**DRAFT 1 04/08/2021**

**DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT**

**Hazardous Materials and Waste Management Division**

**RADIATION CONTROL - RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS**

**6 CCR 1007-1 Part 05**
*[Editor's Notes follow the text of the rules at the end of this CCR Document.]*

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**Adopted by the Board of Health on June 16, 2021; effective August 14, 2021.**

**PART 5: RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS**

**5.1 Purpose and Scope.**

[ * * * DENOTES UNAFFECTED SECTIONS/PROVISIONS IN THE DRAFT RULE]

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5.1.4 Applicability.

5.1.4.1 Part 5 applies to all licensees or registrants who use sources of radiation for industrial radiography. Radiation machines and sealed radioactive sources are both covered by Part 5, except for sections which are applicable only to sealed radioactive sources.

5.1.4.2 The provisions and requirements of this part are in addition to, and not in substitution for, other requirements of these regulations. In particular, the general requirements and provisions of Parts 1, 2, 3, 4, **8,** 10, **17,** and ~~17~~**22** apply to applicants, licensees and registrants subject to this part. Parts 3 and 17 apply to licensing and transportation of radioactive material. Part 2 applies to the registration of radiation machines. Part 5 does not apply to medical uses of **x-ray** sources of radiation that are governed by Parts 6 and **24**~~20~~.

5.1.5 Published Material Incorporated by Reference.

~~Published material incorporated in Part 5 by reference is available in accord with 1.4.~~

**5.1.5.1. Throughout this Part 5, federal regulations, state regulations, and standards or guidelines of outside organizations have been adopted and incorporated by reference. Unless a prior version of the incorporated material is otherwise specifically indicated, the materials incorporated by reference cited herein include only those versions that were in effect as of the most recent effective date of this Part 5 (August 2021), and not later amendments or editions of the incorporated material.**

**5.1.5.2. Materials incorporated by reference are available for public inspection, and copies (including certified copies) can be obtained at reasonable cost, during normal business hours from the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management**

**Commented [JSJ92]:**
**Editorial note 1:** All comments (such as this one) shown in the right side margin of this draft document are for information purposes only to assist the reader in understanding the proposed rule change during the review and comment process.

These side margin notes are **not** part of the rule and all comments will be deleted prior to publication of the final rule.

**Editorial note 2:** Alignment and formatting corrections and minor typographical adjustments may be made in the rule and may not be specifically identified with a side margin comment.

**Editorial note 3:** The acronym "RATS 2020-1" refers to the U.S. Nuclear Regulatory Commission (NRC) regulatory action tracking system (RATS). This system is used to identify and summarize changes to federal regulations that may be required for adoption by an NRC agreement state. To maintain agreement state status, Colorado's radiation regulations must be compatible with federal regulations of the NRC.

Colorado statute also prescribes that the radiation control regulations must be consistent with the model regulations of the Conference of Radiation Control Program Directors, Inc. (CRCPD). The CRCPD model regulation equivalent to part 5 was last updated in 2015.

**Commented [JSJ93]:**
These dates reflect anticipated adoption and effective dates based on the current rulemaking schedule. Dates are subject to change pending additional review, approvals, and department rulemaking and Board of Health schedules.

**Commented [JSJ94]:** This provision amended to incorporate the requirements of Part 22 related to radioactive materials security, and to update a reference due to a prior change in rule numbering.

**Commented [JSJ95]:**
This section amended for consistency with the Colorado Administrative Procedure Act (24-4-103(12.5)(a)(2), CRS).

**Division, 4300 Cherry Creek Drive South, Denver, Colorado 80246. Additionally, https://www.colorado.gov/cdphe/radregs identifies where the incorporated materials are available to the public on the internet at no cost. Due to copyright restrictions certain materials incorporated in this Part are available for public inspection at the state publications depository and distribution center.**

**5.1.5.3. Availability from Source Agencies or Organizations.**

**(1) All federal agency regulations incorporated by reference herein are available at no cost in the online edition of the Code of Federal Regulations (CFR) hosted by the U.S. Government Printing Office, online at www.govinfo.gov.**

**(2) All state regulations incorporated by reference herein are available at no cost in the online edition of the Code of Colorado Regulations (CCR) hosted by the Colorado Secretary of State's Office, online at https://www.sos.state.co.us/CCR/RegisterHome.do.**

**(3) Copies of the standards or guidelines of outside organizations are available at no cost or for purchase from the source organizations below.**

**(a) American National Standards Institute, Inc.**
**25 West 43rd Street**
**New York, New York 10036**
**Phone (212) 642-4900**
**ansi.org**

**5.2 Definitions.**

As used in this part, these terms have the definitions set forth as follows:

* * *

"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 **Part** 1020.40 ~~(April 1, 2009)~~.

"Certified cabinet x-ray system" means an x-ray system that has been certified in accordance with 21 CFR **Part** 1010.2 ~~(April 1, 2009)~~, as being manufactured and assembled pursuant to the provisions of 21 **Part** CFR 1020.40 ~~(April 1, 2009)~~.

* * *

**5.3 Exemptions.**

5.3.1 ~~Uses of certified and certifiable cabinet x-ray systems are exempt from the requirements of Part 5 except for the following:~~**Certified and certifiable cabinet x-ray systems and other x-ray generating device imaging for education or research purposes at a fixed location are exempt from the requirements of Part 5, but shall follow the requirements of Part 8.**

~~5.3.1.1 For certified and certifiable cabinet x-ray systems, including those designed to allow admittance of individuals:~~

~~(1) No registrant shall 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 and has demonstrated competence in its use. Records that~~

**Commented [JSJ96]:** Provision is updated, parallel with the proposed changes to Part 8. Instead of listing the requirements applicable to cabinet x-ray systems in Part 5, the requirements of Part 8 are applied.

**Commented [JSJ97]:** The requirements for training that are applicable to cabinet x-ray systems are addressed in the proposed Part 8, Section 8.3.3, and 8.4.11.

~~demonstrate compliance with this subparagraph shall be maintained for Department inspection until disposal is authorized by the Department.~~

~~(2) Tests for proper operation of interlocks must be conducted and recorded at intervals not to exceed six months. Records of these tests shall be maintained for Department inspection until disposal is authorized by the Department.~~

~~(3) The registrant shall perform an evaluation of the radiation exposure to determine compliance with 4.14.1 and 4.14.3, and 21 CFR 1020.40 (April 1, 2004) (Cabinet X-Ray Systems, 39 Federal Register 12986, April 10, 1974), at intervals not to exceed one year. Records of these evaluations shall be maintained for Department inspection for two years after the evaluation.~~

~~5.3.1.2 Certified cabinet x-ray systems shall be maintained in compliance with 21 CFR 1020.40 (April 1, 2004) (Cabinet X-Ray Systems, 39 Federal Register 12986, April 10, 1974), and no modification shall be made to the system unless prior Department approval has been granted.~~

5.3.~~2~~**1** Industrial uses of hand-held light intensified imaging devices are exempt from the requirements of this Part if the dose rate 45 cm (18 inches) from the source of radiation to any individual does not exceed 0.02 millisievert (2 millirem) per hour. When this dose rate limit is exceeded, such devices shall meet the applicable requirements of this part and the licensing or registration requirements of Part 2 ~~or~~ Part 3, **or Part 8** as applicable.

* * *

**5.7 Limits on External Radiation Levels From Storage Containers and Source Changers.**

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

* * *

**5.10 Leak Testing and Replacement of Sealed Sources.**

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

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

5.10.3 Testing and recordkeeping requirements.

5.10.3.1 Each licensee who uses a sealed source shall have the source tested for leakage at intervals not to exceed 6 months. The leak testing of the source must be performed using a method approved by the Department, the Nuclear

**Commented [JSJ98]:** The requirements for testing of interlocks and other safety devices at 6 month intervals and that are applicable to cabinet x-ray systems are addressed in the proposed Part 8, Section 8.4.10.

**Commented [JSJ99]:** The requirements for surveys that are applicable to cabinet x-ray systems are addressed in the proposed Part 8, Section 8.2 (cabinet radiography definition), Section 8.4.5, and 8.5.

**Commented [JSJ100]:** Section 8.4 of the proposed Part 8, requires cabinet x-ray systems to meet the requirements of 21 CFR 1020.40. Additionally, under the exemption section of Part 8 (Section 8.3.5), modifications to the device would require Department approval.

**Commented [JSJ101]:** Formatted for unneeded spaces/gaps in current rule.

**Commented [JSJ102]:** Section 5.10 is formatted for alignment of text. No changes to the actual regulatory requirements are being proposed.

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 µCi) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the Nuclear Regulatory Commission, or another Agreement State to perform the analysis.

5.10.3.2 The licensee shall maintain records of the leak tests in accordance with 5.27.

5.10.3.3 Unless a sealed source is accompanied by a certificate from the transferor that shows that it has been leak tested within 6 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 6 months.

5.10.4 Any test conducted pursuant to 5.10.2 and 5.10.3 that reveals the presence of 185 becquerel (0.005 µCi) or more of removable radioactive material must be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall have it decontaminated and repaired or disposed of in accordance with Department regulations. A report must be filed with the Department within 5 days of any test with results that exceed the threshold in this paragraph, describing the equipment involved, the test results, and the corrective action taken.

5.10.5 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.

5.10.5.1 The analysis must be capable of detecting the presence of 185 becquerel (0.005 µCi) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the Nuclear Regulatory Commission, or another Agreement State to perform the analysis.

5.10.5.2 Should such testing reveal the presence of DU contamination, the exposure device must be removed from use until an evaluation of the wear of the S-tube has been made.

5.10.5.3 Should the evaluation reveal that 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.

5.10.5.4 Before using or transferring such a device, however, the device must be tested for DU contamination, if the interval of storage exceeds 12 months.

5.10.5.5 A record of the DU leak-test must be made in accordance with 5.27.

* * *

**5.13 Permanent Radiographic Installations.**

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

5.13.1.1 An entrance control of the type described in **Part 4, Section** 4.19 of these regulations that causes the radiation level upon entry into the area to be reduced; or

* * *

**5.14 Labeling, Storage, and Transportation.**

5.14.1 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, i.e., 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"

* * *

**5.20 Personnel Monitoring.**

5.20.1 The licensee or registrant ~~shall~~**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~~ic~~ installations where other appropriate alarming or warning devices are in routine use, or during radiographic operations using radiation machines, the wearing of an alarming ratemeter is not required.

5.20.1.1 Pocket dosimeters must have a range from zero to 2 millisievert (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.

5.20.1.2 Each personnel dosimeter must be assigned to and worn by only one individual.

5.20.1.3 Film badges must be ~~exchanged at periods not to exceed one month~~**replaced at least monthly** and **all** other personnel dosimeters ~~processed and evaluated by an accredited NVLAP processor~~ **that require replacement** must be replaced ~~at periods not to exceed three months~~ **at least quarterly**.

5.20.1.4 ~~After replacement, each personnel dosimeter must be processed as soon as possible.~~**All personnel dosimeters must be evaluated at least quarterly or promptly after replacement whichever is more frequent.**

5.20.2 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 5.34.

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5.14.1 is formatted for alignment of text. No changes to regulatory requirements are proposed.

**Commented [JSJ104]:** The provisions of 5.20 are revised for consistency with 2020 amendments to 10 CFR Part 34.47.

NRC amended this federal rule to authorize the use of modern individual monitoring devices for industrial radiography operations. In the past, NRC has required the use of personnel dosimetry that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor. Some new dosimetry devices do not require the type of processing envisioned in the text of the current rule and may instead be read directly by internet-enabled computers, smartphones, and tablets. The design of these newer devices (rather than the qualifications of the processor) allow for collection of accurate dose information. The proposed rule is rephrased to allow the use of individual monitoring devices that do not require NVLAP processing.

Section 5.20 is also formatted for alignment of text.

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NRC Compatibility "C"

5.20.3 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 5.34. Acceptable dosimeters must read within plus or minus 20 percent of the true radiation exposure.

5.20.4 If an individual's pocket ~~dosimeter~~**chamber** ~~indicates a reading~~**is found to be** off-scale**,** or if ~~the~~**his or her** electronic personal dosimeter ~~reading exceeds~~**reads greater than** 2 millisievert**s** (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 **and evaluation** within 24 hours. **For personnel dosimeters that do not require processing, evaluation of the dosimeter must be started within 24 hours.**

5.20.4.1 In addition, the individual may not resume work associated with use of sources of radiation until a determination of the individual's radiation ~~exposure~~**dose** has been made. This determination must be made by the radiation safety officer or the radiation safety officer's designee.

5.20.4.1 The results of this determination must be included in the records maintained in accordance with 5.34.

5.20.5 If the personnel dosimeter that is required by 5.20.1 is lost or damaged, the worker shall cease work immediately until a replacement personnel dosimeter meeting the requirements of 5.20.1 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 5.34.

5.20.6 ~~Reports received from the accredited NVLAP personnel dosimeter processor~~ **Dosimetry results** must be retained in accordance with 5.34.

**Commented [JSJ105]:** Provision is updated for consistency with the language of 10 CFR Part 34.47(f).

5.20.7 Each alarming ratemeter must:

5.20.7.1 Be checked to ensure that the alarm functions properly before using at the start of each shift;

5.20.7.2 Be set to give an audible alarm signal at a preset dose rate of 5 millisievert (500 mrem) per hour; with an accuracy of plus or minus 20 percent of the true radiation dose rate;

5.20.7.3 Require special means to change the preset alarm function; and

5.20.7.4 Be calibrated at periods not to exceed 12 months for correct response to radiation. The licensee shall maintain records of alarming ratemeter calibrations in accordance with 5.34.

**5.21 Radiation Surveys.**

**Commented [JSJ106]:** Section 5.21 is formatted for alignment.
No changes to regulatory requirements are being proposed.

5.21.1 The licensee or registrant shall:

5.21.1.1 Conduct all surveys with a calibrated and operable radiation survey instrument that meets the requirements of 5.9;

5.21.1.2 Conduct a survey of the radiographic exposure device and the guide tube after each exposure when approaching the device or the guide tube.

(1) The survey must determine that the sealed source has returned to its shielded position before exchanging films, repositioning the exposure head, or dismantling equipment.

(2) Radiation machines shall be surveyed after each exposure to determine that the machine is off;

5.21.1.3 Conduct a survey of the radiographic exposure device whenever the source is exchanged and whenever a radiographic exposure device is placed in a storage area as defined in ~~5.35~~.2, to ensure that the sealed source is in its shielded position; and

5.21.1.4 Maintain records in accordance with 5.35.

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**5.27 Records of Leak Testing of Sealed Sources and Devices Containing DU.**

5.27.1 Each licensee shall maintain records of leak test results for sealed sources and for devices containing DU.

5.27.1.1 The results must be stated in units of becquerel (microcurie).

5.27.1.2 The licensee shall retain each record for 3 years after it is made or until the source in storage is removed.

* * *

**5.29 Utilization Logs.**

5.29.1 Each licensee or registrant shall maintain utilization logs showing for each source of radiation the following information:

5.29.1.1 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;

5.29.1.2 The identity and signature of the radiographer to whom assigned;

5.29.1.3 The location and dates of use, including the dates removed and returned to storage; and

5.29.1.4 For permanent radiographic installations, the dates each radiation machine is energized.

5.29.2 The licensee or registrant shall retain the logs required by 5.29.1 for 3 years.

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**Commented [JSJ107]:** Correction of cross-reference error.

**Commented [JSJ108]:** Section 5.27 is formatted for alignment of text. No changes to regulatory requirements are being proposed.

**Commented [JSJ109]:** Section 5.29 is formatted for alignment of text. No changes to regulatory requirements are being proposed.

**5.32 Records of Training and Certification.**

5.32.1 Each licensee or registrant shall maintain the following records for 3 years:

5.32.1.1 Records of training of each radiographer and each radiographer's assistant.

(1) The record must include radiographer certification documents and verification of certification status, copies of written tests, dates of oral and practical examinations, the 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

5.32.2.1 Records of annual refresher safety training and semi-annual inspections of job performance for each radiographer and each radiographer's assistant.

(1) 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.

(2) For inspections of job performance, the records must also include a list showing the items checked and any noncompliance observed by the radiation safety officer or designee.

* * *

**5.34 Records of Personnel Monitoring.**

Each licensee or registrant shall maintain the following exposure records specified in 5.20:

5.34.1 Direct reading dosimeter readings and yearly operability checks required by 5.20.2 and 5.20.3 for 3 years after the record is made;

5.34.2 Records of alarming ratemeter calibrations for 3 years after the record is made;

5.34.3 Personnel dosimeter results ~~received from the accredited NVLAP processor~~ until the Department terminates the license or registration; and

5.34.4 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.

* * *

**5.37 Location of Documents and Records.**

5.37.1 Each licensee or registrant shall maintain copies of records required by this Part and other applicable Parts of these regulations at the location specified in 5.4.11.

5.37.2 Each licensee or registrant shall also maintain current copies of the following documents and records sufficient to demonstrate compliance at each applicable field station and each temporary jobsite;

5.37.2.1 The license or registration authorizing use of sources of radiation;

5.37.2.2 A copy of Parts 1, 4, 5 and 10 of these regulations;

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Section 5.32 is formatted for alignment of text.
No changes to regulatory requirements are being proposed.

**Commented [JSJ111]:**
Provision is updated for consistency with the language of 10 CFR Part 34.83(c). See prior side-margin comment pertaining to Section 5.20 for additional information.

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Section 5.37 is formatted for alignment of text.
No changes to regulatory requirements are being proposed.

5.37.2.3 Utilization logs for each source of radiation dispatched from that location as required by 5.29;

5.37.2.4 Records of equipment problems identified in daily checks of equipment as required by 5.30.1;

5.37.2.5 Records of alarm system and entrance control checks required by 5.31, if applicable;

5.37.2.6 Records of dosimeter readings as required by 5.34;

5.37.2.7 Operating and emergency procedures as required by 5.33;

5.37.2.8 Evidence of the latest calibration of the radiation survey instruments in use at the site, as required by 5.26;

5.37.2.9 Evidence of the latest calibrations of alarming ratemeters and operability checks of dosimeters as required by 5.34;

5.37.2.10 Survey records as required by 5.35 and 4.42 of these regulations as applicable, for the period of operation at the site;

5.37.2.11 The shipping papers for the transportation of radioactive materials required by Part 17 of these regulations; and

5.37.2.12 When operating under reciprocity pursuant to Part 3 of these regulations, a copy of the applicable State license or registration, or Nuclear Regulatory Commission license authorizing use of sources of radiation.

**NOTIFICATIONS**

**5.38 Notifications.**

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Section 5.38 is formatted for alignment of text.
No changes to regulatory requirements are being proposed.

5.38.1 In addition to the reporting requirements specified in 4.52 of these regulations, each licensee or registrant shall provide a written report to the Department within 30 days of the occurrence of any of the following incidents involving radiographic equipment:

5.38.1.1 Unintentional disconnection of the source assembly from the control cable;

5.38.1.2 Inability to retract the source assembly to its fully shielded position and secure it in this position;

5.38.1.3 Failure of any component, which is critical to safe operation of the device, to properly perform its intended function; or

5.38.1.4 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.

5.38.2 The licensee or registrant shall include the following information in each report submitted under 5.38.1, and in each report of overexposure submitted under 4.53.2 of these regulations which involves failure of safety components of radiography equipment:

5.38.2.1 Description of the equipment problem;

5.38.2.2 Cause of each incident, if known;

5.38.2.3 Name of the manufacturer and model number of equipment involved in the incident;

5.38.2.4 Place, date, and time of the incident;

5.38.2.5 Actions taken to establish normal operations;

5.38.2.6 Corrective actions taken or planned to prevent recurrence; and

5.38.2.7 Names and qualifications of personnel involved in the incident.

5.38.3 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 90 days in a calendar year, shall notify the Department prior to exceeding the 90 days.

**5.39 Specific Requirements for Personnel Performing Industrial Radiography.**

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Section 5.39 is formatted for alignment of text.
No changes to regulatory requirements are being proposed.

5.39.1 At a job site, the following shall be supplied by the licensee or registrant:

5.39.1.1 At least one operable, calibrated survey instrument for each exposure device or radiation machine in use;

5.39.1.2 A current whole body personnel dosimeter (OSL dosimeter, TLD or film badge) for each person performing radiographic operations;

5.39.1.3 An operable, calibrated pocket dosimeter with a range of zero to 2 millisievert (200 milliroentgen) for each person performing radiographic operations;

5.39.1.4 An operable, calibrated, alarming ratemeter for each person performing radiographic operations using a radiographic exposure device; and

5.39.1.5 The appropriate barrier ropes and signs.

5.39.2 Each radiographer at a job site shall have on their person a valid certification identification card issued by a certifying entity.

5.39.3 Industrial radiographic operations shall not be performed if any of the items in 5.39.1 and 5.39.2 are not available at the job site or are inoperable.

5.39.4 During an inspection, the Department may terminate an operation if any of the items in 5.39.1 and 5.39.2 are not available or operable, or if the required number of radiographic personnel are not present.

5.39.4.1 Operations shall not be resumed until all required conditions are met.

**PART 5, APPENDIX 5A: CERTIFICATION**

**5A.1 Requirements for an Independent Certifying Organization.**

An independent certifying organization shall:

5A.1.1 Be an organization such as a society or association, whose members participate in, or have an interest in, the field of industrial radiography;

5A.1.2 Make its membership available to the general public nationwide. Membership shall not be restricted because of race, color, religion, sex, age, national origin or disability;

5A.1.3 Have a certification program open to nonmembers, as well as members;

5A.1.4 Be an incorporated, nationally recognized organization that is involved in setting national standards of practice within its fields of expertise;

5A.1.5 Have an adequate staff, a viable system for financing its operations, and a policy and decision-making review board;

5A.1.6 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;

5A.1.7 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;

5A.1.8 Have a committee, whose members can carry out their responsibilities impartially, to review complaints against certified individuals and to determine appropriate sanctions;

5A.1.9 Have written procedures describing all aspects of its certification program and maintain records of the current status of each individual's certification and the administration of its certification program;

5A.1.10 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;

5A.1.11 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;

5A.1.12 Exchange information about certified individuals with the Nuclear Regulatory Commission and other independent certifying organizations and/or Agreement States and allow periodic review of its certification program and related records; and

5A.1.13 Provide a description to the Nuclear Regulatory Commission of its procedures for choosing examination sites and for providing an appropriate examination environment.

**5A.2 Requirements for Certification Programs.**

All certification programs must:

5A.2.1 Require applicants for certification to

**Commented [JSJ115]:**
Prior to final publication, insert a page break at the top of appendix 5A.

All Appendices of Part 5 are formatted for text alignment purposes. No changes to regulatory requirements are being proposed.

(1) Receive training in the topics set forth in Appendix 5C, Section 5C.2, or equivalent State or Nuclear Regulatory Commission regulations, and

(2) Satisfactorily complete a written examination covering these topics;

5A.2.2 Require applicants for certification to provide documentation that demonstrates that the applicant has:

(1) Received training in the topics set forth in Appendix 5C, Section 5C.2 or equivalent State or Nuclear Regulatory Commission regulations;

(2) Satisfactorily completed a minimum period of on-the-job training as specified in Appendix 5C, Section 5C.2.4; and

(3) Received verification by a State licensee or registrant or a Nuclear Regulatory Commission licensee that the applicant has demonstrated the capability of independently working as a radiographer.

5A.2.3 Include procedures to ensure that all examination questions are protected from disclosure;

5A.2.4 Include procedures for denying an application and revoking, suspending, and reinstating a certification;

5A.2.5 Provide a certification period of not less than 3 years nor more than 5 years;

5A.2.6 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

5A.2.7 Provide a timely response to inquiries, by telephone or letter, from members of the public, about an individual's certification status.

**5A.3 Requirements for Written Examinations**

All examinations must:

5A.3.1 Be designed to test an individual's knowledge and understanding of the topics listed in Appendix 5C, Section 5C.2 or equivalent State or Nuclear Regulatory Commission requirements;

5A.3.2 Be written in a multiple-choice format;

5A.3.3 Have test items drawn from a question bank containing psychometrically valid questions based on the material in Appendix 5C, Section 5C.2.

**PART 5, APPENDIX 5B: INDUSTRIAL RADIOGRAPHY RADIATION SAFETY OFFICER ADEQUATE RADIATION SAFETY TRAINING AND EXPERIENCE**

**The licensee or registrant shall not permit any individual to act as a radiation safety officer for industrial radiography unless and until the individual:**

**5B.1 Has provided evidence of valid certification (valid identification) through a radiographer certification program by a certifying organization in accordance with the criteria specified in Appendix 5A;**

and

**5B.2 Has provided evidence of having:**

5B.2.1 Satisfactorily completed 40 hours of training including each of the following:

(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;

(e) Methods of controlling radiation dose (time, distance, and shielding); and

(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; and

(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 (pigtails);

(b) Operation and control of radiation machines;

(c) Storage, control, and disposal of sources of radiation; and

(d) Inspection and maintenance of equipment; and

(4) The requirements of pertinent state and federal regulations; and

(5) Case histories of accidents in radiography; and

5B.2.2 Successfully completed a written or oral examination after having received copies of and instruction in the:

(1) Requirements of Part 5;

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(2) Requirements of applicable sections of Parts 4, 10 and 17;

(3) License or registration under which the radiographer will perform industrial radiography; and

(4) Licensee's or registrant's operating and emergency procedures; and

5B.2.3 Successfully completed a practical examination which demonstrates understanding of the use of the equipment after receiving training in the:

(1) Use of the registrant's radiation machines; or

(2) Use of the licensee's radiographic exposure devices and sealed sources;

(3) Daily inspection of devices and associated equipment; and

(4) Use of radiation survey instruments; and

5B.2.4 Completed hands on and on the job training in the performance of industrial radiography, including at least 2000 hours of hands on experience, as defined in 5.2, as a qualified radiographer in industrial radiographic operations. The on the job training shall include a minimum of:

(1) 320 hours (2 months) of on the job active participation utilizing radioactive material; and / or

(2) 160 hours (1 month) of on the job active participation utilizing radiation machines; or

(3) 480 hours (3 months) of on the job training for individuals utilizing both radioactive materials and radiation machines; and

5B.2.5 Completed formal training in the establishment and maintenance of a radiation protection program;

or

**5B.3 Has demonstrated to the Department an acceptable alternative to 5B.2 when the individual 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 for industrial radiography;**

and

**5B.4 Has provided evidence of annual refresher safety training, as defined in 5.2, at intervals not to exceed 12 months.**

**PART 5, APPENDIX 5C: INDUSTRIAL RADIOGRAPHER ADEQUATE RADIATION SAFETY TRAINING AND EXPERIENCE**

The licensee or registrant shall not permit any individual to act as a radiographer unless and until the individual:

**5C.1 Has provided evidence of valid certification (valid identification) through a radiographer certification program by a certifying organization in accordance with the criteria specified in Appendix 5A;**

and

**5C.2 Has provided evidence of having:**

5C.2.1 Satisfactorily completed 40 hours of training including each of the following:

(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;

(e) Methods of controlling radiation dose (time, distance, and shielding); and

(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; and

(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 (pigtails);

(b) Operation and control of radiation machines;

(c) Storage, control, and disposal of sources of radiation; and

(d) Inspection and maintenance of equipment; and

(4) The requirements of pertinent state and federal regulations; and

(5) Case histories of accidents in radiography; and

5C.2.2 Successfully completed a written or oral examination after having received copies of and instruction in the:

(1) Requirements of Part 5;

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(2) Requirements of applicable sections of Parts 4, 10 and 17;

(3) License or registration under which the radiographer will perform industrial radiography; and

(4) Licensee's or registrant's operating and emergency procedures; and

5C.2.3 Successfully completed a practical examination which demonstrates understanding of the use of the equipment after receiving training in the:

(1) Use of the registrant's radiation machines; or

(2) Use of the licensee's radiographic exposure devices and sealed sources;

(3) Daily inspection of devices and associated equipment; and

(4) Use of radiation survey instruments; and

5C.2.4 Completed hands on and on the job training in the performance of industrial radiography, including hands on experience, as defined in 5.2, as a qualified radiographer in industrial radiographic operations. The on the job training shall include a minimum of:

(1) 320 hours (2 months) of on the job active participation utilizing radioactive material; and / or

(2) 160 hours (1 month) of on the job active participation utilizing radiation machines; or

(3) 480 hours (3 months) of on the job training for individuals utilizing both radioactive materials and radiation machines;

or

**5C.3 Has demonstrated to the Department an acceptable alternative to 5C.2 when the individual has appropriate training and experience in the field of ionizing radiation, and, in addition, has adequate formal training with respect to radiation protection for industrial radiography;**

and

**5C.4 Has provided evidence of annual refresher safety training, as defined in 5.2, at intervals not to exceed 12 months.**

**PART 5, APPENDIX 5D: INDUSTRIAL RADIOGRAPHER'S ASSISTANT ADEQUATE RADIATION SAFETY TRAINING AND EXPERIENCE**

The licensee or registrant shall not permit any individual to act as a radiographer's assistant unless and until the individual has:

**5D.1 Received initial radiation safety training;**

and

**5D.2 Has provided evidence of having:**

5D.2.1 Successfully completed a written examination after having received copies of and instruction in the:

(1) Requirements of Part 5;

(2) Requirements of applicable sections of Parts 4, 10 and 17;

(3) License or registration under which the radiographer will perform industrial radiography; and

(4) Licensee's or registrant's operating and emergency procedures; and

5D.2.2 Successfully completed a practical examination under the personal supervision of a radiographer which demonstrates understanding of the use of the equipment after receiving training in the:

(1) Use of the registrant's radiation machines; or

(2) Use of the licensee's radiographic exposure devices and sealed sources;

(3) Daily inspection of devices and associated equipment; and

(4) Use of radiation survey instruments; and

or

**5D.3 Has demonstrated to the Department an acceptable alternative to 5D.2 when the individual has appropriate training and experience in the field of ionizing radiation, and, in addition, has adequate formal training with respect to radiation protection for industrial radiography;**

and

**5D.4 Has provided evidence of annual refresher safety training, as defined in 5.2, at intervals not to exceed 12 months.**

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