

**CHAPTER 225. RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS**

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**Authority**

The provisions of this Chapter 225 issued under section 301 of The Atomic Energy Development and Radiation Control Act (73 P.S. § 1301) (Repealed); and amended under sections 301 and 302 of the Radiation Protection Act (35 P.S. §§ 7110.301 and 7110.302); and section 1920-A of The Administrative Code of 1929 (71 P.S. § 510-20), unless otherwise noted.

**Source**

The provisions of this Chapter 225 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212, unless otherwise noted.

**Cross References**

This chapter cited in 25 Pa. Code § 78.111 (relating to abandonment); 25 Pa. Code § 78a.111 (relating to abandonment); 25 Pa. Code § 215.32 (relating to exemption qualifications); 25 Pa. Code § 217.1 (relating to purpose and scope); 25 Pa. Code § 228.45 (relating to portable or mobile accelerators); 28 Pa. Code § 501.4 (relating to regulations); and 28 Pa. Code § 565.12 (relating to radiology service policy).

**Subchapter A. GENERAL PROVISIONS**

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### § 225.1. Purpose and scope.

(a) This chapter establishes radiation safety requirements for persons utilizing radiation sources for industrial radiography. Licensees and registrants who use radiation sources for industrial radiography shall comply with this chapter. The requirements of this chapter are in addition to and not in substitution for other applicable requirements in this article, in particular, the requirements and provisions of Chapters 215, 217—220, 228 and 230.

(b) Persons using only radiation-producing machines for industrial radiographic operations need not comply with § 225.2a (relating to incorporation by reference) unless otherwise specified in Subchapter B (relating to radiation-producing machines).

(c) This chapter does not apply to the use of radiation sources for medical diagnosis or therapy.

#### Source

The provisions of this § 225.1 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; amended September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239; amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial page (282406).

### § 225.2. [Reserved].

#### Source

The provisions of this § 225.2 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203957) to (203958).

### § 225.2a. Incorporation by reference.

(a) Except as provided in this chapter, the requirements of 10 CFR Part 34 (relating to licenses for industrial radiography and radiation safety requirements for industrial radiographic operations) are incorporated by reference.

(b) Notwithstanding the requirements incorporated by reference, 10 CFR 34.5, 34.8, 34.121 and 34.123 are not incorporated by reference.

#### Source

The provisions of this § 225.2a adopted September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239.

#### Cross References

This section cited in 25 Pa. Code § 225.1 (relating to purpose and scope).

**§ 225.3. [Reserved].****Source**

The provisions of this § 225.3 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial pages (4895) to (4896).

**§ 225.3a. Effect of incorporation of 10 CFR Part 34.**

To reconcile differences between this chapter and the incorporated sections of 10 CFR Part 34, the following words and phrases shall be substituted for the language in 10 CFR Part 34 as follows:

- (1) A reference to “NRC” or “Commission” means Department.
- (2) A reference to “NRC or agreement state” means Department, NRC or agreement state.
- (3) The definition of “sealed source” includes NARM.
- (4) The definition of “licensed material” includes NARM.
- (5) Notifications, reports and correspondence referenced in the incorporated parts of 10 CFR shall be directed to the Department and, for NRC licenses, to the NRC until agreement state status is in effect.

**Source**

The provisions of this § 225.3a adopted September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239.

**§ 225.4. [Reserved].****Source**

The provisions of this § 225.4 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial page (4896).

**§ 225.4a. Radiation safety program.**

(a) A person who intends to use radiation-producing machines for industrial radiography shall have a program for training personnel, written operating procedures and emergency procedures, an internal review system and an organizational structure for radiographic operations which includes specified delegations of authority and responsibility for operation of the program. This program shall be approved by the Department before commencing industrial radiographic operations.

(b) The registrant shall notify the Department of intended changes to the registrant’s radiation safety program and obtain Departmental approval.

**Source**

The provisions of this § 225.4a adopted September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239; amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial page (282407).

**Cross References**

This section cited in 25 Pa. Code § 225.102 (relating to shielded room X-ray radiography).

**§ 225.5. [Reserved].****Source**

The provisions of this § 225.5 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial page (4896).

**§ 225.5a. Reciprocity.**

Out-of-State users of radiation producing machines shall meet the requirements of § 216.7 (relating to out-of-State radiation-producing machines).

**Source**

The provisions of this § 225.5a adopted September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239.

**§ 225.6. [Reserved].****Source**

The provisions of this § 225.6 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial page (4896).

**§ 225.6a. Prohibitions.**

Use of radiation sources covered under this chapter for diagnosis or therapy on humans or animals is not permitted.

**Source**

The provisions of this § 225.6a adopted September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239.

**§ 225.7. [Reserved].****Source**

The provisions of this § 225.7 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial pages (4896) to (4897).

**§ 225.8. [Reserved].****Source**

The provisions of this § 225.8 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial page (4897).

**§ 225.9. [Reserved].****Source**

The provisions of this § 225.9 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial page (4897).

**§§ 225.11—225.13. [Reserved].****Source**

The provisions of these § 225.11—225.13 adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203959) to (203960).

**§ 225.14. [Reserved].****Source**

The provisions of this § 225.14 adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; amended June 19, 1992, effective June 20, 1992, 22 Pa. B. 3135; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5085; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203960) to (203961).

**§§ 225.15—225.18. [Reserved].****Source**

The provisions of these §§ 225.15—225.18 adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial text pages (203962) to (203964).

**§ 225.21. [Reserved].****Source**

The provisions of this § 225.21 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5085; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial page (203964).

**§ 225.22. [Reserved].****Source**

The provisions of this § 225.22 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5085; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203965).

**§ 225.23. [Reserved].****Source**

The provisions of this § 225.23 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203965) to (203966).

 **§§ 225.31—225.33. [Reserved].****Source**

The provisions of these §§ 225.31—225.33 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203966) to (203967).

 **§§ 225.34—225.36. [Reserved].****Source**

The provisions of these §§ 225.34—225.36 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (4902) to (4904).

 **§§ 225.41—225.43. [Reserved].****Source**

The provisions of these §§ 225.41—225.43 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5085; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203968) to (203970).

 **§ 225.44. [Reserved].****Source**

The provisions of this § 225.44 adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203970) to (203971).

 **§§ 225.51—225.53. [Reserved].****Source**

The provisions of these §§ 225.51—225.53 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; amended December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; amended November 17, 1995, effective November 18, 1995, 25 Pa.B. 5085; reserved September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239. Immediately preceding text appears at serial pages (203971) to (203972).

**§§ 225.54—225.65. [Reserved].****Source**

The provisions of these §§ 225.54—225.65 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212; reserved December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235. Immediately preceding text appears at serial pages (4908) to (4916).

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**Source**

The provisions of this Subchapter B adopted September 14, 2001, effective September 15, 2001, 31 Pa.B. 5239, unless otherwise noted.

**Cross References**

This subchapter cited in 25 Pa. Code § 225.1 (relating to purpose and scope).

**GENERAL ADMINISTRATIVE REQUIREMENTS****§ 225.71. Definitions.**

The following words and terms, when used this subchapter, have the following meanings, unless the context clearly indicates otherwise:

*Cabinet radiography*—Industrial radiography conducted in an enclosure or cabinet (not a room) so shielded that doses to individual members of the public at every location on the exterior meet the limitations specified in 10 CFR 20.1301 (relating to dose limits for individual members of the public).

*Cabinet X-ray system*—An X-ray system with the X-ray tube installed in an interlocked enclosure or cabinet, designed to exclude personnel from its interior during operation.

(i) Included are all X-ray systems designed primarily for the inspection of baggage or packages.

(ii) 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.

*Certified cabinet X-ray system*—An X-ray system which has been certified under 21 CFR 1010.2 (relating to certification) as being manufactured and assembled under 21 CFR 1020.40 (relating to cabinet x-ray systems).

*DRD—Direct reading dosimeter*—

(i) As used in this subchapter, means an “individual monitoring device” (see 10 CFR 20.1003 (relating to definitions)) that does not require additional processing to measure an individual’s dose.

(ii) The term also includes the direct reading personnel (individual) monitoring devices known as pocket dosimeter, pocket ionization chamber and electronic personal dosimeter (EPD).

*Field radiography*—A location where radiographic operations are conducted (onsite or offsite) other than those designated as a permanent radiographic facility.

*Industrial radiography*—An examination of the structure of materials by nondestructive methods, including fluoroscopy, which utilizes radiation producing machines to make radiographic images.

*NVLAP*—National Voluntary Laboratory Accreditation Program.

*Permanent radiographic installation*—A shielded installation or structure designed or intended for radiography in which radiography is regularly performed.



*Personal supervision*—The provision of guidance and instruction to a radiographer's assistant given by a radiographer who is:

- (i) Physically present at the site.
- (ii) In visual contact with the radiographer's assistant while the assistant is using radiation sources.
- (iii) In proximity so that immediate assistance can be given if required.

*Personnel dosimeter*—As used in this subchapter, means any of the "individual monitoring devices" (see 10 CFR 20.1003) that shall be processed and evaluated to generate a permanent record of an individual's dose, for example, a film badge, thermoluminescent dosimeter (TLD) or optically stimulated luminescent dosimeter (OSLD).

*RSO—radiation safety officer*—An individual who ensures that, in the daily operation of the registrant's or licensee's radiation safety program, activities are being performed in accordance with approved procedures and are in compliance with Department requirements.

*Radiographer*—An individual who performs radiographic operations or an individual in attendance at a site where radiation producing machines are being used who personally supervises industrial radiographic operations.

*Radiographer's assistant*—An individual who, under the personal supervision of a radiographer, uses radiation producing machines or radiation survey instrumentation.

*Radiographer trainee*—An individual who is in the process of becoming a radiographer's assistant or a radiographer.

*Radiographic operations*—The activities associated with a radiation producing machine during use of the machine, to include surveys to confirm adequacy of boundaries, setting up equipment and any activity inside restricted area boundaries.

*Safety device*—As applied to radiation-producing machines in this subchapter, a device or component that causes the unit to de-energize or interrupt the beam.

*Shielded room radiography*—Industrial radiography that is conducted in an enclosed room, the interior of which is not occupied during radiographic operations.

#### Source

The provisions of this § 225.71 amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial pages (282412) to (282413).

### § 225.72. Duties of personnel.

- (a) The RSO shall assure that the radiation safety program of the registrant or licensee is implemented and suspend or terminate operations that are not being conducted in accordance with approved procedures or the Department's requirements.

(b) The radiographer is responsible to the registrant or licensee for following the procedures of the registrant or licensee and for complying with the Department's requirements while industrial radiographic operations are being conducted.

(c) The radiographer's assistant shall only use radiation producing machines or radiation survey instrumentation under the personal supervision of a radiographer.

(d) The radiographer trainee is not permitted to operate radiation producing machines or radiation survey instrumentation.

#### **§ 225.73. Training of personnel.**

(a) A registrant may not allow an individual to act as a radiographer or radiographer's assistant unless that individual meets the requirements of § 225.74 (relating to training and testing).

(b) Persons performing field radiography shall comply with the training requirements in Appendix A (relating to subjects to be covered during the instruction of radiographers).

#### **Source**

The provisions of this 225.73 amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial page (282414).

#### **§ 225.74. Training and testing.**

(a) The registrant may not permit an individual to act as a radiographer until that individual has:

(1) Been instructed in the subjects outlined in Appendix A.

(2) Received copies of this chapter, Chapters 219 and 220 (relating to standards for protection against radiation; and notices, instructions and reports to workers; inspections and investigations), and copies of the license or certificate of registration and the operating and emergency procedures of the registrant or licensee.

(3) Received instruction covering regulatory requirements, operating and emergency procedures and the use of radiation-producing machines and radiation survey instruments of the registrant or licensee.

(4) Demonstrated competency and understanding of the information in this subsection to the satisfaction of the registrant or licensee as evidenced by the successful completion of a written test and a field examination.

(b) The registrant or licensee may not permit an individual to act as a radiographer's assistant until that individual has:

(1) Received copies of, and instruction in, the applicable operating and emergency procedures and has been instructed in the use of sources of radiation and radiation survey instruments of the registrant or licensee.

(2) Demonstrated that, under direct personal supervision of a radiographer, the individual is competent to use sources of radiation and radiation survey

instruments as evidenced by the successful completion of a written or oral test and a field examination on the subjects relevant to being an assistant radiographer.

(c) Records of the training required under subsections (a) and (b), including copies of written tests, dates of oral tests and field examinations, shall be maintained for inspection by the Department for 3 years following termination of employment by the individual or until the registration or license is terminated.

#### Cross References

This section cited in 25 Pa. Code § 225.73 (relating to training and testing).

### § 225.75. Audits and safety reviews of radiographers and radiographer's assistants.

(a) The registrant or licensee shall review and provide for the safety and ongoing training needs of radiographers and radiographer's assistants at least once during each calendar year.

(b) The registrant or licensee shall conduct an annual inspection program of the job performance of each radiographer and radiographer's assistant to ensure that operating and emergency procedures and this article and registration or license requirements for the registrant or licensee are followed. This audit program shall:

(1) Include observation of the performance of each radiographer and radiographer's assistant during an actual radiographic operation at intervals not to exceed 1 calendar year.

(2) Provide that, if a radiographer or radiographer's assistant has not participated in a radiographic operation for more than 6 months since the last annual inspection, the individual's performance shall be observed and recorded when the individual next participates in a radiographic operation.

(c) The registrant or licensee shall maintain records of the training set forth in subsection (b) to include certification documents, written and field examinations, annual safety reviews and annual audits of job performance. Records shall be available for inspection by the Department for 3 years following the termination of employment of the individual or until the registration or license is terminated.

### § 225.76. Reporting requirements.

(a) In addition to the reporting requirements in §§ 219.221 and 219.222 (relating to reports of stolen, lost or missing licensed or registered sources of radiation; and notification of incidents and reportable events), each registrant or licensee shall provide to the Department, within 30 days of its occurrence, a written report on any of the following incidents involving machines or equipment used in radiographic operations:

(1) The inability to terminate irradiation from a radiation producing machine.

(2) An interlock failure during shielded room radiography.

(b) The registrant or licensee shall include the following information in each report submitted under subsection (a):

- (1) A description of the equipment problem.
- (2) The cause of the incident, if known or determined.
- (3) The manufacturer and model number of the equipment involved.
- (4) The place, date and time of the incident.
- (5) Actions taken to reestablish normal operations.
- (6) Corrective actions taken or planned to prevent reoccurrence.
- (7) The names and qualifications of personnel involved.

(c) Reports of overexposures, required under 10 CFR 20.2202 (relating to notification of incidents) or of excessive exposures, required under 10 CFR 20.2203 (relating to reports of exposures, radiation levels and concentrations of radioactive material exceeding the limits) which involve the failure of safety components of radiography equipment shall also include, to the extent known, the information specified under subsection (b). Complete information required in subsection (b) shall be available in the 30-day follow-up report rule under 10 CFR 20.2203(a).

#### Cross References

This section cited in 25 Pa. Code § 225.102 (relating to shielded room X-ray radiography).

### GENERAL TECHNICAL REQUIREMENTS

#### § 225.81. Permanent radiographic installations.

(a) Permanent radiographic installations having high radiation area entrance controls of the types described in 10 CFR 20.1601 and 20.1902 (relating to control of access to high radiation areas; and posting requirements) shall also meet the following requirements.

(1) Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation shall have both visible and audible warning signals to warn of the presence of radiation. The visible signal shall be activated by radiation whenever the X-ray source is energized. The audible signal shall be actuated when an attempt is made to enter the installation while the X-ray source is energized.

(2) The entrance control device or alarm system shall be tested for proper function prior to beginning operations on each day of use.

(3) The radiographic exposure system may not be used if an entrance control device or alarm system is not operating properly. If an entrance control device or alarm system is not functioning properly, it shall be removed from service and repaired or replaced immediately. If no replacement is available, the facility may continue to be used provided that the registrant implements the continuous surveillance under 10 CFR 34.51 and 34.52 (relating to surveillance; posting), § 225.83 (relating to records required at field radiography sites) and uses an alarming ratemeter. Before the entrance control device or alarm system is returned to service, the radiation safety officer or an individual designated by the radiation safety officer shall validate the repair.

(b) Records of the tests performed under subsection (a) shall be maintained for inspection by the Department for 3 years.

**§ 225.82. Operating requirements.**

(a) When radiographic operations are performed at a location other than a permanent radiographic installation, a minimum of two radiographic personnel shall be present to operate the X-ray device. At least one of the radiographic personnel shall be qualified as a radiographer. The other individual may be either a radiographer, a radiographer's assistant or a radiographer trainee.

(b) Other than a radiographer, or a radiographer's assistant who is under the personal supervision of a radiographer, an individual may not manipulate the controls or operate the equipment used in industrial radiographic operations.

(c) At each job site, the following shall be supplied by the registrant or licensee:

(1) The appropriate barrier ropes and warning signs.

(2) At least one operable, calibrated radiation survey instrument.

(3) For each worker requiring monitoring, an individual personnel dosimeter that is processed and evaluated by an NVLAP processor.

(4) An operable, calibrated direct reading dosimeter with a range of zero to 51.6  $\mu\text{C}/\text{kg}$  (200 milliroentgen) for each worker requiring monitoring.

(d) An industrial radiographic operation may not be performed if any of the items in subsection (c) is not available at the job site or is inoperable.

**Source**

The provisions of this § 225.82 amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial pages (282416) to (282417).

**§ 225.83. Records required at field radiography sites.**

Each registrant or licensee conducting radiographic operations at a field radiography site shall maintain and have available for inspection by the Department at that job site, the following records or documents:

(1) The certificate of registration, license or equivalent document which authorizes radiographic operations, and radiographic personnel certifications.

(2) Operating and emergency procedures.

(3) Relevant regulations of the Department.

(4) Survey records required under this chapter for the period of operation at the site.

(5) Daily direct reading dosimeter records for the period of operation at the site.

(6) The current radiation survey meter calibration records for meters in use at the site. Acceptable records include tags or labels that are affixed to the survey meter.

**Source**

The provisions of this § 225.83 amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial page (282417).

**Cross References**

This section cited in 25 Pa. Code § 225.81 (relating to permanent radiographic installations).

**§ 225.84. Operating and emergency procedures.**

The operating and emergency procedures of the registrant or licensee shall include instruction in at least the following:

- (1) Handling and use of sources of radiation to be employed so that no individual is likely to be exposed to radiation in excess of the limits established in Chapter 219 (relating to standards for protection against radiation).
- (2) Methods and occasions for conducting radiation surveys and the proper use of survey meters.
- (3) Methods for controlling access to areas where radiographic operations are being conducted.
- (4) Methods and occasions for locking and securing sources of radiation.
- (5) Personnel monitoring and the use of individual monitoring devices, including steps that are to be taken immediately by radiographic personnel when a direct reading dosimeter is found to be off-scale.
- (6) Methods and procedures for minimizing exposure to individuals in the event of an accident.
- (7) The procedure for notifying proper personnel in the event of an accident.
- (8) Maintenance of records required by the Department.
- (9) The inspection and maintenance of radiation-producing machines and survey meters.

**Cross References**

This section cited in 25 Pa. Code § 225.102 (relating to shielded room X-ray radiography).

**§ 225.85. Surveys and survey records.**

- (a) A survey with a calibrated radiation survey instrument shall be made after each radiographic exposure to determine that the emission of radiation has terminated.
- (b) Records of the surveys required by subsection (a) shall be maintained (for inspection by the Department) for 3 years. If the survey has been used to determine an individual's exposure, the records of the survey shall be maintained until the Department terminates the registration or license.

**§ 225.86. Utilization logs.**

A registrant or licensee shall maintain current logs, which shall be kept available for inspection by the Department for 3 years from the date of the event, showing for each radiation-producing machine, the following applicable information:

- (1) The identity (name and signature) of the operator to whom the radiation-producing machine is assigned.
- (2) The model and serial number of the radiation-producing machine.
- (3) The locations and dates of use.
- (4) The technique factors (tube kilovoltage, tube current, exposure time) used for each radiographic exposure.

**§ 225.87. Security.**

During each radiographic operation, the radiographer or radiographer's assistant shall maintain direct surveillance of the operation to protect against unauthorized entry into a high radiation area, except when one of the following exists:

- (1) The high radiation area is equipped with a control device or an alarm system as described in 10 CFR 20.1601 and 20.1902(b) (relating to control of access to high radiation areas; and posting of high radiation areas).
- (2) The high radiation area is locked to protect against unauthorized or accidental entry.

**§ 225.88. Posting.**

Areas in which radiographic operations are being performed shall be conspicuously posted as required by 10 CFR 20.1902 (relating to posting requirements).

**RADIATION SURVEY INSTRUMENT AND PERSONNEL  
MONITORING REQUIREMENTS****§ 225.91. Radiation survey meter requirements.**

(a) A registrant or licensee shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by this chapter and Chapter 219 (relating to standards for the protection against radiation).

(b) A radiographic operation may not be conducted unless calibrated and operable radiation survey instrumentation is available and used at each site where radiographic operations are conducted.

(c) Immediately prior to first use at a site where radiographic operations are conducted and at the beginning of work shift changes thereafter, a radiation survey instrument shall be checked to ensure that it is operating properly by exposing the instrument to a reference source of radiation and observing its response. Instruments that fail to respond as expected may not be used.

**Cross References**

This section cited in 25 Pa. Code § 225.92 (relating to radiation survey meter calibration requirements).

**§ 225.92. Radiation survey meter calibration requirements.**

(a) In addition to the requirements of § 225.91 (relating to survey meter requirements), instruments required by this chapter shall have a range so that 0.516  $\mu\text{C}/\text{kg}$  (2 mR) per hour through 258  $\mu\text{C}/\text{kg}$  (1 R) per hour can be measured.

- (b) Each radiation instrument shall be calibrated:
- (1) At energies appropriate for use.
  - (2) At intervals not to exceed 6 months.
  - (3) After each instrument servicing, other than battery replacement.

- (4) To within an accuracy of +/- 20%.
  - (5) At two points located approximately one-third and two-thirds of full scale on each scale of linear scale instruments; at mid-range of each decade and at two points of at least 1 decade for logarithmic scale instruments; and for digital instruments, at three points between 0.516  $\mu\text{C}/\text{kg}$  (2 mR) and 258  $\mu\text{C}/\text{kg}$  (1000 mR) per hour.
  - (6) By a person authorized by the Department, the NRC or an agreement state.
- (c) Calibration records shall be maintained for inspection by the Department for 3 years after the date of calibration.

**§ 225.93. Personnel monitoring control.**

- (a) The registrant or licensee may not permit an individual to act as a radiographer or as a radiographer's assistant unless, at all times during radiographic operations, each individual wears a direct reading dosimeter and a personnel dosimeter that is processed and evaluated by an NVLAP processor.
  - (1) Personnel monitoring devices used to determine compliance with dose limits for the whole body shall be worn on the trunk of the body over the area most likely to receive exposure.
  - (2) This does not relieve the registrant or licensee from providing peripheral monitoring devices such as ring finger TLDs when appropriate.
  - (3) Each personnel monitoring device shall be assigned to and worn by only one individual.
- (b) Film badges shall be replaced at intervals not to exceed 1 month. Other personnel dosimeters processed and evaluated by an accredited NVLAP processor shall be replaced at intervals not to exceed 3 months.
- (c) Direct reading dosimeters shall meet the criteria as in ANSI N13.5-1972, "Performance Specifications for Direct Reading and Indirect Reading Pocket Dosimeters for X- and Gamma-Radiation" published in 1972, exclusive of subsequent amendments or additions.
- (d) The use of DRDs is subject to the following requirements:
  - (1) DRDs shall have a range of zero to 51.6  $\mu\text{C}/\text{kg}$  (200 mR) and shall be rezeroed at the start of each work shift.
  - (2) As a minimum, at the beginning and the end of each worker's shift involving the use of a source of radiation, DRDs shall be read and the exposure values recorded.
  - (3) Direct reading dosimeters shall be checked for correct response to radiation at periods not to exceed 1 year. A dosimeter may not be used for personnel monitoring unless the response is accurate within +/- 20% of the true radiation exposure. Records of dosimeter response checks shall be maintained for inspection by the Department for 3 years.
  - (4) If an individual's DRD indicates exposure that is "off-scale" beyond the range it can measure, industrial radiographic operations by that individual



shall cease immediately and the individual's personnel dosimeter shall be sent immediately for processing. The individual may not use any sources of radiation until the individual's radiation dose has been determined.

(e) Data on personnel exposure reported or recorded from personnel monitoring devices shall be kept for inspection by the Department until the certificate of registration or license is terminated or until the Department authorizes their disposition, in writing, following a determination by the Department that the records contain inaccurate personnel monitoring information.

### **RADIATION-PRODUCING MACHINE REQUIREMENTS**

#### **§ 225.101. Cabinet X-ray systems and baggage/package X-ray systems.**

(a) Cabinet and baggage/package X-ray systems that are certified under 21 CFR Chapter I, Subchapter J (relating to radiological health) shall also meet the requirement of 21 CFR 1020.40 (relating to cabinet X-ray systems).

(b) A cabinet X-ray system may not be energized unless all openings are securely closed and exposure to radiation from the system does not exceed the limits in 10 CFR 20.1301 (relating to dose limits for individual members of the public). Each access door to the cabinet shall have an interlock that terminates the exposure whenever the door is opened. The enclosure shall be shielded so that every location on the exterior meets the conditions for an unrestricted area.

(c) A registrant may not permit an individual to operate a cabinet X-ray system until the individual has received a copy of, and instruction in, the operating procedures for the X-ray system and has demonstrated competency in the use of the cabinet X-ray system and an understanding of the operating procedures.

(d) The registrant shall perform radiation surveys to demonstrate compliance with 10 CFR 20.1301 and maintain records of these surveys for inspection by the Department for 3 years:

(1) Upon installation of the equipment.

(2) Following a change in the initial arrangement, relocation of the unit, or following any maintenance requiring the disassembly or removal of any shielding component.

(3) When a visual inspection reveals an abnormal condition.

(e) The registrant shall test on-off switches, interlocks and safety devices at intervals not exceeding 1 year, and make repairs as necessary to maintain all safety features including warning labels. Records of these tests shall be maintained for inspection by the Department for 3 years.

(f) Cabinet X-ray systems and baggage/package X-ray systems are exempt from all other provisions of this chapter.

#### **Source**

The provisions of this § 225.101 amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial page (282421).

**Cross References**

This section cited in 25 Pa. Code § 225.104 (relating to X-ray detection systems for explosives, weapons and illegal items).

**§ 225.102. Shielded room X-ray radiography.**

(a) A room used for shielded room X-ray radiography shall be shielded so that every location on the exterior meets conditions for an unrestricted area and the only access to the room is through openings which are interlocked so that the radiation source will not operate unless all openings are securely closed and meet the requirements of 10 CFR 20.1601 (relating to control of access to high radiation areas).

(b) The operator shall conduct a physical radiation survey to determine that the radiation source is deenergized prior to each entry into the radiographic exposure area.

(c) As an alternative to subsection (b), the registrant may use an independent radiation monitoring system that displays the radiation intensity or displays when radiation levels have returned to their pre-irradiation levels.

(d) With the exception of the provisions in §§ 225.4a, 225.76 and 225.84 (relating to radiation safety program; reporting requirements; and operating and emergency procedures), shielded room radiography is exempt from all other provisions of this chapter.

**Authority**

The provisions of this § 225.102 amended under sections 301 and 302 of the Radiation Protection Act (35 P. S. §§ 7110.301 and 7110.302); section 1920-A of The Administrative Code of 1929 (71 P. S. § 510-20); and the Radon Certification Act (63 P. S. §§ 2001—2014).

**Source**

The provisions of this § 225.102 amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823; amended May 16, 2008, effective May 17, 2008, 38 Pa.B. 2243. Immediately preceding text appears at serial page (304550).

**§ 225.103. Field site radiography.**

(a) The operator shall conduct a physical radiation survey to determine that the radiation source is de-energized prior to each entry into the radiographic exposure area. Survey results and records of the boundary location shall be maintained and kept available for inspection by the Department for 3 years.

(b) Mobile or portable radiation producing machines shall be physically secured to prevent tampering or removal by unauthorized personnel.

**Source**

The provisions of this § 225.103 amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial page (282422).

**§ 225.104. X-ray detection systems for explosives, weapons and illegal items.**

(a) This section applies to X-ray systems that produce an image that may be used to screen for the presence of explosive devices or components, weapons, contraband or prohibited items. This section does not apply to cabinet and baggage/package X-ray systems covered under § 225.101 (relating to cabinet X-ray systems and baggage/package X-ray systems).



(b) An X-ray system used for detection of explosives, weapons or illegal items may not be used on human beings or animals without specific permission of the Department. X-ray systems that irradiate human beings for medical diagnosis are covered under Chapter 221 (relating to human use of X-ray machines). X-ray systems that irradiate animals for diagnosis or therapy are covered under Chapter 223 (relating to veterinary medicine).

(c) Radiographic X-ray detection systems shall conform to the following:

(1) The leakage radiation from the source assembly measured at a distance of 1 meter in any direction from the source may not exceed 25.8  $\mu\text{C}/\text{kg}$  (100 mR) in 1 hour when the X-ray tube is operated at its leakage technique factors. Compliance shall be determined by measurements averaged over an area of 100 square centimeters with no linear dimension greater than 20 centimeters.

(2) Portable X-ray systems shall be equipped with collimators which are capable of restricting the useful beam to the area of interest. Collimators shall provide the same degree of protection required in paragraph (1).

(3) A means shall be provided to terminate the exposure after a preset time, a preset to image receptor or a preset product of exposure time and tube current.

(4) The X-ray control shall have a dead-man type exposure switch.

(5) The X-ray controls shall indicate the technique factors, (that is, kilovoltage, tube current and exposure time or the product of tube current and exposure time).

(6) The X-ray machine shall be labeled with a readily discernible sign bearing the radiation symbol and the words, "CAUTION RADIATION—THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED" or words having a similar intent, near any switch that energizes the X-ray tube.

(7) For fixed radiographic equipment, an easily visible warning light shall be located adjacent to the X-ray tube and labeled with the words "X-RAY ON" or words having a similar intent. The warning light shall be illuminated only when the X-ray tube is energized or only when the shutter is open.

(d) Fluoroscopic X-ray detection systems shall conform to the following:

(1) The leakage radiation from the source assembly measured at a distance of 1 meter in any direction from the source may not exceed 25.8  $\mu\text{C}/\text{kg}$  (100 mR) in 1 hour when the X-ray tube is operated at its leakage technique factors. Compliance shall be determined by measurements averaged over an area of 100 square centimeters with no linear dimension greater than 20 centimeters.

(2) The X-ray machine shall be labeled with a readily discernible sign bearing the radiation symbol and the words, "CAUTION RADIATION—THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED" or words having a similar intent, near any switch that energizes the X-ray tube.

(3) To the extent practicable, the X-ray system (X-ray tube, imaging system and the object being irradiated) shall be completely enclosed so that every location on the exterior meets conditions for an unrestricted area and the only

access to the room or enclosure is through openings which are interlocked so that the radiation source will not operate unless all openings are securely closed and meet the requirements of 10 CFR 20.1601 (relating to control of access to high radiation areas).

(4) The equipment shall be constructed so that, under conditions of normal use, the entire cross-section of the useful beam shall be attenuated by a primary protective barrier permanently incorporated into the equipment.

(5) The X-ray control shall have a dead-man type exposure switch. Activation of the X-ray beam shall be possible only by continuous pressure on the exposure switch.

(6) An easily visible warning light shall be located adjacent to the X-ray tube or on the outside of the enclosure and be labeled with the words "X-RAY ON" or words having a similar intent. This light shall be illuminated only when the X-ray tube is energized or only when the shutter is open.

(e) Operating procedures for portable radiographic X-ray detection systems are as follows:

(1) To the extent practicable, portable X-ray tube heads shall be supported by a stand.

(2) To the extent practicable, supporting or positioning devices for the image receptor shall be used during radiation exposures.

(3) Individuals, other than those whose presence is necessary to conduct the X-ray procedure, shall be located at least 2 meters away from the X-ray tube and the object being irradiated during exposures.

(4) An individual may not be regularly employed to support the image receptor or object during radiation exposures.

(f) Operating procedures for fixed radiographic X-ray detection systems are as follows:

(1) A registrant shall test the safety and warning devices, including interlocks, at intervals not to exceed 12 months. Test records shall be maintained for inspection by the Department for 3 years after the test has been conducted.

(2) Safety or warning devices that do not function properly shall be repaired in a timely manner.

(3) If an X-ray detection system is required to be operated while in need of repair, procedures shall be modified to maintain the design level equivalent of safety or else the equipment may not be used.

**APPENDIX A**Subjects to be Covered During the  
Instruction of Radiographers

- I. *Fundamentals of Radiation Safety*
  - A. Characteristics of radiation
  - B. Units of radiation dose and quantity of radioactivity
  - C. Significance of radiation dose
    1. Radiation protection standards
    2. Biological effects of radiation dose
  - D. Levels of radiation from radiation sources
  - E. Methods of controlling radiation dose
    1. Working time
    2. Working distances
    3. Shielding
- II. *Radiation Detection Instrumentation to be Used*
  - A. Use of radiation survey instruments
    1. Operation
    2. Calibration
    3. Limitations
  - B. Survey techniques
  - C. Use of personnel monitoring equipment
    1. Film badges
    2. Thermoluminescent dosimeters
    3. Pocket dosimeters
- III. *Radiographic Equipment to be Used*
  - A. Remote handling equipment
  - B. Radiographic exposures devices and sealed sources
  - C. Storage containers
  - D. Operation and control of X-ray equipment
- IV. *The Requirements of Pertinent Federal and State Regulations*
- V. *The Licensee's or Registrant's Written Operating and Emergency Procedures*
- VI. *Inspection and Maintenance Performed by the Radiographers*
- VII. *Case Histories of Radiography Incidents*

**Source**

The provisions of this Appendix A adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235.

**Cross References**

This appendix cited in 25 Pa. Code § 225.73 (relating to training of personnel).

[Next page is 226-1.]

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