Qualifications of the personnel involved in the incident.

R4 (3) Reports of overexposures submitted as specified in rules contained in Part III of
R4 Chapter 64E-5, F.A.C., that involve failure of safety components of radiography
R4 equipment also must include the information specified in 64E-5.441(2), F.A.C.

R8 (4) Any licensee conducting radiographic operations or storing radioactive material at
R8 any location not listed on the license for a period in excess of 180 days in a
R8 calendar year, shall notify the Department prior to exceeding the 180 days.
R8 (Pursuant to 120.54(6) Florida Statutes, 64E-5.441(4) is substantively identical to
R8 10 CFR 34.101(c) published on 01/01/2007.)

R4 Specific Authority: 404.051, F.S.
R4 Law Implemented: 404.022, 404.051(1), (4), 404.081(1), F.S.
R8 History: New September 11, 2001,September 28, 2006, Amended February 28, 2008.