

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
NOTICE OF PUBLIC HEARING

December 3, 2019
10:00 a.m. Central Time
Nebraska State Office Building – Lower Level B
301 Centennial Mall South, Lincoln, Nebraska

The purpose of this hearing is to receive comments on proposed changes to Title 180, Chapter 5 of the Nebraska Administrative Code (NAC) – *Radiation Safety Requirements for Industrial Radiographic Operations*. The chapter outlines requirements for the issuance of licenses or registration, and the safety requirements, for the industrial use of radioactive materials or x-ray tubes. The proposed changes remove the requirement that vehicles transporting radioactive material or radiation machines for use at temporary job sites prominently display on both sides of the vehicle the city and town where the main business office is located; transfer the exemption for certified or certifiable cabinet x-ray systems to 180 NAC 8; and remove any unnecessary language and duplicative statutory language from the regulation.

Authority for these regulations is found in Neb. Rev. Stat. § 81-3117(7).

Interested persons may attend the hearing and provide verbal or written comments or mail, fax or email written comments, no later than the day of the hearing to: DHHS Legal Services, PO Box 95026, Lincoln, NE 68509-5026, (402) 742-2382 or dhhs.regulations@nebraska.gov, respectively.

A copy of the proposed changes is available online at <http://www.sos.ne.gov>, or by contacting DHHS at the mailing address or email above, or by phone at (402) 471-8417. The fiscal impact statement for these proposed changes may be obtained at the office of the Secretary of State, Regulations Division, 1201 N Street, Suite 120, Lincoln, NE 68508, or by calling (402) 471-2385.

Auxiliary aids or reasonable accommodations needed to participate in a hearing can be requested by calling (402) 471-8417. Individuals with hearing impairments may call DHHS at (402) 471-9570 (voice and TDD) or the Nebraska Relay System at 711 or (800) 833-7352 TDD at least 2 weeks prior to the hearing.

FISCAL IMPACT STATEMENT

Agency: Department of Health and Human Services	
Title: 180	Prepared by: Julia Schmitt
Chapter: 5	Date prepared: 6/4/2019
Subject: Radiation Safety Requirements for Industrial Radiographic Operations	Telephone: 402/471-0528

Type of Fiscal Impact:

	State Agency	Political Sub.	Regulated Public
No Fiscal Impact	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>)
Increased Costs	(<input type="checkbox"/>)	(<input type="checkbox"/>)	(<input type="checkbox"/>)
Decreased Costs	(<input type="checkbox"/>)	(<input type="checkbox"/>)	(<input type="checkbox"/>)
Increased Revenue	(<input type="checkbox"/>)	(<input type="checkbox"/>)	(<input type="checkbox"/>)
Decreased Revenue	(<input type="checkbox"/>)	(<input type="checkbox"/>)	(<input type="checkbox"/>)
Indeterminable	(<input type="checkbox"/>)	(<input type="checkbox"/>)	(<input type="checkbox"/>)

Provide an Estimated Cost & Description of Impact:

State Agency:

Political Subdivision:

Regulated Public:

If indeterminable, explain why:

TITLE 180 CONTROL OF RADIATION

CHAPTER 5 RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL
RADIOGRAPHIC OPERATIONS COMPATIBILITY CHAPTER

001. SCOPE AND AUTHORITY. 180 Nebraska Administrative Code (NAC) 5 prescribes requirements for the issuance of licenses or registrations for the industrial use of sources of radiation and radiation safety requirements for persons using these sources of radiation in industrial radiography. The regulations are authorized by and implement the Nebraska Radiation Control Act, Nebraska Revised Statute (Neb. Rev. Stat.) §§ 71-3501 to 71-3520.

001.01 GENERAL PROVISIONS. The provisions and requirements of 180 NAC 5 are in addition to, and not in substitution for, other requirements of Title 180. In particular, the general requirements and provisions of 180 NAC 1, 2, 3, 4, 10, 13, and 18 apply to applicants, licensees and registrants subject to 180 NAC 5. 180 NAC 5 does not apply to medical uses of sources of radiation which are addressed in 180 NAC 6, 7 and 20.

001.02 CODE OF FEDERAL REGULATIONS. 21 Code of Federal Regulations (CFR) as published on April 1, 2014 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

001.03 NATIONAL BUREAU OF STANDARDS HANDBOOK. National Bureau of Standards Handbook 136 issued 1-1981 as referred to in this Chapter is herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

002. DEFINITIONS. As used in 180 NAC 5, the following definitions apply:

002.01 ANNUAL REFRESHER SAFETY TRAINING. Annual refresher training is a review conducted or provided by the licensee or registrant for its employees on radiation safety aspects of industrial radiography. The review must include, as a minimum, any results of internal inspections, new procedures or equipment, new or revised regulations, and accidents or errors that have been observed. The review must also provide opportunities for employees to ask safety questions.

002.02 ASSOCIATED EQUIPMENT. Associated equipment is used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides, or comes

in contact with the source. Associated equipment includes, but is not limited to the guide tube, control or drive cable, removable stop, and the "J" tube and collimator when used as an exposure head.

002.03 CABINET RADIOGRAPHY. Cabinet radiography is industrial radiography conducted in an enclosure or cabinet so shielded that radiation levels at every location on the exterior meet the limitations specified in 180 NAC 4-013.01, 4-013.02, and 4-013.03.

002.04 CABINET X-RAY SYSTEM. A cabinet x-ray system is an x-ray system with the x-ray tube installed in an enclosure that is independent of existing architectural structures except the floor. The cabinet x-ray system is intended to contain at least that portion of a material being irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of radiation. Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities. An x-ray tube used within a shielded part of a building, or x-ray equipment which may temporarily or occasionally incorporate portable shielding is not considered a cabinet x-ray system.

002.05 CAMERA. Camera has the same meaning as radiographic exposure device.

002.06 CERTIFYING ENTITY. A certifying entity is an independent certifying organization meeting the requirements in Appendix A of 180 NAC 5 or a state regulatory program meeting the requirements in Appendix A, Parts II and III of 180 NAC 5.

002.07 COLLIMATOR. A collimator is 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.

002.08 CONTROL CABLE. A control cable is a cable connected to the source assembly and used to drive the source to and from the exposure location. A control cable is also known as a drive cable.

002.09 CONTROL DRIVE MECHANISM. A control drive mechanism is a device that enables the source assembly to be moved into and out of the exposure device.

002.10 CONTROL TUBE. The control tube is a protective sheath for guiding the control cable. The control tube connects the control drive mechanism to the radiographic exposure device.

002.11 DRIVE CABLE. Drive cable has the same meaning as control cable.

002.12 EXPOSURE HEAD. Device that locates the gamma radiography sealed source in the selected working position is an exposure head. An exposure head is also known as a source stop.

002.13 FIELD STATION. A facility where sources of radiation may be stored or used and from which equipment is dispatched is a field station.

002.14 GUIDE TUBE. A flexible or rigid tube or "J" tube for guiding the source assembly and the attached control cable from the exposure device to the exposure head is a guide tube.

The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head. A guide tube is also known as a projection sheath.

002.15 HANDS-ON EXPERIENCE. Hands-on experience is experience in all of those areas considered to be directly involved in the radiography process that includes, but is not limited to taking radiographs, calibration of survey instruments, operational and performance testing of survey instruments and devices, film development, posting of radiation areas, transportation of radiography equipment, posting of records and radiation area surveillance, as applicable.

002.16 INDEPENDENT CERTIFYING ORGANIZATION. An independent organization that meets all of the criteria of Appendix A to 180 NAC 5 is an independent certifying organization.

002.17 INDUSTRIAL RADIOGRAPHY. Industrial radiography is the examination of the structure of materials by nondestructive methods using sources of ionizing radiation to produce radiographic images. Industrial radiography is also known as radiography.

002.18 PERMANENT RADIOGRAPHIC INSTALLATION. A permanent radiographic installation is an enclosed shielded room, cell, or vault, not located at a temporary jobsite, in which radiography is performed.

002.19 PIGTAIL. Pigtail has the same meaning as source assembly.

002.20 PRACTICAL EXAMINATION. A demonstration through application of the safety rules and principles in industrial radiography including use of all procedures and equipment to be used by radiographic personnel is a practical examination.

002.21 PROJECTOR. Projector has the same meaning as radiographic exposure device.

002.22 RADIATION SAFETY OFFICER FOR INDUSTRIAL RADIOGRAPHY. A radiation safety officer for industrial radiography is an individual with the responsibility for the overall radiation safety protection program on behalf of the licensee or registrant and who meets the requirements of 180 NAC 5-015.

002.23 RADIOGRAPHER. A radiographer is any individual who performs or who, in attendance at the site where the sources of radiation are being used, personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of the Department's regulations and the conditions of the license or registration.

002.24 RADIOGRAPHER'S ASSISTANT. A radiographer's assistant is any individual who under the direct supervision of a radiographer, uses radiographic exposure devices, sources of radiation, related handling tools, or radiation survey instruments in industrial radiography.

002.25 RADIOGRAPHER CERTIFICATION. Radiographer certification is written approval received from a certifying entity stating that an individual has satisfactorily met the radiation safety, testing, and experience criteria in 180 NAC 15-016.

002.26 RADIOGRAPHIC EXPOSURE DEVICE. A radiographic exposure device is any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure. A radiographic exposure device is also known as a camera or projector.

002.27 RADIOGRAPHIC OPERATIONS. Radiographic operations are all activities performed with a radiographic exposure device, or with a radiation machine. Activities include using, transporting, except by common or contract carriers, or storing a temporary job site, performing surveys to confirm the adequacy of boundaries, setting up equipment, and any activity inside restricted area boundaries. Transporting a radiation machine is not considered a radiographic operation.

002.28 RADIOGRAPHY. See Industrial radiography.

002.29 S-TUBE. An S-tube is a tube through which the radioactive source travels when inside a radiographic exposure device.

002.30 SEALED SOURCE. Sealed source has the same meaning as 180 NAC 1-002.

002.31 SHIELDED POSITION. A shielded position is a location within the radiographic exposure device, source changer or storage container that, by manufacturer's design, is the proper location for storage of the sealed source.

002.32 SOURCE ASSEMBLY. A source assembly consists of the sealed source and a connector that attaches the source to the control cable. The source assembly may include a ballstop to secure the source in the shielded position. A source assembly is also known as a pigtail.

002.33 SOURCE CHANGER. A source changer is a device designed and used for replacement of sealed sources in radiographic exposure devices. A source changer may also be used for transporting and storing sealed sources.

002.34 STORAGE AREA. A storage area is any location, facility, or vehicle that is used to store and secure a radiographic exposure device, a radiation machine, sealed source, or a storage container, when it is not used for radiographic operations. Storage areas are locked or have a physical barrier to prevent accidental exposure, tampering, or unauthorized removal of the device, machine, or container.

002.35 STORAGE CONTAINER. A storage container is a device in which sealed sources or radiation machines are secured or stored.

002.36 TEMPORARY JOB SITE. A temporary job site is a location where radiographic operations are performed and where sources of radiation may be stored other than the location(s) of use authorized on the license or registration.

002.37 UNDERWATER RADIOGRAPHY. Radiographic operations performed when the radiographic exposure device or radiation machine or related equipment, or both, are beneath the surface of the water is underwater radiography.

003. EXEMPTIONS. Industrial uses of hand-held light intensified imaging devices are exempt from the requirements in 180 NAC 5 if the dose rate 18 inches from the source of radiation to any individual does not exceed 2 millirem per hour. Devices which exceed this limit must meet the applicable requirements of 180 NAC 5 and the licensing or registration requirements of 180 NAC 2 or 180 NAC 3, as applicable.

004. LICENSING AND REGISTRATION REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHY OPERATIONS. The licensing and registration requirements for industrial radiography operations are as follows.

004.01 APPLICATION REQUIREMENTS. In addition to paying the applicable fees specified 180 NAC 18, an application for specific license for the use of licensed material or a registration for use of radiation machines must include the following.

- (A) The applicant satisfies the general requirements specified in 180 NAC 2 for radiation machine facilities or 180 NAC 3 for radioactive material, as applicable, and any special requirements contained in 180 NAC 5;
- (B) The applicant submits an adequate program for training radiographers and radiographer's assistants that meets the requirements of 180 NAC 5-016;
- (C) The applicant submits procedures for verifying and documenting the certification status of radiographers and for ensuring that the certification of individuals acting as radiographers remains valid;
- (D) The applicant submits written operating and emergency procedures as described in 180 NAC 5-017;
- (E) The applicant submits a description of a program for inspections of the job performance of each radiographer and radiographer's assistant at intervals not to exceed six months as described in 180 NAC 5-016.05;
- (F) The applicant submits a description of the applicant's overall organizational structure as it applies to the radiation safety responsibilities in industrial radiography, including specified delegation of authority and responsibility;
- (G) The applicant submits the qualifications of the individual or individuals designated as the radiation safety officer as described in 180 NAC 5-015.01;
- (H) If an applicant intends to perform leak testing of sealed sources or exposure devices containing depleted uranium (DU) shielding, the applicant must describe the procedures for performing the test and the qualifications of the person or persons authorized to do the leak testing. If the applicant intends to analyze its own wipe samples, the application must include a description of the procedures to be followed. The description must include the:
 - (i) Methods of collecting the samples;
 - (ii) Qualifications of the individual who analyzes the samples;
 - (iii) Instruments to be used; and
 - (iv) Methods of analyzing the samples.
- (I) If the applicant intends to perform calibrations of survey instruments and alarming ratemeters, the applicant must describe methods to be used and the experience of the person or persons who will perform the calibrations. All calibrations must be

- performed according to the procedures described and at the intervals prescribed in 180 NAC 5-008 and 180 NAC 5-019.07(D).
- (J) The applicant identifies and describes the location or locations of all field stations and permanent radiographic installations.
 - (K) The applicant identifies the location or locations where all records required by Title 180 will be maintained.
 - (L) If an application includes underwater radiography, a description of:
 - (i) Radiation safety procedures and radiographer responsibilities unique to the performance of underwater radiography;
 - (ii) Radiographic equipment and radiation safety equipment unique to underwater radiography; and
 - (iii) Methods for gas-tight encapsulation of equipment.

005. PERFORMANCE REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHY EQUIPMENT. Equipment used in industrial radiographic operations must meet the following requirements.

005.01 DESIGN STANDARDS. Each radiographic exposure device, source assembly or sealed source, and all associated equipment must 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 "NBS Handbook 136, issued January 1981". This publication has been incorporated herein by reference and is available for viewing at the Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

005.02 ADDITIONAL REQUIREMENTS. In addition to the requirements specified in 180 NAC 5-005.01, the following requirements apply to radiographic exposure devices, source changers, source assemblies and sealed sources:

- (A) The licensee must ensure that each radiographic exposure device has attached to it a durable, legible, clearly visible label bearing the:
 - (i) Chemical symbol and mass number of the radionuclide in the device;
 - (ii) Activity and the date on which this activity was last measured;
 - (iii) Model or product code and serial number of the sealed source;
 - (iv) Name of the manufacturer of the sealed source; and
 - (v) Licensee's name, address, and telephone number;
- (B) Radiographic exposure devices intended for use as Type B packages must meet the applicable transportation requirements of 180 NAC 13; and
- (C) Modification of radiographic exposure devices, source changers, and source assemblies and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system.

005.03 ADDITIONAL REQUIREMENTS FOR COMPONENTS THAT ALLOW THE SOURCE TO BE MOVED OUT OF THE DEVICE. In addition to the requirements specified in 180 NAC 5-005.01 and 5-005.02, the following requirements apply to radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the device for radiographic operations or to source changers:

- (A) The coupling between the source assembly and the control cable must be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling must be such that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions;
- (B) The device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. This securing system may only be released by means of a deliberate operation on the exposure device;
- (C) The outlet fittings, lock box, and drive cable fittings on each radiographic exposure device must be equipped with safety plugs or covers which must be installed during storage and transportation to protect the source assembly from water, mud, sand or other foreign matter;
- (D) Each sealed source or source assembly must have attached to it or engraved on it, a durable, legible, visible label with the words:

“DANGER -- RADIOACTIVE”

- The label may not interfere with the safe operation of the exposure device or associated equipment;
- (E) The guide tube must be able to withstand a crushing test that closely approximates the crushing forces that are likely to be encountered during use, and be able to withstand a kinking resistance test that closely approximates the kinking forces that are likely to be encountered during use;
- (F) Guide tubes must be used when moving the source out of the device;
- (G) An exposure head or similar device designed to prevent the source of assembly from passing out of the end of the guide tube must be attached to the outermost end of the guide tube during the industrial radiography operations;
- (H) The guide tube exposure head connection must be able to withstand the tensile test for control units specified in American National Standards Institute (ANSI), N432-1980; and
- (I) Source changes must provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.

005.04 EXCEPTION. As an exception to 180 NAC 5-005.01, equipment used in industrial radiographic operations need not comply with Section 8.9.2(c) of the Endurance Test in American National Standards Institute (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 can reasonably exert on the lever or crankshaft of the drive mechanism.

006. LIMITS ON EXTERNAL RADIATION LEVELS FROM STORAGE CONTAINERS AND SOURCE CHANGERS. The maximum exposure rate limits for storage containers and source changers are 2 millisieverts (200 mrem) per hour at any exterior surface, and 0.1 millisieverts (10 mrem) per hour at 1 meter from any exterior surface with the sealed source in the shielded position.

007. LOCKING OF SOURCES OF RADIATION, STORAGE CONTAINERS AND SOURCE CHANGERS. Sources of radiation, storage containers and sources changers must have locks as described as follows.

007.01 RADIOGRAPHIC EXPOSURE DEVICE. Each radiographic exposure device must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The exposure device or its container, or both, must be kept locked, and if a keyed-lock, with the key removed at all times, when not under the direct surveillance of a radiographer or a radiographer's assistant except at permanent radiographic installations as stated in 180 NAC 5-021. In addition, during radiographic operations the sealed source assembly must be secured in a shielded position each time the source is returned to that position.

007.02 SEALED SOURCE STORAGE CONTAINER OR SOURCE CHANGER. Each sealed source storage container and source changer must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers must be kept locked (and if a keyed-lock, with the key removed at all times) when containing sealed sources except when under the direct surveillance of a radiographer or a radiographer's assistant.

007.03 RADIATION MACHINE. The control panel of each radiation machine must be equipped with a lock that will prevent the unauthorized use of a x-ray system or the accidental production of radiation. The radiation machine must be kept locked and the key removed at all times except when under the direct visual surveillance of a radiographer or a radiographer's assistant.

008. RADIATION SURVEY INSTRUMENTS. Radiation survey instruments must meet the following requirements.

008.01 INSTRUMENT PERFORMANCE REQUIREMENTS. The licensee or registrant must keep sufficient calibrated and operable radiation survey instruments at each location where sources of radiation are present to make the radiation surveys required by 180 NAC 4 and 180 NAC 5. Instrumentation required by 180 NAC 5 must be capable of measuring a range from 0.02 millisieverts (2 mrem) per hour through 0.01 sievert (1 rem) per hour.

008.02 CALIBRATION REQUIREMENTS. The licensee or registrant must have each radiation survey instrument required under 180 NAC 5-008.01 calibrated:

- (A) At energies appropriate for use and at intervals not to exceed six months or after instrument servicing, except for battery changes;
- (B) For linear scale instruments, at two points located approximately one-third and two-thirds of full-scale on each scale; for logarithmic scale instruments, at mid-range of each decade, and at two points of at least one decade; and for digital instruments, at 3 points between 0.02 and 10 millisieverts (2 and 1000 mrem) per hour; and
- (C) So that an accuracy within plus or minus 20% of the true radiation dose rate can be demonstrated at each point checked.

008.03 RECORDS. The licensee or registrant must maintain records of the results of the instrument calibrations as required by 180 NAC 5-025.

009. LEAK TESTING AND REPLACEMENT OF SEALED SOURCES. Sealed sources must be leak tested as follows.

009.01 SEALED SOURCE REPLACEMENT. The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing of any sealed source must be performed by persons authorized to do so by the Department, the U.S. Nuclear Regulatory Commission (NRC), or another Agreement State.

009.02 OPENING REPAIR OR MODIFICATION. The opening, repair, or modification of any sealed source must be performed by persons specifically authorized to do so by the Department, the U.S. Nuclear Regulatory Commission (NRC), or another Agreement State.

009.03 LEAK TESTING AND RECORDKEEPING REQUIREMENTS. The following requirements apply:

- (A) Each licensee who uses a sealed source must have the source tested for leakage at intervals not to exceed six months. The leak testing of the sources must be performed using a method approved by the Department, the U.S. Nuclear Regulatory Commission (NRC), or by another Agreement State. The wipe sample should be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample must be analyzed for radioactive contamination. The analysis must be capable of detecting the presence of 185 becquerel (0.005 μ Ci) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the U.S. Nuclear Regulatory Commission (NRC), or another Agreement State to perform the analysis.
- (B) The licensee must maintain records of the leak tests as required by 180 NAC 5-026.
- (C) Unless a sealed source is accompanied by a certificate from the transferor that shows that it has been leak tested within six months before the transfer, it may not be used by the licensee until tested for leakage. Sealed sources that are in storage and not in use do not require leak testing, but must be tested before use or transfer to another person if the interval of storage exceeds six months.

009.04 LEAKING SOURCES. Any test conducted pursuant to 180 NAC 5-009.02 and 180 NAC 5-009.03 that reveals the presence of 185 becquerel (0.005 μ Ci) or more of removable radioactive material must be considered evidence that the sealed source is leaking. The licensee must immediately withdraw the equipment involved from use and must have it decontaminated and repaired or disposed of as required by Department regulations. A report must be filed with the Department within five days of any test with results that exceed the threshold in 180 NAC 5-009.04, describing the equipment involved, the test results, and the corrective action taken.

009.05 DEPLETED URANIUM LEAK TESTING. Each exposure device using depleted uranium (DU) shielding and an S-tube configuration must be tested for depleted uranium (DU) contamination at intervals not to exceed 12 months. The analysis must be capable of detecting the presence of 185 becquerel (0.005 μ Ci) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the U.S. Nuclear Regulatory Commission (NRC) or another Agreement State to perform the analysis. Should such testing reveal the presence of 185 becquerel (0.005 μ Ci) or more of depleted uranium (DU) contamination, the exposure device must be removed from use until an evaluation of the

wear of the S-tube has been made. Should the evaluation reveal the S-tube is worn through, the device may not be used again. Depleted uranium (DU) shielded devices do not have to be tested for depleted uranium (DU) contamination while not in use and in storage. Before using or transferring such a device, however, the device must be tested for depleted uranium (DU) contamination, if the interval of storage exceeds 12 months. A record of the depleted uranium (DU) leak-test must be made as required by 180 NAC 5-026.

010. QUARTERLY INVENTORY. Licensees must perform a quarterly inventory as required as follows.

010.01 PHYSICAL INVENTORY. Each licensee or registrant must conduct a quarterly physical inventory to account for all sources of radiation, and for devices containing depleted uranium (DU) received and possessed under the license.

010.02 RECORDS. The licensee or registrant must maintain records of the quarterly inventory as required by 180 NAC 5-027.

011. INSPECTION AND MAINTENANCE OF RADIATION MACHINES, RADIOGRAPHIC EXPOSURE DEVICES, TRANSPORT, AND STORAGE CONTAINERS, ASSOCIATED EQUIPMENT, SOURCE CHANGERS, AND SURVEY INSTRUMENTS.

011.01 VISUAL AND OPERABILITY CHECKS. The licensee or registrant must perform visual and operability checks on survey meters, radiation machines, radiographic exposure devices, transport and storage containers, associated equipment and source changers before each day's use, or work shift, to ensure that:

- (A) The equipment is in good working condition;
- (B) The sources are adequately shielded; and
- (C) Required labeling is present.

011.02 SURVEY INSTRUMENT OPERABILITY. Survey instrument operability must be performed using check sources or other appropriate means.

011.03 EQUIPMENT PROBLEMS. If equipment problems are found, the equipment must be removed from service until repaired.

011.04 INSPECTION AND ROUTINE MAINTENANCE. Each licensee or registrant must have written procedures for and perform inspection and routine maintenance of radiation machines, radiographic exposure devices, source changers, associated equipment, transport and storage containers, and survey instruments at intervals not to exceed three months or before the first use thereafter to ensure the proper functioning of components important to safety. If equipment problems are found, the equipment must be removed from service until repaired.

011.05 PACKAGE PROCEDURES. The licensee's inspection and maintenance program must include procedures to assure that Type B packages are shipped and maintained as specified in the certificate of compliance or other approval.

011.06 RECORDS. Records of equipment problems and of any maintenance performed under 180 NAC 5-011 must be made as required by 180 NAC 5-029.

011.07 TRANSPORT CONTAINER INSPECTION AND MAINTENANCE PROGRAM. A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of 180 NAC 5-011 or equivalent U.S. Nuclear Regulatory Commission (NRC) or Agreement State requirement, is deemed to satisfy the requirements of 180 NAC 13-007 and 180 NAC 13-021.

012. PERMANENT RADIOGRAPHIC INSTALLATIONS. The following requirements apply to permanent radiographic installations.

012.01 ENTRANCE. Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation must have either:

- (A) An entrance control of the type described in 180 NAC 4-023.01(A) that causes the radiation level upon entry into the area to be reduced; or
- (B) Both conspicuous visible and audible warning signals to warn of the presence of radiation. The visible sign must be actuated by radiation whenever the source is exposed or the machine is energized. The audible signal must be actuated when an attempt is made to enter the installation while the source is exposed or the machine is energized.

012.02 ALARM SYSTEM TEST. The alarm system must be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test must include a check of both the visible and audible signals. Entrance control devices that reduce the radiation level upon entry as designated in 180 NAC 5-012.01(A) must be tested monthly. If an entrance control device or an alarm is operating improperly, it must be immediately labeled as defective and repaired within 7 calendar days. The facility may continue to be used during this seven day period, provided the licensee or registrant implements the continuous surveillance requirements of 180 NAC 5-021 and uses an alarming ratemeter. Test records for entrance controls and audible and visual alarms must be maintained as required by 180 NAC 5-030.

013. LABELING, STORAGE, AND TRANSPORTATION. Radiography devices must be labelled, transported and secured in a manner that meets the following requirements.

013.01 LABELING. The licensee may not use a source changer or a container to store radioactive material unless the source changer or the storage container has securely attached to it a durable, legible, and clearly visible label bearing the standard trefoil radiation caution symbol conventional colors, that is, magenta, purple or black on a yellow background, having a minimum diameter of 25 mm, and the wording:

CAUTION*
RADIOACTIVE MATERIAL
NOTIFY CIVIL AUTHORITIES (or "NAME OF COMPANY")
* _____ or "DANGER"

013.02 TRANSPORT OF RADIOACTIVE MATERIAL. The licensee may not transport radioactive material unless the material is packaged, and the package is labeled, marked, and accompanied with appropriate shipping papers as required by 180 NAC 13.

013.03 SECURE DEVICE. Radiographic exposure devices, source changers, storage containers, and radiation machines, must be physically secured to prevent tampering or removal by unauthorized personnel. The licensee must store radioactive material in a manner that will minimize danger from explosion or fire.

013.04 SECURE TRANSPORT PACKAGE. The licensee must lock and physically secure the transport package containing radioactive material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal.

013.05 TRANSPORT VEHICLE. The licensee or registrant's name must be prominently displayed with a durable, clearly visible label or labels on both sides of all vehicles used to transport radioactive material or radiation machines for temporary job site use.

014. CONDUCTING INDUSTRIAL RADIOGRAPHIC OPERATIONS. Radiographic operations must be conducted in a manner that meets the following requirements.

014.01 RADIOGRAPHIC PERSONNEL. Whenever radiography is performed at a location other than a permanent radiographic installation, the radiographer must be accompanied by at least one other qualified radiographer or an individual who has at a minimum met the requirements of 180 NAC 5-016.03. The additional qualified individual must observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one qualified individual is present.

014.02 PERMANENT RADIOGRAPHIC INSTALLATION. All radiographic operations must be conducted in a permanent radiographic installation unless otherwise specifically authorized by the Department.

014.03 COLLIMATORS. Except when physically impossible, collimators must be used in industrial radiographic operations that use radiographic exposure devices that allow the source to be moved out of the device.

014.04 LAY-BARGE, OFFSHORE PLATFORM AND UNDERWATER RADIOGRAPHY. A licensee or registrant may conduct lay-barge, offshore platform or underwater radiography only if procedures have been approved by the Department, the U.S. Nuclear Regulatory Commission (NRC), or by another Agreement State.

015. RADIATION SAFETY OFFICER FOR INDUSTRIAL RADIOGRAPHY. The radiation safety officer must ensure that radiation safety activities are being performed as specified in approved procedures and regulatory requirements in the daily operation of the licensee's or registrant's program.

015.01 QUALIFICATIONS, TRAINING AND EXPERIENCE. The minimum qualifications, training, and experience for radiation safety officers for industrial radiography are as follows:

(A) Completion of the training and testing requirements of 180 NAC 5-016.01;

- (B) 2000 hours of hands-on experience as a qualified radiographer in industrial radiographic operations; and
- (C) Formal training in the establishment and maintenance of a radiation safety protection program.

015.02 ALTERNATIVE TRAINING AND EXPERIENCE. The Department will consider alternatives when the radiation safety officer has appropriate training and experience in the field of ionizing radiation, and in addition, has adequate formal training with respect to the establishment and maintenance of a radiation safety protection program.

015.03 DUTIES AND AUTHORITIES. The specific duties and authorities of the radiation safety officer include:

- (A) Establishing and overseeing all operating, emergency, and as low as reasonably achievable (ALARA) procedures as required by 180 NAC 4 and reviewing them regularly to ensure that they conform to Department regulations and the license or registration conditions;
- (B) Overseeing and approving the training program for radiographic personnel to ensure that appropriate and effective radiation protection practices are taught;
- (C) Ensuring that required radiation surveys and leak tests are performed and documented as specified in the regulations, including any corrective measures when levels of radiation exceed established limits;
- (D) Ensuring that personnel monitoring devices are calibrated, if applicable, and used properly; that records are kept of the monitoring results; and that timely notifications are made as required by 180 NAC 4; and
- (E) Ensuring that operations are conducted safely and for implementing corrective actions including terminating operations.

016. TRAINING. Personnel conducting radiographic operations must meet the following training requirements.

016.01 RADIOGRAPHER TRAINING. The licensee or registrant may not permit any individual to act as a radiographer until the individual:

- (A) Has received at least 40 hours of training in the subjects outlined in 180 NAC 5-016.07, in addition to on the job training consisting of hands-on experience under the supervision of a radiographer, and is certified through a radiographer certification program by a certifying entity according to with the criteria specified in Appendix A of 180 NAC 5. The on the job training must include a minimum of two months (320 hours) of active participation in the performance of industrial radiography utilizing radioactive material or one month (160 hours) of active participation in the performance of industrial radiography utilizing radiation machines, or both. Individuals performing industrial radiography utilizing radioactive materials and radiation machines must complete both segments of the on the job training totaling three months (480 hours).

016.02 ADDITIONAL REQUIREMENTS. In addition, the licensee or registrant may not permit any individual to act as a radiographer until the individual:

- (A) Has received copies and instruction in the requirements described in the regulations contained in 180 NAC 5, and applicable chapters of 180 NAC 4, 10, and 13, in the

- license or registration under which the radiographer will perform industrial radiography, and the licensee's or registrant's operating and emergency procedures;
- (B) Has demonstrated an understanding of items in 180 NAC 5-016.02(A) by successful completion of a written or oral examination;
 - (C) Has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure devices, sealed sources, in the daily inspection of devices and associated equipment, and in the use of radiation survey instruments; and
 - (D) Has demonstrated understanding of the use of the equipment described in 180 NAC 5-016.02(C) by successful completion of a practical examination.

016.03 RADIOGRAPHER'S ASSISTANT. The licensee or registrant may not permit any individual to act as a radiographer's assistant until the individual:

- (A) Has received copies of and instruction in the requirements described in the regulations contained in 180 NAC 5, and applicable 180 NAC 4, 10, and 13, in the license or registration under which the radiographer's assistant will perform industrial radiography, and the licensee's or registrant's operating and emergency procedures;
- (B) Has demonstrated an understanding of items 180 NAC 5-016.03(A) by successful completion of a written or oral examination;
- (C) Under the personal supervision of a radiographer, has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure devices and sealed sources, in the daily inspection of devices and associated equipment, and in the use of radiation survey instruments; and
- (D) Has demonstrated understanding of the use of the equipment described in 180 NAC 5-016.03(C) by successful completion of a practical examination.

016.04 ANNUAL REFRESHER SAFETY TRAINING. The licensee or registrant must provide annual refresher safety training for each radiographer and radiographer's assistant at intervals not to exceed 12 months.

016.05 JOB PERFORMANCE INSPECTION PROGRAM. Except as provided in 180 NAC 5-016.05(D), the radiation safety officer or designee must conduct an inspection program of the job performance of each radiographer and radiographer's assistant to ensure that the Department's regulations, license or registration requirements, and the applicant's operating and emergency procedures are followed.

- (A) The inspection program must include observation of the performance of each radiographer and radiographer's assistant during an actual industrial radiographic operation, at intervals not to exceed six months; and
- (B) The inspection program must provide that, if a radiographer or a radiographer's assistant has not participated in an industrial radiographic operation for more than six months since the last inspection, the radiographer must demonstrate knowledge of the training requirements of 180 NAC 5-016.02(C) and the radiographer's assistant must demonstrate knowledge of the training requirements of 180 NAC 5-016.03(C) by a practical examination before these individuals can next participate in a radiographic operation.
- (C) In situations where the individual serves as both radiographer and radiation safety officer, the license or registrant must contact the Department for approval of alternative methods of meeting the requirements of 180 NAC 016.05.

- (D) In those operations where a single individual serves as both radiographer and radiation safety officer, and performs all radiography operations, an inspection program is not required.

016.06 TRAINING RECORD MAINTENANCE. The licensee or registrant must maintain records of the above training to include certification documents, written, oral and practical examinations, refresher safety training and inspections of job performance as required by 180 NAC 5-031.

016.07 TRAINING SUBJECT REQUIREMENTS. The licensee or registrant must include the following subjects required in 180 NAC 5-016.01:

- (A) Fundamentals of radiation safety including:
- (i) Characteristics of gamma and x-radiation;
 - (ii) Units of radiation dose and quantity of radioactivity;
 - (iii) Hazards of exposure to radiation;
 - (iv) Levels of radiation from sources of radiation; and
 - (v) Methods of controlling radiation dose (time, distance, and shielding);
- (B) Radiation detection instruments including:
- (i) Use, operation, calibration, and limitations of radiation survey instruments;
 - (ii) Survey techniques; and
 - (iii) Use of personnel monitoring equipment;
- (C) Equipment to be used including:
- (i) Operation and control of radiographic exposure equipment, remote handling equipment, and storage containers, including pictures or models of source assemblies (pigtailed);
 - (ii) Operation and control of radiation machines;
 - (iii) Storage, control, and disposal of sources of radiation; and
 - (iv) Inspection and maintenance of equipment;
- (D) The requirements of pertinent state and federal regulations; and
- (E) Case histories of accidents in radiography.

016.08 RADIOGRAPHER CERTIFICATION RECORDS. Records of radiographer certification maintained as required by 180 NAC 5-031.01 provide documentation of certification requirements specified in 180 NAC 5-016.01.

017. OPERATING AND EMERGENCY PROCEDURES. Licensees and registrants must have and follow operating and emergency procedures.

017.01 PROCEDURE CONTENT. Operating and emergency procedures must include, as a minimum, instructions in the following:

- (A) Appropriate handling and use of sources of radiation so that no person is likely to be exposed to radiation doses in excess of the limits established in 180 NAC 4;
- (B) Methods and occasions for conducting radiation surveys;
- (C) Methods of posting and controlling access to radiographic areas;
- (D) Methods and occasions for locking and securing sources of radiation;
- (E) Personnel monitoring and the use of personnel monitoring equipment;

- (F) Transporting equipment to field locations, including packing of radiographic exposure devices and storage containers in the vehicles, placarding of vehicles when needed, and control of the equipment during transportation as described in 180 NAC 13;
- (G) The inspection, maintenance, and operability checks of radiographic exposure devices, radiation machines, survey instruments, alarming ratemeters, transport containers, and storage containers;
- (H) Steps that must be taken immediately by radiography personnel in the event a pocket dosimeter is found to be off-scale or an alarming ratemeter alarms unexpectedly;
- (I) The procedure for identifying and reporting defects and noncompliance, as required by 180 NAC 5-037;
- (J) The procedure for notifying proper persons in the event of an accident or incident;
- (K) Minimizing exposure of persons in the event of an accident or incident, including a source disconnect, a transport accident, or loss of a source of radiation;
- (L) Source recovery procedure if licensee will perform source recoveries; and
- (M) Maintenance of records.

017.02 MAINTENANCE OF PROCEDURES. The licensee or registrant must maintain copies of current operating and emergency procedures as required by 180 NAC 5-032 and 180 NAC 5-036.

018. SUPERVISION OF RADIOGRAPHERS' ASSISTANTS. Radiographer's assistance must be supervised as follows.

018.01 PERSONAL SUPERVISION. The radiographer's assistant must be under the personal supervision of a radiographer when using sources of radiation or conducting radiation surveys required by 180 NAC 5-020.02 to determine that the sealed source has returned to the shielded position or the radiation machine is off after an exposure. The personal supervision must include:

- (A) The radiographer's physical presence at the site where the sources of radiation are being used;
- (B) The availability of the radiographer to give immediate assistance if required; and
- (C) The radiographer's direct observation of the assistant's performance of the operations referred to in 180 NAC 5-018.01.

019. PERSONNEL MONITORING. Personnel must be monitored for exposure to radiation as follows.

019.01 DIRECT READING DOSIMETER, ALARMING RATE METER AND PERSONNEL DOSIMETER. The licensee or registrant may not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each individual wears, on the trunk of the body, a direct reading dosimeter, an operating alarming ratemeter, and a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor. At permanent radiography installations where other appropriate alarming or warning devices are in routine use, the use of an alarming ratemeter is not required.

- (A) Pocket dosimeters must have a range from zero to 2 millisieverts (200 mrem) and must be recharged at the start of each shift. Electronic personal dosimeters may only be used in place of ion-chamber pocket dosimeters.

- (B) Each personnel dosimeter must be assigned to and worn by only one individual;
- (C) Film badges must be replaced at periods not to exceed one month and other personnel dosimeters processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor must be replaced at periods not to exceed three months.
- (D) After replacement, each personnel dosimeter must be processed as soon as possible.

019.02 BEGINNING AND END OF SHIFT. Direct reading dosimeters such as pocket dosimeters or electronic personal dosimeters, must be read and the exposures recorded at the beginning and end of each shift, and records must be maintained as required by 180 NAC 5-033.

019.03 RESPONSE TO RADIATION CHECK. Pocket dosimeters, or electronic personal dosimeters, must be checked at periods not to exceed 12 months for correct response to radiation, and records must be maintained as required by 180 NAC 5-033. Acceptable dosimeters must read within plus or minus 20% of the true radiation exposure.

019.04 PERSONNEL DOSIMETER PROCESSING. If an individual's pocket dosimeter is found to be off-scale, or if the individual's electronic personal dosimeter reads greater than 2 millisieverts (200 mrem), and the possibility of radiation exposure cannot be ruled out as the cause, the individual's personnel dosimeter must be sent for processing within 24 hours. In addition, the individual may not resume work associated with sources of radiation until a determination of the individual's radiation exposure has been made. This determination must be made by the radiation safety officer or the radiation safety officer's designee. The results of this determination must be included in the records maintained as required by 180 NAC 5-033.

019.05 LOST OR DAMAGED PERSONNEL DOSIMETER. If the personnel dosimeter that is required by 180 NAC 5-019 is lost or damaged, the worker must cease work immediately until a replacement personnel dosimeter meeting the requirements of 180 NAC 5-019 is provided and the exposure is calculated for the time period from issuance to loss or damage of the personnel dosimeter. The results of the calculated exposure and the time period for which the personnel dosimeter was lost or damaged must be included in the records maintained as required by 180 NAC 5-033.

019.06 RECORD RETENTION. Dosimetry reports received from the accredited National Voluntary Laboratory Accreditation Program (NVLAP) personnel dosimeter processor must be retained as required by 180 NAC 5-033.

019.07 ALARMING RATEMETER. Each alarming ratemeter must:

- (A) Be checked to ensure that the alarm functions properly before using at the start of each shift;
- (B) Be set to give an alarm signal at a preset dose rate of 5 millisieverts per hour (500 mrem/hr); with an accuracy of plus or minus 20% of the true radiation dose rate;
- (C) Require special means to change the preset alarm function; and

- (D) Be calibrated at periods not to exceed 12 months for correct response to radiation. The licensee must maintain records of alarming ratemeter calibrations as required by 180 NAC 5-033.

020. RADIATION SURVEYS. The licensee or registrant must conduct radiation surveys as follows.

020.01 SURVEY INSTRUMENT REQUIREMENTS. Conduct all surveys with a calibrated and operable radiation survey instrument that meets the requirements of 180 NAC 5-008;

020.02 EACH EXPOSURE SURVEY. Conduct a survey of the radiographic exposure device and guide tube after each exposure when approaching the device or the guide tube. The survey must determine that a sealed source has returned to its shielded position before exchanging films, repositioning the exposure head, or dismantling equipment. Radiation machines must be surveyed after each exposure to determine that the machine is off.

020.03 SOURCE EXCHANGE AND STORAGE SURVEY. Conduct a survey of the radiographic exposure device whenever the source is exchanged and whenever a radiographic exposure devices is placed in a storage area as defined in 180 NAC 5-002, to ensure that the sealed source is in its shielded position.

020.04 RADIATION SURVEY RECORD MAINTENANCE. Maintain records as required by 180 NAC 5-034.

021. SURVEILLANCE. During each radiographic operation, the radiographer must ensure continuous direct visual surveillance of the operation to protect against unauthorized entry into a radiation area or a high radiation area, as defined in 180 NAC 1 except at permanent radiographic installations where all entryways are locked and the requirements of 180 NAC 5-012 are met.

022. POSTING. All areas in which industrial radiography is being performed must be conspicuously posted as required by 180 NAC 4-034. The exceptions listed in 180 NAC 4-035 do not apply to industrial radiographic operations.

023. RECORDS FOR INDUSTRIAL RADIOGRAPHY. Each licensee or registrant must maintain a copy of its license or registration, documents incorporated by reference, and amendments to each of these items until superseded by new documents approved by the Department, or until the Department terminates the license or registration.

024. RECORDS OF RECEIPT AND TRANSFER OF SOURCES OF RADIATION. Records of the receipt and transfer of radiation sources must meet the following requirements.

024.01 RECEIPT AND TRANSFER. Each licensee or registrant must maintain records showing the receipts and transfers of sealed sources, devices for using depleted uranium (DU) for shielding, and radiation machines, and retain each record for three years after it is made.

024.02 RECORD CONTENT. These records must include the date, the name of the individual making the record, radionuclide, number of becquerels or curies, or mass for depleted

uranium (DU), and manufacturer, model, and serial number of each source of radiation or device, or both, as appropriate.

025. RECORDS OF RADIATION SURVEY INSTRUMENTS. Each licensee or registrant must maintain records of the calibrations of its radiation survey instruments that are required under 180 NAC 5-008 and retain each record for three years after it is made.

026. RECORDS OF LEAK TESTING OF SEALED SOURCES AND DEVICES CONTAINING DEPLETED URANIUM (DU). Each licensee must maintain records of leak test results for sealed sources and for devices containing depleted uranium (DU). The results must be stated in units of becquerels or microcuries. The licensee must retain each record for three years after it is made or until the source in storage is removed.

027. RECORDS OF QUARTERLY INVENTORY. Quarterly inventory records must be maintained.

027.01 MAINTENANCE OF RECORD. Each licensee or registrant must maintain records of the quarterly inventory of sources of radiation, including devices containing depleted uranium (DU) as required by 180 NAC 5-010, and retain each record for three years from the date of inventory.

027.02 RECORD CONTENT. The record must include the date of the inventory, name of the individual conducting the inventory, radionuclide, number of becquerels or curies, or mass for depleted uranium (DU) in each device, location of sources of radiation or devices, or both, and manufacturer, model, and serial number of each source of radiation or device, or both, as appropriate.

028. UTILIZATION LOGS. A log showing the utilization of each source of radiation must be made.

028.01 UTILIZATION LOG CONTENTS. Each licensee or registrant must maintain utilization logs showing for each source of radiation the following information:

- (A) A description, including the make, model, and serial number of the radiation machine or the radiographic exposure device, transport, or storage container in which the sealed source is located;
- (B) The identity and signature of the radiographer to whom assigned;
- (C) The location and dates of use, including the dates removed and returned to storage; and
- (D) For permanent radiographic installations, the dates each radiation machine is energized.

028.02 UTILIZATION LOG RETENTION. The licensee or registrant must retain the logs required by 180 NAC 5-028.01 for three years after the log is made.

029. RECORDS OF INSPECTION AND MAINTENANCE OF RADIATION MACHINES, RADIOGRAPHIC EXPOSURE DEVICES, TRANSPORT, AND STORAGE CONTAINERS, ASSOCIATED EQUIPMENT, SOURCE CHANGERS, AND SURVEY INSTRUMENTS.

029.01 EQUIPMENT PROBLEMS. Each licensee or registrant must maintain records specified in 180 NAC 5-011 of equipment problems found in daily checks and quarterly inspections of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments; and retain each record for three years after it is made.

029.02 RECORD CONTENT. The record must include the date of check or inspection, name of inspector, equipment involved, any problems found, and what repair or maintenance, or both, if any, was performed.

030. RECORDS OF ALARM SYSTEM AND ENTRANCE CONTROL CHECKS AT PERMANENT RADIOGRAPHIC INSTALLATIONS. Each licensee or registrant must maintain records of alarm systems and entrance control device tests required by 180 NAC 5-012 and retain each record for three years after the record is made.

031. RECORDS OF TRAINING AND CERTIFICATION. Records of training and certification must be maintained as follows.

031.01 RECORDS. Each licensee or registrant must maintain the following records for three years:

- (A) Training of each radiographer and each radiographer's assistant. The record must include radiographer certification documents and verification of certification status, copies of written tests, dates of oral and practical examinations, names of individuals conducting and receiving the oral and practical examinations, and a list of items tested and the results of the oral and practical examinations; and
- (B) Annual refresher safety training and semi-annual inspections of job performance for each radiographer and each radiographer's assistant. The records must list the topics discussed during the refresher safety training, the dates the annual refresher safety training was conducted, and names of the instructors and attendees. For inspections of job performance, the records must also include a list showing the items checked and any non-compliance observed by the radiation safety officer or designee.

032. COPIES OF OPERATING AND EMERGENCY PROCEDURES. Each licensee or registrant must maintain a copy of current operating and emergency procedures until the Department terminates the license or registration. Superseded material must be retained for three years after the change is made.

033. RECORDS OF PERSONNEL MONITORING. Personnel monitoring records must be maintained as follows.

033.01 EXPOSURE RECORD MAINTENANCE. Each licensee or registrant must maintain the following exposure records specified in 180 NAC 5-019:

- (A) Direct reading dosimeter readings and yearly operability checks required by 180 NAC 5-019.02 and 5-019.03 for three years after the record is made;
- (B) Records of alarming ratemeter calibrations three years after the record is made;
- (C) Personnel dosimeter results received from the accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor until the Department terminates the license or registration; and

- (D) Records of estimates of exposures as a result of off-scale personal direct reading dosimeters, or lost or damaged personnel dosimeters until the Department terminates the license or registration.

034. RECORDS OF RADIATION SURVEYS. Each licensee must maintain a record of each exposure device survey conducted before the device is placed in storage as specified in 180 NAC 5-020.03. Each record must be maintained for three years after the record is made.

035. FORM OF RECORDS. Each record required by 180 NAC 5 must be legible throughout the specified retention period. The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of reproducing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability of producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials and signatures. The licensee or registrant must maintain adequate safeguards against tampering with and the loss of records.

036. LOCATION OF DOCUMENTS AND RECORDS. Documents and records must be maintained as follows.

036.01 LOCATION. Each licensee or registrant must maintain copies of records required by 180 NAC 5 and other applicable chapters of Title 180 at the location or locations specified in 180 NAC 5-004.01(K).

036.02 ADDITIONAL REQUIREMENTS. Each licensee or registrant must also maintain current copies of the following documents and records sufficient to demonstrate compliance at each applicable field station and each temporary jobsite:

- (A) The license or registration authorizing the use of sources of radiation;
- (B) A copy of 180 NAC 1, 4, 5, and 10;
- (C) Utilization logs for each source of radiation dispatched from the location as required by 180 NAC 5-028;
- (D) Records of equipment problems identified in daily checks of equipment as required by 180 NAC 5-029.01;
- (E) Records of alarm system and entrance control checks required by 180 NAC 5-030, if applicable;
- (F) Records of dosimeter readings as required by 180 NAC 5-033;
- (G) Operating and emergency procedures required by 180 NAC 5-032;
- (H) Evidence of the latest calibrations and of radiation survey instruments in use at the site, as required by 180 NAC 5-025;
- (I) Evidence of the latest calibrations of alarming ratemeters and operability checks of dosimeters as required by 180 NAC 5-033;
- (J) Survey records as required by 180 NAC 5-034 and 180 NAC 4-049 as applicable, for the period of operation at that site;
- (K) The shipping papers for the transportation of radioactive materials required by 180 NAC 013; and

- (L) When operating under reciprocity pursuant to 180 NAC 3 or registration pursuant to 180 NAC 2, a copy of the applicable state license or registration, or U.S. Nuclear Regulatory Commission (NRC) license authorizing the use of sources of radiation.

037. NOTIFICATIONS. Notifications must be made to the Department as follows.

037.01 WRITTEN REPORT. In addition to the reporting requirements specified in 180 NAC 3-026 and 180 NAC 4, each licensee or registrant must provide a written report to the Department within 30 days of the occurrence of any of the following incidents involving radiographic equipment:

- (A) Unintentional disconnection of the source assembly from the control cable;
- (B) Inability to retract the source assembly to its fully shielded position and secure it in this position;
- (C) Failure of any component, which is critical to safe operation of the device, to properly perform its intended function; or
- (D) An indicator on a radiation machine fails to show that radiation is being produced, an exposure switch fails to terminate production of radiation when turned to the off position, or a safety interlock fails to terminate x-ray production.

037.02 WRITTEN REPORT CONTENT. The licensee or registrant must include the following information in each report submitted under 180 NAC 5-037.01, and in each report of overexposure submitted under 180 NAC 4-060 which involves failure of safety components of radiography equipment:

- (A) Description of the equipment problem;
- (B) Cause of each incident, if known;
- (C) Name of the manufacturer and model number of equipment involved in the incident;
- (D) Place, date, and time of the incident;
- (E) Actions taken to establish normal operations;
- (F) Corrective actions taken or planned to prevent recurrence; and
- (G) Names and qualifications of personnel involved in the incident.

037.03 LIMITATIONS. Any licensee or registrant conducting radiographic operations or storing sources of radiation at any location not listed on the license or registration for a period in excess of 180 days in a calendar year, must notify the Department prior to exceeding the 180 days.

038. RECIPROCITY. The requirements for reciprocal recognition of licenses and individual radiographer certification are as follows.

038.01 RECIPROCAL RECOGNITION OF LICENSES. Licensees requesting reciprocal recognition of a license must meet the requirements of 180 NAC 3-028.

038.02 RECIPROCAL RECOGNITION OF INDIVIDUAL RADIOGRAPHER CERTIFICATION. Applicants requesting reciprocal recognition of an individual radiographer certification must ensure that:

- (A) The individual holds a valid certification in the appropriate category issued by a certifying entity, as defined in 180 NAC 5-002;

- (B) The requirements and procedures of the certifying entity issuing the certification affords the same or comparable certification standards as those afforded by 180 NAC 5-016.01;
- (C) The applicant presents the certification to the Department prior to the entry into the state; and
- (D) No escalated enforcement action is pending with the U.S. Nuclear Regulatory Commission (NRC) or in any other state.

038.03 EXPIRATION OF CERTIFICATION. Certified individuals who are granted reciprocity by the Department must maintain the certification upon which the reciprocal recognition was granted, or prior to the expiration of such certification, must meet the requirements of 180 NAC 5-016.01.

039. SPECIFIC REQUIREMENTS FOR RADIOGRAPHIC PERSONNEL PERFORMING INDUSTRIAL RADIOGRAPHY. Requirements for items that must be available at job sites are as follows.

039.01 JOB SITE REQUIREMENTS. At a job site, the following must be supplied by the licensee or registrant:

- (A) At least one operable, calibrated survey instrument for each exposure device or radiation machine in use;
- (B) A current whole body personnel monitor dosimeter, film badge, thermoluminescence dosimeter (TLD) or optically stimulated luminescence dosimeter (OSLD), that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor for each person performing radiographic operations;
- (C) An operable, calibrated pocket dosimeter with a range of zero to 200 milliroentgens for each person performing radiographic operations;
- (D) An operable, calibrated, alarming ratemeter for each person performing radiographic operations using a radiographic exposure device; and
- (E) The appropriate barrier ropes and signs.

039.02 IDENTIFICATION CARD. Each radiographer at a job site must have on their person a valid certification identification card issued by a certifying entity.

039.03 LIMITATIONS. Industrial radiographic operations must not be performed if any of the items in 180 NAC 5-039.01 and 5-039.02 are not available at the job site or are inoperable.

APPENDIX A

- I. REQUIREMENTS FOR AN INDEPENDENT CERTIFYING ORGANIZATION. An independent certifying organization must:
- (A) Be an organization such as a society or association, whose members participate in, or have an interest in, the field of industrial radiography;
 - (B) Make its membership available to the general public nationwide. Membership must not be restricted because of race, color, religion, sex, age, national origin or disability;
 - (C) Have a certification program open to nonmembers, as well as members;
 - (D) Be an incorporated, nationally recognized organization that is involved in setting national standards of practice within its field of expertise;
 - (E) Have an adequate staff, a viable system for financing its operations, and a policy and decision-making review board;
 - (F) Have a set of written organizational by-laws and policies that provide adequate assurance of lack of conflict of interest and a system for monitoring and enforcing those by-laws and policies;
 - (G) Have a committee, whose members can carry out their responsibilities impartially, to review and approve the certification guidelines and procedures, and to advise the organization's staff in implementing the certification program;
 - (H) Have a committee, whose members can carry out their responsibilities impartially, to review complaints against certified individuals and to determine appropriate sanctions;
 - (I) Have written procedures describing all aspects of its certification program, maintain records of the current status of each individual's certification and the administration of its certification program;
 - (J) Have procedures to ensure that certified individuals are provided due process with respect to the administration of its certification program, including the process of becoming certified and any sanctions imposed against certified individuals;
 - (K) Have procedures for proctoring examinations, including qualifications for proctors. These procedures must ensure that the individuals proctoring each examination are not employed by the same company or corporation (or a wholly-owned subsidiary of such company or corporation) as any of the examinees;
 - (L) Exchange information about certified individuals with the U.S. Nuclear Regulatory Commission (NRC) and other independent certifying organizations and Agreement States and allow periodic review of its certification program and related records; and
 - (M) Provide a description to the U.S. Nuclear Regulatory Commission (NRC) of its procedures for choosing examination sites and for providing an appropriate examination environment.

II. REQUIREMENTS FOR CERTIFICATION PROGRAMS. All certification programs must:

- (A) Require applicants for certification to:
 - (i) Receive training in the topics set forth in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission regulations, and
 - (ii) Satisfactorily complete a written examination covering these topics;

- (B) Require applicants for certification to provide documentation that demonstrates that the applicant has:
 - (i) Received training in the topics set forth in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission regulations;
 - (ii) Satisfactorily completed a minimum period of on-the-job training as specified in 180 NAC 5-016.01 and
 - (iii) Received verification by an Agreement State licensee or registrant or an U.S. Nuclear Regulatory Regulation licensee that the applicant has demonstrated the capability of independently working as a radiographer.

- (C) Include procedures to ensure that all examination questions are protected from disclosure;

- (D) Include procedures for denying an application and revoking, suspending, and reinstating a certification;

- (E) Provide a certification period of not less than three years nor more than five years;

- (F) Include procedures for renewing certifications and, if the procedures allow renewals without examination, require evidence of recent full-time employment and annual refresher training; and

- (G) Provide a timely response to inquiries, by telephone or letter, from members of the public, about an individual's certification status.

III. REQUIREMENTS FOR WRITTEN EXAMINATIONS. All examinations must:

- (A) Be designed to test an individual's knowledge and understanding of the topics listed in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements;

- (B) Be written in multiple-choice format;

- (C) Have test items drawn from a question bank containing psychometrically valid questions based on the material in 180 NAC 5-016.07.

TITLE 180 _____ CONTROL OF RADIATION

CHAPTER 5 _____ RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC
_____ OPERATIONS

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EFFECTIVE DATE _____ NEBRASKA DEPARTMENT OF
NOVEMBER 28, 2016 _____ HEALTH AND HUMAN SERVICES _____ 180 NAC 5

TITLE 180 _____ CONTROL OF RADIATION

CHAPTER 5 _____ RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC
OPERATIONS

5-001 SCOPE AND AUTHORITY

~~5-001.01~~ 180 NAC 5 prescribes requirements for the issuance of licenses or registrations for the industrial use of sources of radiation and radiation safety requirements for persons using these sources of radiation in industrial radiography. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 71-3520.

~~5-001.02~~ The provisions and requirements of 180 NAC 5 are in addition to, and not in substitution for, other requirements of Title 180. In particular, the general requirements and provisions of 180 NAC 1, 2, 3, 4, 10, 13, 17 and 18 apply to applicants, licensees and registrants subject to 180 NAC 5. 180 NAC 3 and 13 apply to licensing and transportation of radioactive material and 180 NAC 2 applies to registration of radiation machines. Except for chapters which are applicable only to sealed radioactive source, radiation machines and sealed radioactive sources are both covered by 180 NAC 5. 180 NAC 5 does not apply to medical uses of sources of radiation which are addressed in 180 NAC 6, 7 and 9.

~~5-001.03~~ 21 CFR as published on April 1, 2014 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

~~5-001.04~~ National Bureau of Standards Handbook 136 issued 1-1981 as referred to in this Chapter is herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

5-002 DEFINITIONS: As used in 180 NAC 5, the following definitions apply:

~~Annual refresher safety training~~ means a review conducted or provided by the licensee or registrant for its employees on radiation safety aspects of industrial radiography. The review must

include, as a minimum, any results of internal inspections, new procedures or equipment, new or revised regulations, and accidents or errors that have been observed. The review must also provide opportunities for employees to ask safety questions.

~~ANSI means the American National Standards Institute.~~ **Removed.**

~~Associated equipment~~ means equipment that is used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides, or comes in contact with the source.⁴

~~Cabinet radiography~~ means industrial radiography conducted in an enclosure or cabinet so shielded that radiation levels at every location on the exterior meet the limitations specified in 180 NAC 4-013.01, 4-013.02, and 4-013.03.

~~Cabinet x-ray system~~ means an x-ray system with the x-ray tube installed in an enclosure that is independent of existing architectural structures except the floor. The cabinet x-ray system is intended to contain at least that portion of a material being irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of radiation. Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities. A x-ray tube used within a shielded part of a building, or x-ray equipment which may temporarily or occasionally incorporate portable shielding is not considered a cabinet x-ray system.

~~Camera~~ see Radiographic exposure device.

~~Certifiable cabinet x-ray system~~ means an existing uncertified x-ray system that has been modified to meet the certification requirements specified in 21 CFR 1020.40. **Removed.**

~~Certified cabinet x-ray system~~ means an x-ray system which has been certified in accordance with 21 CFR 1010.2 as being manufactured and assembled pursuant to the provisions of 21 CFR 1020.40. **Removed.**

~~Certifying entity~~ means an independent certifying organization meeting the requirements in Appendix A of 180 NAC 5 or a state regulatory program meeting the requirements in Appendix A, Parts II and III of 180 NAC 5.

~~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.

~~Control cable (Drive cable)~~ means the cable that is connected to the source assembly and used to drive the source to and from the exposure location.

~~Control drive mechanism~~ means a device that enables the source assembly to be moved into and out of the exposure device.

⁴For example, guide tube, control tube, control (drive) cable, removable stop, "J" tube and collimator when used as an exposure head.

~~Control tube means a protective sheath for guiding the control cable. The control tube connects the control drive mechanism to the radiographic exposure device.~~

~~Drive cable see Control cable.~~

~~Exposure head means a device that locates the gamma radiography sealed source in the selected working position.²~~

~~Field station means a facility where sources of radiation may be stored or used and from which equipment is dispatched.~~

~~Guide tube (Projection sheath) means a flexible or rigid tube or "J" tube for guiding the source assembly and the attached control cable from the exposure device to the exposure head. The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head.~~

~~Hands-on experience means experience in all of those areas considered to be directly involved in the radiography process, and includes taking radiographs, calibration of survey instruments, operational and performance testing of survey instruments and devices, film development, posting of radiation areas, transportation of radiography equipment, posting of records and radiation area surveillance, etc., as applicable. Excessive time spent in only one or two of these areas, such as film development or radiation area surveillance, should not be counted toward the 2000 hours of hands-on experience required for an Radiation Safety Officer in 180 NAC 5-015.01, item 2 or the hands-on experience for a radiographer as required by 180 NAC 5-016.01.~~

~~Independent certifying organization means an independent organization that meets all of the criteria of Appendix A to 180 NAC 5.~~

~~Industrial radiography (Radiography) means the examination of the structure of materials by nondestructive methods using sources of ionizing radiation to produce radiographic images.~~

~~Permanent radiographic installation means an enclosed shielded room, cell, or vault, not located at a temporary jobsite, in which radiography is performed.~~

~~Pigtail see Source assembly.~~

~~Practical examination means a demonstration through application of the safety rules and principles in industrial radiography including use of all procedures and equipment to be used by radiographic personnel.~~

~~Projector see Radiographic exposure device.~~

²An exposure head is also known as a source stop.

~~Radiation Safety Officer for "industrial radiography" means an individual with the responsibility for the overall radiation safety protection program on behalf of the licensee or registrant and who meets the requirements of 180 NAC 5-015.~~

~~Radiographer means any individual who performs or who, in attendance at the site where the sources of radiation are being used, personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of the Department's regulations and the conditions of the license or registration.~~

~~Radiographer's assistant means any individual who under the direct supervision of a radiographer, uses radiographic exposure devices, sources of radiation, related handling tools, or radiation survey instruments in industrial radiography.~~

~~Radiographer certification means written approval received from a certifying entity stating that an individual has satisfactorily met the radiation safety, testing, and experience criteria in 180 NAC 15-016.~~

~~Radiographic exposure device (Camera or Projector) means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure.~~

~~Radiographic operations means all activities performed with a radiographic exposure device, or with a radiation machine. Activities include using, transporting (except by common or contract carriers), or storing a temporary job site, performing surveys to confirm the adequacy of boundaries, setting up equipment, and any activity inside restricted area boundaries. Transporting a radiation machine is not considered a radiographic operation.~~

~~Radiography see Industrial radiography.~~

~~S-tube means a tube through which the radioactive source travels when inside a radiographic exposure device.~~

~~Sealed source see 180 NAC 1-002.~~

~~Shielded position means the location within the radiographic exposure device, source changer or storage container that, by manufacturer's design, is the proper location for storage of the sealed source.~~

~~Source assembly (Pigtail) means an assembly that consists of the sealed source and a connector that attaches the source to the control cable. The source assembly may include a ballstop to secure the source in the shielded position.~~

~~Source changer means a device designed and used for replacement of sealed sources in radiographic exposure devices. They may also be used for transporting and storing sealed source.~~

~~Storage area means any location, facility, or vehicle that is used to store and secure a radiographic exposure device, a radiation machine, sealed source, or a storage container, when it is not used for radiographic operations. Storage areas are locked or have a physical barrier to prevent accidental exposure, tampering, or unauthorized removal of the device, machine, or container.~~

~~Storage container means a device in which sealed sources or radiation machines are secured or stored.~~

~~Temporary job site means a location where radiographic operations are performed and where sources of radiation may be stored other than the location(s) of use authorized on the license or registration.~~

~~Underwater radiography means radiographic operations performed when the radiographic exposure device or radiation machine and/or related equipment are beneath the surface of the water.~~

5-003 EXEMPTIONS

~~5-003.01 Uses of certified and certifiable cabinet x-ray systems are exempt from the requirements of 180 NAC 5 except for the following:~~

- ~~1. For certified and certifiable cabinet x-ray systems, including those designed to allow admittance of individuals:
 - ~~a. No registrant may permit any individual to operate a cabinet x-ray system until the individual has received a copy of and instruction in the operating procedures for the unit. Records that demonstrate compliance with 180 NAC 5-003.01, item 1 must be maintained for Department inspection until disposal is authorized by the Department.~~
 - ~~b. Tests for proper operation of interlocks must be conducted and recorded at intervals not to exceed six months. Records of these tests must be maintained for Department inspection until disposal is authorized by the Department.~~
 - ~~c. The registrant must perform an evaluation of the radiation dose limits to determine compliance with 180 NAC 4-013.01, 4-013.02, and 4-013.03, and 21 CFR 1020.40, Cabinet X-ray Systems, at intervals not to exceed one year. Records of these evaluations must be maintained for Department inspection for two years after the evaluation.~~~~

Removed.

~~5-003.02 Industrial uses of hand-held light intensified imaging devices are exempt from the requirements in 180 NAC 5 if the dose rate 18 inches from the source of radiation to any individual does not exceed 2 millirem per hour. Devices which exceed this limit must meet the applicable requirements of 180 NAC 5 and the licensing or registration requirements of 180 NAC 2 or 180 NAC 3, as applicable.~~

~~5-004 LICENSING AND REGISTRATION REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHY OPERATIONS~~

~~5-004.01~~ The Department will approve an application for specific license for the use of licensed material or a registration for use of radiation machines if the applicant meets the following requirements and pays applicable fees specified in 180 NAC 18:

- ~~1. The applicant satisfies the general requirements specified in 180 NAC 2 for radiation machine facilities or 180 NAC 3 for radioactive material, as applicable, and any special requirements contained in 180 NAC 5;~~
- ~~2. The applicant submits an adequate program for training radiographers and radiographer's assistants that meets the requirements of 180 NAC 5-016;~~
- ~~3. The applicant submits procedures for verifying and documenting the certification status of radiographers and for ensuring that the certification of individuals acting as radiographers remains valid;~~
- ~~4. The applicant submits written operating and emergency procedures as described in 180 NAC 5-017;~~
- ~~5. The applicant submits a description of a program for inspections of the job performance of each radiographer and radiographer's assistant at intervals not to exceed six months as described in 180 NAC 5-016.05;~~
- ~~6. The applicant submits a description of the applicant's overall organizational structure as it applies to the radiation safety responsibilities in industrial radiography, including specified delegation of authority and responsibility;~~
- ~~7. The applicant submits the qualifications of the individual(s) designated as the radiation safety officer as described in 180 NAC 5-015.01;~~
- ~~8. If an applicant intends to perform leak testing of sealed sources or exposure devices containing depleted uranium (DU) shielding, the applicant must describe the procedures for performing the test and the qualifications of the persons(s) authorized to do the leak testing. If the applicant intends to analyze its own wipe samples, the application must include a description of the procedures to be followed. The description must include the:
 - ~~a. Methods of collecting the samples;~~
 - ~~b. Qualifications of the individual who analyzes the samples;~~
 - ~~c. Instruments to be used; and~~
 - ~~d. Methods of analyzing the samples~~~~
- ~~9. If the applicant intends to perform calibrations of survey instruments and alarming ratemeters, the applicant must describe methods to be used and the experience of the person(s) who will perform the calibrations. All calibrations must be performed according to the procedures described and at the intervals prescribed in 180 NAC 5-008 and 180 NAC 5-019.07, item 4.~~
- ~~10. The applicant identifies and describes the location(s) of all field stations and permanent radiographic installations.~~
- ~~11. The applicant identifies the location(s) where all records required by this and other Chapters of Title 180 will be maintained.~~
- ~~12. If an application includes underwater radiography, a description of:~~

- ~~_____~~ a. ~~_____~~ Radiation safety procedures and radiographer responsibilities unique to the performance of underwater radiography;
- ~~_____~~ b. ~~_____~~ Radiographic equipment and radiation safety equipment unique to underwater radiography; and
- ~~_____~~ c. ~~_____~~ Methods for gas-tight encapsulation of equipment.

~~5-005 PERFORMANCE REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHY EQUIPMENT:~~
Equipment used in industrial radiographic operations must meet the following minimum criteria:

~~5-005.01~~ Each radiographic exposure device, source assembly or sealed source, and all associated equipment must meet the requirements specified in (ANSI), N432-1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography," (published as NBS Handbook 136, issued January 1981). This publication has been incorporated herein by reference and is available for viewing at the Department of Health and Human Services, Division of Public Health, Office of Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

~~5-005.02~~ In addition to the requirements specified in 180 NAC 5-005.01, the following requirements apply to radiographic exposure devices, source changers, source assemblies and sealed sources:

- ~~1. _____~~ The licensee must ensure that each radiographic exposure device has attached to it a durable, legible, clearly visible label bearing the:
 - ~~a. _____~~ Chemical symbol and mass number of the radionuclide in the device;
 - ~~b. _____~~ Activity and the date on which this activity was last measured;
 - ~~c. _____~~ Model or product code and serial number of the sealed source;
 - ~~d. _____~~ Name of the manufacturer of the sealed source; and
 - ~~e. _____~~ Licensee's name, address, and telephone number.
- ~~2. _____~~ Radiographic exposure devices intended for use as Type B packages must meet the applicable transportation requirements of 180 NAC 13.
- ~~3. _____~~ Modification of radiographic exposure devices, source changers, and source assemblies and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system.

~~5-005.03~~ In addition to the requirements specified in 180 NAC 5-005.01 and 5-005.02, the following requirements apply to radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the device for radiographic operations or to source changers;

- ~~1. _____~~ The coupling between the source assembly and the control cable must be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling must be such that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.

2. ~~The device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. This securing system may only be released by means of a deliberate operation on the exposure device.~~
3. ~~The outlet fittings, lock box, and drive cable fittings on each radiographic exposure device must be equipped with safety plugs or covers which must be installed during storage and transportation to protect the source assembly from water, mud, sand or other foreign matter.~~
4. ~~Each sealed source or source assembly must have attached to it or engraved on it, a durable, legible, visible label with the words:~~

~~“DANGER --- RADIOACTIVE”~~

~~The label may not interfere with the safe operation of the exposure device or associated equipment.~~

5. ~~The guide tube must be able to withstand a crushing test that closely approximates the crushing forces that are likely to be encountered during use, and be able to withstand a kinking resistance test that closely approximates the kinking forces that are likely to be encountered during use.~~
6. ~~Guide tubes must be used when moving the source out of the device.~~
7. ~~An exposure head or similar device designed to prevent the source of assembly from passing out of the end of the guide tube must be attached to the outermost end of the guide tube during the industrial radiography operations.~~
8. ~~The guide tube exposure head connection must be able to withstand the tensile test for control units specified in ANSI N432-1980.~~
9. ~~Source changers must provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.~~

5-005.04 ~~All radiographic exposure devices and associated equipment in use after January 10, 1996, must comply with the requirements of 180 NAC 5; and~~ **Removed.**

5-005.05 ~~As an exception to 180 NAC 5-005.01, equipment used in industrial radiographic operations need not 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 can reasonably exert on the lever or crankshaft of the drive mechanism.~~

5-006 ~~LIMITS ON EXTERNAL RADIATION LEVELS FROM STORAGE CONTAINERS AND SOURCE CHANGERS: The maximum exposure rate limits for storage containers and source changers are 2 millisieverts (200 mrem) per hour at any exterior surface, and 0.1 millisieverts (10 mrem) per hour at 1 meter from any exterior surface with the sealed source in the shielded position.~~

5-007 ~~LOCKING OF SOURCES OF RADIATION, STORAGE CONTAINERS AND SOURCE CHANGERS~~

~~5-007.01~~ Each radiographic exposure device must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The exposure device and/or its container must be kept locked (and if a keyed lock, with the key removed at all times) when not under the direct surveillance of a radiographer or a radiographer's assistant except at permanent radiographic installations as stated in 180 NAC 5-021. In addition, during radiographic operations the sealed source assembly must be secured in a shielded position each time the source is returned to that position.

~~5-007.02~~ Each sealed source storage container and source changer must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers must be kept locked (and if a keyed lock, with the key removed at all times) when containing sealed sources except when under the direct surveillance of a radiographer or a radiographer's assistant.

~~5-007.03~~ The control panel of each radiation machine must be equipped with a lock that will prevent the unauthorized use of a x-ray system or the accidental production of radiation. The radiation machine must be kept locked and the key removed at all times except when under the direct visual surveillance of a radiographer or a radiographer's assistant.

5-008 RADIATION SURVEY INSTRUMENTS

~~5-008.01~~ The licensee or registrant must keep sufficient calibrated and operable radiation survey instruments at each location where sources of radiation are present to make the radiation surveys required by 180 NAC 4 and 180 NAC 5. Instrumentation required by 180 NAC 5 must be capable of measuring a range from 0.02 millisieverts (2 mrem) per hour through 0.01 sievert (1 rem) per hour.

~~5-008.02~~ The licensee or registrant must have each radiation survey instrument required under 180 NAC 5-008.01 calibrated:

- ~~1.~~ At energies appropriate for use and at intervals not to exceed six months or after instrument servicing, except for battery changes;
- ~~2.~~ For linear scale instruments, at two points located approximately one-third and two-thirds of full scale on each scale; for logarithmic scale instruments, at mid-range of each decade, and at two points of at least one decade; and for digital instruments, at 3 points between 0.02 and 10 millisieverts (2 and 1000 mrem) per hour; and
- ~~3.~~ So that an accuracy within plus or minus 20% of the true radiation dose rate can be demonstrated at each point checked.

~~5-008.03~~ The licensee or registrant must maintain records of the results of the instrument calibrations in accordance with 180 NAC 5-025.

5-009 LEAK TESTING AND REPLACEMENT OF SEALED SOURCES

~~5-009.01~~ The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing of any sealed source must be performed by persons authorized to do so by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State.

~~5-009.02~~ The opening, repair, or modification of any sealed source must be performed by persons specifically authorized to do so by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State.

~~5-009.03~~ Testing and recordkeeping requirements.

- ~~1.~~ Each licensee who uses a sealed source must have the source tested for leakage at intervals not to exceed six months. The leak testing of the sources must be performed using a method approved by the Department, the U.S. Nuclear Regulatory Commission, or by another Agreement State. The wipe sample should be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample must be analyzed for radioactive contamination. The analysis must be capable of detecting the presence of 185 becquerel (0.005 μ Ci) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State to perform the analysis.
- ~~2.~~ The licensee must maintain records of the leak tests in accordance with 180 NAC 5-026.
- ~~3.~~ Unless a sealed source is accompanied by a certificate from the transferor that shows that it has been leak tested within six months before the transfer, it may not be used by the licensee until tested for leakage. Sealed sources that are in storage and not in use do not require leak testing, but must be tested before use or transfer to another person if the interval of storage exceeds six months.

~~5-009.04~~ Any test conducted pursuant to 180 NAC 5-009.02 and 180 NAC 5-009.03 that reveals the presence of 185 becquerel (0.005 μ Ci) or more of removable radioactive material must be considered evidence that the sealed source is leaking. The licensee must immediately withdraw the equipment involved from use and must have it decontaminated and repaired or disposed of in accordance with Department regulations. A report must be filed with the Department within five days of any test with results that exceed the threshold in 180 NAC 5-009.04, describing the equipment involved, the test results, and the corrective action taken.

~~5-009.05~~ Each exposure device using depleted uranium (DU) shielding and an S-tube configuration must be tested for DU contamination at intervals not to exceed 12 months. The analysis must be capable of detecting the presence of 185 becquerel (0.005 μ Ci) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the U.S. Nuclear Regulatory Commission or another Agreement State to perform the analysis. Should such testing reveal the presence of 185 becquerel (0.005 μ Ci) or more of DU contamination, the exposure device must be removed from use until an evaluation of the wear of the S-tube has been made. Should the evaluation reveal the S-tube is worn through, the device may not be used again. DU

~~shielded devices do not have to be tested for DU contamination while not in use and in storage. Before using or transferring such a device, however, the device must be tested for DU contamination, if the interval of storage exceeds 12 months. A record of the DU leak test must be made in accordance with 180 NAC 5-026.~~

~~5-010 QUARTERLY INVENTORY~~

~~5-010.01 Each licensee or registrant must conduct a quarterly physical inventory to account for all sources of radiation, and for devices containing depleted uranium received and possessed under the license.~~

~~5-010.02 The licensee or registrant must maintain records of the quarterly inventory in accordance with 180 NAC 5-027.~~

~~5-011 INSPECTION AND MAINTENANCE OF RADIATION MACHINES, RADIOGRAPHIC EXPOSURE DEVICES, TRANSPORT, AND STORAGE CONTAINERS, ASSOCIATED EQUIPMENT, SOURCE CHANGERS, AND SURVEY INSTRUMENTS~~

~~5-011.01 The licensee or registrant must perform visual and operability checks on survey meters, radiation machines, radiographic exposure devices, transport and storage containers, associated equipment and source changers before each day's use, or work shift, to ensure that:~~

- ~~1. The equipment is in good working condition;~~
- ~~2. The sources are adequately shielded; and~~
- ~~3. Required labeling is present.~~

~~5-011.02 Survey instrument operability must be performed using check sources or other appropriate means.~~

~~5-011.03 If equipment problems are found, the equipment must be removed from service until repaired.~~

~~5-011.04 Each licensee or registrant must have written procedures for and perform inspection and routine maintenance of radiation machines, radiographic exposure devices, source changers, associated equipment, transport and storage containers, and survey instruments at intervals not to exceed three months or before the first use thereafter to ensure the proper functioning of components important to safety. If equipment problems are found, the equipment must be removed from service until repaired.~~

~~5-011.05 The licensee's inspection and maintenance program must include procedures to assure that Type B packages are shipped and maintained in accordance with the certificate of compliance or other approval.~~

~~5-011.06 Records of equipment problems and of any maintenance performed under 180 NAC 5-011 must be made in accordance with 180 NAC 5-029.~~

~~5-011.07~~ A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of 180 NAC 5-011 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirement, is deemed to satisfy the requirements of 180 NAC 13-007 and 180 NAC 13-021.

5-012 PERMANENT RADIOGRAPHIC INSTALLATIONS

~~5-012.01~~ Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation must have either:

- ~~1.~~ An entrance control of the type described in 180 NAC 4-023.01, item 1 that causes the radiation level upon entry into the area to be reduced; or
- ~~2.~~ Both conspicuous visible and audible warning signals to warn of the presence of radiation. The visible sign must be actuated by radiation whenever the source is exposed or the machine is energized. The audible signal must be actuated when an attempt is made to enter the installation while the source is exposed or the machine is energized.

~~5-012.02~~ The alarm system must be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test must include a check of both the visible and audible signals. Entrance control devices that reduce the radiation level upon entry as designated in 180 NAC 5-012.01, item 1 must be tested monthly. If an entrance control device or an alarm is operating improperly, it must be immediately labeled as defective and repaired within 7 calendar days. The facility may continue to be used during this seven day period, provided the licensee or registrant implements the continuous surveillance requirements of 180 NAC 5-021 and uses an alarming ratemeter. Test records for entrance controls and audible and visual alarms must be maintained in accordance with 180 NAC 5-030.

5-013 LABELING, STORAGE, AND TRANSPORTATION

~~5-013.01~~ The licensee may not use a source changer or a container to store radioactive material unless the source changer or the storage container has securely attached to it a durable, legible, and clearly visible label bearing the standard trefoil radiation caution symbol conventional colors, that is, magenta, purple or black on a yellow background, having a minimum diameter of 25 mm, and the wording:

CAUTION*
RADIOACTIVE MATERIAL
NOTIFY CIVIL AUTHORITIES (or "NAME OF COMPANY")
*—or "DANGER"

~~5-013.02~~ The licensee may not transport radioactive material unless the material is packaged, and the package is labeled, marked, and accompanied with appropriate shipping papers in accordance with 180 NAC 13.

~~5-013.03 Radiographic exposure devices, source changers, storage containers, and radiation machines, must be physically secured to prevent tampering or removal by unauthorized personnel. The licensee must store radioactive material in a manner that will minimize danger from explosion or fire.~~

~~5-013.04 The licensee must lock and physically secure the transport package containing radioactive material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal.~~

~~5-013.05 The licensee's or registrant's name and city or town where the main business office is located must be prominently displayed with a durable, clearly visible label(s) on both sides of all vehicles used to transport radioactive material or radiation machines for temporary job site use.~~

RADIATION SAFETY REQUIREMENTS

~~5-014 CONDUCTING INDUSTRIAL RADIOGRAPHIC OPERATIONS~~

~~5-014.01 Whenever radiography is performed at a location other than a permanent radiographic installation, the radiographer must be accompanied by at least one other qualified radiographer or an individual who has at a minimum met the requirements of 180 NAC 5-016.03. The additional qualified individual must observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one qualified individual is present.~~

~~5-014.02 All radiographic operations must be conducted in a permanent radiographic installation unless otherwise specifically authorized by the Department.~~

~~5-014.03 Except when physically impossible, collimators must be used in industrial radiographic operations that use radiographic exposure devices that allow the source to be moved out of the device.~~

~~5-014.04 A licensee or registrant may conduct lay barge, offshore platform or underwater radiography only if procedures have been approved by the Department, the U.S. Nuclear Regulatory Commission, or by another Agreement State.~~

~~5-015 RADIATION SAFETY OFFICER FOR INDUSTRIAL RADIOGRAPHY: The Radiation Safety Officer must ensure that radiation safety activities are being performed in accordance with approved procedures and regulatory requirements in the daily operation of the licensee's or registrant's program.~~

~~5-015.01 The minimum qualifications, training, and experience for Radiation Safety Officers for industrial radiography are as follows:~~

- ~~1. Completion of the training and testing requirements of 180 NAC 5-016.04~~
- ~~2. 2000 hours of hands-on experience as a qualified radiographer in industrial radiographic operations; and~~

- ~~3. Formal training in the establishment and maintenance of a radiation safety protection program.~~

~~5-015.02 The Department will consider alternatives when the Radiation Safety Officer has appropriate training and experience in the field of ionizing radiation, and in addition, has adequate formal training with respect to the establishment and maintenance of a radiation safety protection program.~~

~~5-015.03 The specific duties and authorities of the Radiation Safety Officer include:~~

- ~~1. Establishing and overseeing all operating, emergency, and ALARA procedures as required by 180 NAC 4 and reviewing them regularly to ensure that they conform to Department regulations and the license or registration conditions;~~
- ~~2. Overseeing and approving the training program for radiographic personnel to ensure that appropriate and effective radiation protection practices are taught;~~
- ~~3. Ensuring that required radiation surveys and leak tests are performed and documented in accordance with the regulations, including any corrective measures when levels of radiation exceed established limits;~~
- ~~4. Ensuring that personnel monitoring devices are calibrated, if applicable, and used properly; that records are kept of the monitoring results; and that timely notifications are made as required by 180 NAC 4; and~~
- ~~5. Ensuring that operations are conducted safely and for implementing corrective actions including terminating operations.~~

5-016 TRAINING

~~5-016.01 The licensee or registrant may not permit any individual to act as a radiographer until the individual:~~

- ~~1. Has received at least 40 hours of training in the subjects outlined in 5-016.07, in addition to on the job training consisting of hands-on experience under the supervision of a radiographer, and is certified through a radiographer certification program by a certifying entity in accordance with the criteria specified in Appendix A of 180 NAC 5. The on the job training must include a minimum of two months (320 hours) of active participation in the performance of industrial radiography utilizing radioactive material and/or one month (160 hours) of active participation in the performance of industrial radiography utilizing radiation machines. Individuals performing industrial radiography utilizing radioactive materials and radiation machines must complete both segments of the on the job training (three months or 480 hours).~~

~~5-016.02 In addition, the licensee or registrant may not permit any individual to act as a radiographer until the individual:~~

- ~~1. Has received copies and instruction in the requirements described in the regulations contained in 180 NAC 5, and applicable chapters of 180 NAC 4, 10, and 13, in the license or registration under which the radiographer will perform~~

~~industrial radiography, and the licensee's or registrant's operating and emergency procedures;~~

- ~~2. Has demonstrated an understanding of items in 180 NAC 5-016.02, item 1 by successful completion of a written or oral examination;~~
- ~~3. Has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure devices, sealed sources, in the daily inspection of devices and associated equipment, and in the use of radiation survey instruments; and~~
- ~~4. Has demonstrated understanding of the use of the equipment described in 180 NAC 5-016.02, item 3 by successful completion of a practical examination.~~

~~5-016.03 The licensee or registrant may not permit any individual to act as a radiographer's assistant until the individual:~~

- ~~1. Has received copies of and instruction in the requirements described in the regulations contained in 180 NAC 5, and applicable 180 NAC 4, 10, and 13, in the license or registration under which the radiographer's assistant will perform industrial radiography, and the licensee's or registrant's operating and emergency procedures;~~
- ~~2. Has demonstrated an understanding of items 180 NAC 5-016.03, item 1 by successful completion of a written or oral examination;~~
- ~~3. Under the personal supervision of a radiographer, has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure devices and sealed sources, in the daily inspection of devices and associated equipment, and in the use of radiation survey instruments; and~~
- ~~4. Has demonstrated understanding of the use of the equipment described in 180 NAC 5-016.03, item 3 by successful completion of a practical examination.~~

~~5-016.04 The licensee or registrant must provide annual refresher safety training for each radiographer and radiographer's assistant at intervals not to exceed 12 months.~~

~~5-016.05 Except as provided in 180 NAC 5-016.05, item 4, the Radiation Safety Officer or designee must conduct an inspection program of the job performance of each radiographer and radiographer's assistant to ensure that the Department's regulations, license or registration requirements, and the applicant's operating and emergency procedures are followed. The inspection program must:~~

- ~~1. Include observation of the performance of each radiographer and radiographer's assistant during an actual industrial radiographic operation, at intervals not to exceed six months; and~~
- ~~2. Provide that, if a radiographer or a radiographer's assistant has not participated in an industrial radiographic operation for more than six months since the last inspection, the radiographer must demonstrate knowledge of the training requirements of 180 NAC 5-016.02, item 3 and the radiographer's assistant must demonstrate knowledge of the training requirement of 180 NAC 5-016.03, item 3, by a practical examination before these individuals can next participate in a radiographic operation.~~

- ~~3. The Department may consider alternatives in those situations where the individual serves as both radiographer and Radiation Safety Officer.~~
- ~~4. In those operations where a single individual serves as both radiographer and Radiation Safety Officer, and performs all radiography operations, an inspection program is not required.~~

~~5-016.06 The licensee or registrant must maintain records of the above training to include certification documents, written, oral and practical examinations, refresher safety training and inspections of job performance in accordance with 180 NAC 5-031.~~

~~5-016.07 The licensee or registrant must include the following subjects required in 180 NAC 5-016.01:~~

- ~~1. Fundamentals of radiation safety including:
 - ~~a. Characteristics of gamma and x-radiation;~~
 - ~~b. Units of radiation dose and quantity of radioactivity;~~
 - ~~c. Hazards of exposure to radiation;~~
 - ~~d. Levels of radiation from sources of radiation; and~~
 - ~~e. Methods of controlling radiation dose (time, distance, and shielding);~~~~
- ~~2. Radiation detection instruments including:
 - ~~a. Use, operation, calibration, and limitations of radiation survey instruments;~~
 - ~~b. Survey techniques; and~~
 - ~~c. Use of personnel monitoring equipment;~~~~
- ~~3. Equipment to be used including:
 - ~~a. Operation and control of radiographic exposure equipment, remote handling equipment, and storage containers, including pictures or models of source assemblies (pigtailed);~~
 - ~~b. Operation and control of radiation machines;~~
 - ~~c. Storage, control, and disposal of sources of radiation; and~~
 - ~~d. Inspection and maintenance of equipment.~~~~
- ~~4. The requirements of pertinent state and federal regulations; and~~
- ~~5. Case histories of accidents in radiography.~~

~~5-016.08 Records of radiographer certification maintained in accordance with 180 NAC 5-031.01 provide appropriate affirmation of certification requirements specified in 180 NAC 005-016.01, item 1.~~

5-017 OPERATING AND EMERGENCY PROCEDURES

~~5-017.01 Operating and emergency procedures must include, as a minimum, instructions in the following:~~

- ~~1. Appropriate handling and use of sources of radiation so that no person is likely to be exposed to radiation doses in excess of the limits established in 180 NAC 4.;~~
- ~~2. Methods and occasions for conducting radiation surveys;~~
- ~~3. Methods of posting and controlling access to radiographic areas;~~
- ~~4. Methods and occasions for locking and securing sources of radiation;~~
- ~~5. Personnel monitoring and the use of personnel monitoring equipment;~~
- ~~6. Transporting equipment to field locations, including packing of radiographic exposure devices and storage containers in the vehicles, placarding of vehicles when needed, and control of the equipment during transportation as described in 180 NAC 13;~~
- ~~7. The inspection, maintenance, and operability checks of radiographic exposure devices, radiation machines, survey instruments, alarming ratemeters, transport containers, and storage containers;~~
- ~~8. Steps that must be taken immediately by radiography personnel in the event a pocket dosimeter is found to be off-scale or an alarming ratemeter alarms unexpectedly;~~
- ~~9. The procedure(s) for identifying and reporting defects and noncompliance, as required by 180 NAC 5-037;~~
- ~~10. The procedure for notifying proper persons in the event of an accident or incident;~~
- ~~11. Minimizing exposure of persons in the event of an accident or incident, including a source disconnect, a transport accident, or loss of a source of radiation;~~
- ~~12. Source recovery procedure if licensee will perform source recoveries; and~~
- ~~13. Maintenance of records.~~

~~5-017.02 The licensee or registrant must maintain copies of current operating and emergency procedures in accordance with 180 NAC 5-032 and 180 NAC 5-036.~~

5-018 SUPERVISION OF RADIOGRAPHERS' ASSISTANTS

~~5-018.01 The radiographer's assistant must be under the personal supervision of a radiographer when using sources of radiation or conducting radiation surveys required by 180 NAC 5-020.02 to determine that the sealed source has returned to the shielded position or the radiation machine is off after an exposure. The personal supervision must include:~~

- ~~1. The radiographer's physical presence at the site where the sources of radiation are being used;~~
- ~~2. The availability of the radiographer to give immediate assistance if required;~~
~~and~~
- ~~3. The radiographer's direct observation of the assistant's performance of the operations referred to in 180 NAC 5-018.01.~~

5-019 PERSONNEL MONITORING

~~5-019.01~~ The licensee or registrant may not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each individual wears, on the trunk of the body, a direct reading dosimeter, an operating alarming ratemeter, and a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor. At permanent radiography installations where other appropriate alarming or warning devices are in routine use, the use of an alarming ratemeter is not required.

- ~~1.~~ Pocket dosimeters must have a range from zero to 2 millisieverts (200 mrem) and must be recharged at the start of each shift. Electronic personal dosimeters may only be used in place of ion-chamber pocket dosimeters.
- ~~2.~~ Each personnel dosimeter must be assigned to and worn by only one individual;
- ~~3.~~ Film badges must be replaced at periods not to exceed one month and other personnel dosimeters processed and evaluated by an accredited NVLAP processor must be replaced at periods not to exceed three months.
- ~~4.~~ After replacement, each personnel dosimeter must be processed as soon as possible.

~~5-019.02~~ Direct reading dosimeters such as pocket dosimeters or electronic personal dosimeters, must be read and the exposures recorded at the beginning and end of each shift, and records must be maintained in accordance with 180 NAC 5-033.

~~5-019.03~~ Pocket dosimeters, or electronic personal dosimeters, must be checked at periods not to exceed 12 months for correct response to radiation, and records must be maintained in accordance with 180 NAC 5-033. Acceptable dosimeters must read within plus or minus 20% of the true radiation exposure.

~~5-019.04~~ If an individual's pocket dosimeter is found to be off-scale, or if his/her electronic personal dosimeter reads greater than 2 millisieverts (200 mrem), and the possibility of radiation exposure cannot be ruled out as the cause, the individual's personnel dosimeter must be sent for processing within 24 hours. In addition, the individual may not resume work associated with sources of radiation until a determination of the individual's radiation exposure has been made. This determination must be made by the Radiation Safety Officer or the Radiation Safety Officer's designee. The results of this determination must be included in the records maintained in accordance with 180 NAC 5-033.

~~5-019.05~~ If the personnel dosimeter that is required by 180 NAC 5-019 is lost or damaged, the worker must cease work immediately until a replacement personnel dosimeter meeting the requirements of 180 NAC 5-019 is provided and the exposure is calculated for the time period from issuance to loss or damage of the personnel dosimeter. The results of the calculated exposure and the time period for which the personnel dosimeter was lost or damaged must be included in the records maintained in accordance with 180 NAC 5-033.

~~5-019.06~~ Dosimetry reports received from the accredited NVLAP personnel dosimeter processor must be retained in accordance with 180 NAC 5-033.

~~5-019.07~~ Each alarming ratemeter must:

1. ~~Be checked to ensure that the alarm functions properly before using at the start of each shift;~~
2. ~~Be set to give an alarm signal at a preset dose rate of 5 millisieverts per hour (500 mrem/hr); with an accuracy of plus or minus 20% of the true radiation dose rate;~~
3. ~~Require special means to change the preset alarm function; and~~
4. ~~Be calibrated at periods not to exceed 12 months for correct response to radiation. The licensee must maintain records of alarming ratemeter calibrations in accordance with 180 NAC 5-033.~~

5-020 RADIATION SURVEYS: ~~The licensee or registrant must:~~

~~5-020.01 Conduct all surveys with a calibrated and operable radiation survey instrument that meets the requirements of 180 NAC 5-008;~~

~~5-020.02 Conduct a survey of the radiographic exposure device and guide tube after each exposure when approaching the device or the guide tube. The survey must determine that a sealed source has returned to its shielded position before exchanging films, repositioning the exposure head, or dismantling equipment. Radiation machines must be surveyed after each exposure to determine that the machine is off;~~

~~5-020.03 Conduct a survey of the radiographic exposure device whenever the source is exchanged and whenever a radiographic exposure devices is placed in a storage area as defined in 180 NAC 5-002, to ensure that the sealed source is in its shielded position; and~~

~~5-020.04 Maintain records in accordance with 180 NAC 5-034.~~

~~5-021 SURVEILLANCE: During each radiographic operation, the radiographer must ensure continuous direct visual surveillance of the operation to protect against unauthorized entry into a radiation area or a high radiation area, as defined in 180 NAC 1 except at permanent radiographic installations where all entryways are locked and the requirements of 180 NAC 5-012 are met.~~

~~5-022 POSTING: All areas in which industrial radiography is being performed must be conspicuously posted as required by 180 NAC 4-034. The exceptions listed in 180 NAC 4-035 do not apply to industrial radiographic operations.~~

RECORDKEEPING REQUIREMENTS ~~Removed.~~

~~5-023 RECORDS FOR INDUSTRIAL RADIOGRAPHY: Each licensee or registrant must maintain a copy of its license or registration, documents incorporated by reference, and amendments to each of these items until superseded by new documents approved by the Department, or until the Department terminates the license or registration.~~

5-024 RECORDS OF RECEIPT AND TRANSFER OF SOURCES OF RADIATION

~~5-024.01~~ Each licensee or registrant must maintain records showing the receipts and transfers of sealed sources, devices for using DU for shielding, and radiation machines, and retain each record for three years after it is made.

~~5-024.02~~ These records must include the date, the name of the individual making the record, radionuclide, number of becquerels (curies) or mass (for DU), and manufacturer, model, and serial number of each source of radiation and/or device, as appropriate.

~~5-025 RECORDS OF RADIATION SURVEY INSTRUMENTS:~~ Each licensee or registrant must maintain records of the calibrations of its radiation survey instruments that are required under 180 NAC 5-008 and retain each record for three years after it is made.

~~5-026 RECORDS OF LEAK TESTING OF SEALED SOURCES AND DEVICES CONTAINING DU:~~ Each licensee must maintain records of leak test results for sealed sources and for devices containing DU. The results must be stated in units of becquerels (μCi). The licensee must retain each record for three years after it is made or until the source in storage is removed.

~~5-027 RECORDS OF QUARTERLY INVENTORY~~

~~5-027.01~~ Each licensee or registrant must maintain records of the quarterly inventory of sources of radiation, including devices containing depleted uranium as required by 180 NAC 5-010, and retain each record for three years from the date of inventory.

~~5-027.02~~ The record must include the date of the inventory, name of the individual conducting the inventory, radionuclide, number of becquerels (curies) or mass (for DU) in each device, location of sources of radiation and/or devices, and manufacturer, model, and serial number of each source of radiation and/or device, as appropriate.

~~5-028 UTILIZATION LOGS~~

~~5-028.01~~ Each licensee or registrant must maintain utilization logs showing for each source of radiation the following information:

- ~~1.~~ A description, including the make, model, and serial number of the radiation machine or the radiographic exposure device, transport, or storage container in which the sealed source is located;
- ~~2.~~ The identity and signature of the radiographer to whom assigned;
- ~~3.~~ The location and dates of use, including the dates removed and returned to storage; and
- ~~4.~~ For permanent radiographic installations, the dates each radiation machine is energized.

~~5-028.02~~ The licensee or registrant must retain the logs required by 180 NAC 5-028.01 for three years after the log is made.

~~5-029 RECORDS OF INSPECTION AND MAINTENANCE OF RADIATION MACHINES, RADIOGRAPHIC EXPOSURE DEVICES, TRANSPORT, AND STORAGE CONTAINERS, ASSOCIATED EQUIPMENT, SOURCE CHANGERS, AND SURVEY INSTRUMENTS~~

~~5-029.01~~ Each licensee or registrant must maintain records specified in 180 NAC 5-011 of equipment problems found in daily checks and quarterly inspections of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments; and retain each record for three years after it is made.

~~5-029.02~~ The record must include the date of check or inspection, name of inspector, equipment involved, any problems found, and what repair and/or maintenance, if any, was performed.

~~5-030~~ RECORDS OF ALARM SYSTEM AND ENTRANCE CONTROL CHECKS AT PERMANENT RADIOGRAPHIC INSTALLATIONS: Each licensee or registrant must maintain records of alarm systems and entrance control device tests required by 180 NAC 5-012 and retain each record for three years after the record is made.

5-031 RECORDS OF TRAINING AND CERTIFICATION

~~5-031.01~~ Each licensee or registrant must maintain the following records for three years:

- ~~1.~~ Records of training of each radiographer and each radiographer's assistant. The record must include radiographer certification documents and verification of certification status, copies of written tests, dates of oral and practical examinations, names of individuals conducting and receiving the oral and practical examinations, and a list of items tested and the results of the oral and practical examinations; and
- ~~2.~~ Records of annual refresher safety training and semi-annual inspections of job performance for each radiographer and each radiographer's assistant. The records must list the topics discussed during the refresher safety training, the dates the annual refresher safety training was conducted, and names of the instructors and attendees. For inspections of job performance, the records must also include a list showing the items checked and any non-compliance observed by the Radiation Safety Officer or designee.

~~5-032~~ COPIES OF OPERATING AND EMERGENCY PROCEDURES: Each licensee or registrant must maintain a copy of current operating and emergency procedures until the Department terminates the license or registration. Superseded material must be retained for three years after the change is made.

5-033 RECORDS OF PERSONNEL MONITORING

~~5-033.01~~ Each licensee or registrant must maintain the following exposure records specified in 180 NAC 5-019:

- ~~1.~~ Direct reading dosimeter readings and yearly operability checks required by 180 NAC 5-019.02 and 5-019.03 for three years after the record is made;
- ~~2.~~ Records of alarming ratemeter calibrations three years after the record is made;

- ~~3. Personnel dosimeter results received from the accredited NVLAP processor until the Department terminates the license or registration; and~~
- ~~4. Records of estimates of exposures as a result of off-scale personal direct reading dosimeters, or lost or damaged personnel dosimeters until the Department terminates the license or registration.~~

~~5-034 RECORDS OF RADIATION SURVEYS: Each licensee must maintain a record of each exposure device survey conducted before the device is placed in storage as specified in 180 NAC 5-020.03. Each record must be maintained for three years after the record is made.~~

~~5-035 FORM OF RECORDS: Each record required by 180 NAC 5 must be legible throughout the specified retention period. The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of reproducing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability of producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials and signatures. The licensee or registrant must maintain adequate safeguards against tampering with and the loss of records.~~

~~5-036 LOCATION OF DOCUMENTS AND RECORDS~~

~~5-036.01 Each licensee or registrant must maintain copies of records required by 180 NAC 5 and other applicable Chapters of Title 180 at the location specified in 180 NAC 5-004.01, item 11.~~

~~5-036.02 Each licensee or registrant must also maintain current copies of the following documents and records sufficient to demonstrate compliance at each applicable field station and each temporary jobsite;~~

- ~~1. The license or registration authorizing the use of sources of radiation;~~
- ~~2. A copy of 180 NAC 1, 4, 5, and 10;~~
- ~~3. Utilization logs for each source of radiation dispatched from the location as required by 180 NAC 5-028;~~
- ~~4. Records of equipment problems identified in daily checks of equipment as required by 180 NAC 5-029.01;~~
- ~~5. Records of alarm system and entrance control checks required by 180 NAC 5-030, if applicable;~~
- ~~6. Records of dosimeter readings as required by 180 NAC 5-033;~~
- ~~7. Operating and emergency procedures required by 180 NAC 5-032;~~
- ~~8. Evidence of the latest calibrations and of radiation survey instruments in use at the site, as required by 180 NAC 5-025;~~
- ~~9. Evidence of the latest calibrations of alarming ratemeters and operability checks of dosimeters as required by 180 NAC 5-033~~
- ~~10. Survey records as required by 180 NAC 5-034 and 180 NAC 4-049 as applicable, for the period of operation at that site;~~
- ~~11. The shipping papers for the transportation of radioactive materials required by 180 NAC 013 and;~~

- ~~12. When operating under reciprocity pursuant to 180 NAC 3 or registration pursuant to 180 NAC 2, a copy of the applicable State license or registration, or U.S. Nuclear Regulatory Commission license authorizing the use of sources of radiation.~~

NOTIFICATIONS Removed.

5-037 NOTIFICATIONS

~~5-037.01 In addition to the reporting requirements specified in 180 NAC 3-026 and 180 NAC 4, each licensee or registrant must provide a written report to the Department within 30 days of the occurrence of any of the following incidents involving radiographic equipment:~~

- ~~1. Unintentional disconnection of the source assembly from the control cable;~~
- ~~2. Inability to retract the source assembly to its fully shielded position and secure it in this position;~~
- ~~3. Failure of any component, which is critical to safe operation of the device, to properly perform its intended function; or~~
- ~~4. An indicator on a radiation machine fails to show that radiation is being produced, an exposure switch fails to terminate production of radiation when turned to the off position, or a safety interlock fails to terminate x-ray production.~~

~~5-037.02 The licensee or registrant must include the following information in each report submitted under 180 NAC 5-037.01, and in each report of overexposure submitted under 180 NAC 4-060 which involves failure of safety components of radiography equipment:~~

- ~~1. Description of the equipment problem;~~
- ~~2. Cause of each incident, if known;~~
- ~~3. Name of the manufacturer and model number of equipment involved in the incident;~~
- ~~4. Place, date, and time of the incident;~~
- ~~5. Actions taken to establish normal operations;~~
- ~~6. Corrective actions taken or planned to prevent recurrence; and~~
- ~~7. Names and qualifications of personnel involved in the incident.~~

~~5-037.03 Any licensee or registrant conducting radiographic operations or storing sources of radiation at any location not listed on the license or registration for a period in excess of 180 days in a calendar year, must notify the Department prior to exceeding the 180 days.~~

5-038 RECIPROCITY

~~5-038.01 All reciprocal recognition of licenses by the Department will be granted in accordance with 180 NAC 3-028.~~

~~5-038.02 Reciprocal recognition by the Department of an individual radiographer certification will be granted provided that:~~

- ~~1. The individual holds a valid certification in the appropriate category issued by a certifying entity, as defined in 180 NAC 5-002;~~

- ~~2. The requirements and procedures of the certifying entity issuing the certification affords the same or comparable certification standards as those afforded by 180 NAC 5-016.01;~~
- ~~3. The applicant presents the certification to the Department prior to the entry into the state; and~~
- ~~4. No escalated enforcement action is pending with the U.S. Nuclear Regulatory Commission or in any other State.~~

~~5-038.03 Certified individuals who are granted reciprocity by the Department must maintain the certification upon which the reciprocal recognition was granted, or prior to the expiration of such certification, must met the requirements of 180 NAC 5-016.01.~~

5-039 SPECIFIC REQUIREMENTS FOR RADIOGRAPHIC PERSONNEL PERFORMING INDUSTRIAL RADIOGRAPHY

~~5-039.01 At a job site, the following must be supplied by the licensee or registrant:~~

- ~~1. At least one operable, calibrated survey instrument for each exposure device or radiation machine in use;~~
- ~~2. A current whole body personnel monitor (film badge, TLD or OSLD) for each person performing radiographic operations;~~
- ~~3. An operable, calibrated pocket dosimeter with a range of zero to 200 milliroentgens for each person performing radiographic operations;~~
- ~~4. An operable, calibrated, alarming ratemeter for each person performing radiographic operations using a radiographic exposure device; and~~
- ~~5. The appropriate barrier ropes and signs.~~

~~5-039.02 Each radiographer at a job site must have on his/her person a valid certification ID card issued by a certifying entity.~~

~~5-039.03 Industrial radiographic operations must not be performed if any of the items in 180 NAC 5-039.01 and 5-039.02 are not available at the job site or are inoperable.~~

~~5-039.04 During an inspection, the Department may terminate an operation if any of the items in 180 NAC 5-039.01 and 180 NAC 5-039.02 are not available or operable, or if the required number of radiographic personnel are not present. Operations must not be resumed until all required conditions are met. **Removed.**~~

APPENDIX A

~~I. Requirements for an Independent Certifying Organization~~

~~An independent certifying organization must:~~

- ~~1. Be an organization such as a society or association, whose members participate in, or have an interest in, the field of industrial radiography;~~
- ~~2. Make its membership available to the general public nationwide. Membership must not be restricted because of race, color, religion, sex, age, national origin or disability;~~
- ~~3. Have a certification program open to nonmembers, as well as members;~~
- ~~4. Be an incorporated, nationally recognized organization that is involved in setting national standards of practice within its field of expertise;~~
- ~~5. Have an adequate staff, a viable system for financing its operations, and a policy and decision-making review board;~~
- ~~6. Have a set of written organizational by-laws and policies that provide adequate assurance of lack of conflict of interest and a system for monitoring and enforcing those by-laws and policies;~~
- ~~7. Have a committee, whose members can carry out their responsibilities impartially, to review and approve the certification guidelines and procedures, and to advise the organization's staff in implementing the certification program;~~
- ~~8. Have a committee, whose members can carry out their responsibilities impartially, to review complaints against certified individuals and to determine appropriate sanctions;~~
- ~~9. Have written procedures describing all aspects of its certification program, maintain records of the current status of each individual's certification and the administration of its certification program;~~
- ~~10. Have procedures to ensure that certified individuals are provided due process with respect to the administration of its certification program, including the process of becoming certified and any sanctions imposed against certified individuals;~~
- ~~11. Have procedures for proctoring examinations, including qualifications for proctors. These procedures must ensure that the individuals proctoring each examination are not employed by the same company or corporation (or a wholly-owned subsidiary of such company or corporation) as any of the examinees;~~
- ~~12. Exchange information about certified individuals with the U.S. Nuclear Regulatory Commission and other independent certifying organizations and/or Agreement States and allow periodic review of its certification program and related records; and~~

13. ~~Provide a description to the U.S. Nuclear Regulatory Commission of its procedures for choosing examination sites and for providing an appropriate examination environment.~~

II. ~~Requirements for Certification Programs~~

All certification programs must:

1. ~~Require applicants for certification to:~~
 - a. ~~Receive training in the topics set forth in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission regulations, and~~
 - b. ~~Satisfactorily complete a written examination covering these topics;~~
2. ~~Require applicants for certification to provide documentation that demonstrates that the applicant has:~~
 - a. ~~Received training in the topics set forth in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission regulations;~~
 - b. ~~Satisfactorily completed a minimum period of on-the-job training as specified in 180 NAC 5-016.01 and~~
 - c. ~~Received verification by an Agreement State licensee or registrant or an U.S. Nuclear Regulatory Commission licensee that the applicant has demonstrated the capability of independently working as a radiographer.~~
3. ~~Include procedures to ensure that all examination questions are protected from disclosure;~~
4. ~~Include procedures for denying an application and revoking, suspending, and reinstating a certification;~~
5. ~~Provide a certification period of not less than three years nor more than five years;~~
6. ~~Include procedures for renewing certifications and, if the procedures allow renewals without examination, require evidence of recent full-time employment and annual refresher training; and~~
7. ~~Provide a timely response to inquiries, by telephone or letter, from members of the public, about an individual's certification status.~~

III. ~~Requirements for Written Examinations~~

All examinations must be:

1. ~~Designed to test an individual's knowledge and understanding of the topics listed in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements;~~
2. ~~Written in multiple-choice format;~~

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- ~~3. Have test items drawn from a question bank containing psychometrically valid questions based on the material in 180 NAC 5-016.07.~~