# CHAPTER 223. VETERINARY MEDICINE

## GENERAL PROVISIONS

Sec.


## X-RAYS



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## ADMINISTRATIVE CONTROLS



### Authority

The provisions of this Chapter 223 issued under section 301 of The Atomic Energy Development and Radiation Control Act (73 P.S. § 1301) (Repealed); amended under sections 301 and 302 of the Radiation Protection Act (35 P.S. §§ 7110.301 and 7110.302); and section 1920-A of The Administrative Code of 1929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 223 adopted February 1, 1972, effective February 2, 1972, 2 Pa.B. 212, unless otherwise noted.

### Cross References

This chapter cited in 25 Pa. Code § 215.32 (relating to exemption qualifications); 28 Pa. Code § 501.4 (relating to regulations); and 28 Pa. Code § 565.12 (relating to radiology service policy).

## GENERAL PROVISIONS

### § 223.1. Purpose and scope.

This chapter establishes radiation safety requirements for persons utilizing radiation sources in veterinary medicine. Persons who use radiation sources for veterinary medicine or research on animals shall comply with this chapter. The requirements of this chapter are in addition to and not in substitution for other applicable requirements of this article.

**Source**

The provisions of this § 223.1 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 October 26, 2018, effective January 24, 2019, 48 Pa.B. 6791. Immediately preceding text appears at serial page (282392).

### § 223.2. [Reserved].

**Source**

The provisions of this § 223.2 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 (119229).

### § 223.2a. Definitions.

As used in this chapter, the following words and terms have the following meanings, unless the context clearly indicates otherwise:

*C—Coefficient of variation*—The ratio of the standard deviation to the mean value of a population of observations.

*Dead-man switch*—A switch so constructed that a circuit closing contact can be maintained only by continuous pressure on the switch by the operator.

*Fluoroscopic imaging assembly*—A subsystem in which X-ray photons produce a fluoroscopic image. The term includes the image receptors such as the image intensifier and spot-film device, electrical interlocks, if any, and structural material providing linkage between the image receptor and diagnostic source assembly.

*Image receptor*—A device, such as a fluorescent screen or radiographic film, which transforms incident X-ray photons either into a visible image or into another form which can be made into a visible image by further transformations.

*Leakage radiation*—Radiation emanating from the diagnostic or therapeutic source assembly except for the following:

(i) The useful beam.

(ii) Radiation produced when the exposure switch or timer is not activated.

**Authority**

The provisions of this § 223.2a issued 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).

**Source**

The provisions of this § 223.2a adopted October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894.

## §§ 223.3—223.6. [Reserved].

**Source**

The provisions of these §§ 223.3—223.6 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 (119230).

## § 223.7. Structural shielding.

Facilities regularly used for diagnostic or therapeutic veterinary X-ray procedures shall have protective barriers sufficient to assure compliance with § 219.51 (Reserved).

**Authority**

The provisions of this § 223.7 issued 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).

**Source**

The provisions of this § 223.7 adopted October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894.

## § 223.8. Operating procedures.

(a) Individuals, whose presence is not necessary to conduct the X-ray procedures, shall be located in a shielded area or at least 2 meters from the primary X-ray beam and X-ray tubehead.

(b) Mechanical supporting or restraining devices shall be used during X-ray procedures to hold the animal patient or films in position, when the technique permits.

(c) Individuals whose presence is necessary to conduct X-ray procedures and who are not located behind protective barriers or at least 2 meters from the X-ray tubehead and primary X-ray beam shall be protected with appropriate shielding devices such as lead aprons and gloves, and be positioned so that no part of their body except hands and forearms will be exposed to the primary beam. Appropriate shielding devices shall have a lead equivalent at least 0.25 millimeters of lead.

(d) X-ray exposures shall be authorized by a veterinarian.

**Authority**

The provisions of this § 223.8 issued 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).

**Source**

The provisions of this § 223.8 adopted October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894.

**Cross References**

This section cited in 25 Pa. Code § 223.12a (relating to fluoroscopic equipment).

## X-RAYS

### § 223.11. Radiographic equipment.

(a) *Leakage radiation.*

(1) The leakage radiation from the tube housing assembly with a beam-limiting device attached measured at a distance of 1 meter in any direction from the source may not exceed 100 milliroentgens (25.8 μC/kg) in 1 hour when the X-ray tube is operated at its maximum 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 radiation emitted by a component other than the tube housing assembly with a beam-limiting device attached may not exceed 2 milliroentgens (0.516 μC/kg) in 1 hour at 5 centimeters from an accessible surface of the component when it is operated in an assembled X-ray system under conditions for which it was designed. Compliance shall be determined by measurements averaged over an area of 100 square centimeters with no linear dimension greater than 20 centimeters.

(b) *X-ray beam restriction.*

(1) The primary X-ray beam shall be restricted to the area of clinical interest and equal to or smaller than the image receptor.

(2) Collimating devices capable of limiting the primary beam to the appropriate image receptor to within 2% of the source to image distance shall be provided and used. They shall provide the same degree of protection as is required in subsection (a)(1) for a diagnostic source assembly.

(3) A means shall be provided to align the center of the X-ray field to the center of the image receptor to within 2% of the source to image distance.

(c) *X-ray beam filtration.* The total filtration permanently in the useful beam may not be less than .5 millimeters aluminum equivalent for machines operating up to 50 kVp, 1.5 millimeters aluminum equivalent for machines operating between 50—70 kVp and 2.5 millimeters aluminum equivalent for machines operating above 70 kVp.

(d) *Exposure control devices.*

(1) An exposure control device shall be provided to terminate the exposure after a preset time interval, preset product of current and time, a preset number of pulses or a preset radiation exposure to the image receptor. Termination of an exposure shall cause automatic resetting of the timer to its initial setting or to zero. It may not be possible to initiate an exposure with the exposure control device in the zero or off position, if either position is available, unless equipped for current adjustment.

(2) A means shall be provided to initiate the radiation exposure by a deliberate action on the part of the operator such as the depression of a switch. The switch shall be of the dead man type.

(e) The coefficient of variation for exposure may not exceed 0.10 when all technique factors are held constant. This requirement shall be deemed to have been met if, when 4 exposures are made at identical technique factors, the value of the average exposure (a) is greater than or equal to 5 times the maximum exposure (e(max)) minus the minimum exposure (e(min)).

(f) Veterinary portable X-ray units shall be supported by a tube stand when the technique permits unless the unit is designed to be hand held during X-ray procedures.

(g) The X-ray control shall provide indication of the production of X-rays that is observable from the operator's position. The technique factors that are set prior to the exposure shall be indicated on the X-ray control and shall be visible to the operator from the operator's position.

**Authority**

The provisions of this § 223.11 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).

**Source**

The provisions of this § 223.11 adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894. Immediately preceding text appears at serial page (203901).

**Cross References**

This section cited in 25 Pa. Code § 223.12a (relating to fluoroscopic equipment).

## § 223.12. [Reserved].

**Source**

The provisions of this § 223.11 adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894. Immediately preceding text appears at serial page (203901).

## § 223.12a. Fluoroscopic equipment.

(a) The fluoroscopic imaging assembly shall be provided with a primary protective barrier that intercepts the entire cross section of the primary beam at the maximum source to image receptor distance.

(b) The X-ray tube used for fluoroscopy may not produce X-rays unless the primary barrier is in position to intercept the entire primary beam.

(c) X-ray production in the fluoroscopic mode shall be controlled by a deadman switch for the duration of any exposure. When recording serial fluoroscopic images, the fluoroscopist shall be able to terminate the X-ray exposures at any time. A means may be provided to permit completion of a single exposure of the series in process.

(d) The protective barrier may not transmit more than 2 milliroentgens (.516 μC/kg) per hour at 10 centimeters from an accessible surface of the fluoroscopic imaging assembly for each roentgen per minute of entrance exposure rate.

(e) During fluoroscopy and cinefluorography, the voltage and the current shall be continuously indicated.

(f) A cumulative timing device activated by the fluoroscope switch shall be provided. It shall indicate the passage of a predetermined period of irradiation either by an audible signal or by temporary or permanent interruption of the irradiation when the increment of exposure time exceeds a predetermined limit not exceeding 5 minutes.

(g) Fluoroscopic table designs when combined with normal operating procedures shall be of a type that no unprotected part of the staff or an ancillary individual's whole body is exposed to unattenuated scattered radiation which originates from under the table. The attenuation required may be not less than 0.25 millimeter lead equivalent.

(h) Equipment configuration when combined with normal operating procedures shall be of a type that no portion of the staff or an ancillary individual's whole body, except the extremities, is exposed to the unattenuated scattered radiation emanating from above the tabletop unless one of the following criteria is met:

(1) The individual is at least 120 centimeters from the center of the primary beam.

(2) The radiation has passed through at least 0.25 millimeter of lead equivalent material—for example, drapes, bucky-slot cover (film-tray cover panel), sliding or folding panel or self-supporting curtains—in addition to the lead equivalency provided by the protective apron referred to in § 223.8(c) (relating to operating procedures).

(i) In addition to the other requirements of this section, mobile fluoroscopes shall have image intensification.

**Authority**

The provisions of this § 223.12a issued 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).

**Source**

The provisions of this § 223.12a adopted October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894.

## § 223.13. [Reserved].

**Source**

The provisions of this § 223.13 adopted December 18, 1987, effective December 19, 1987, 17 Pa.B. 5235; reserved October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894. Immediately preceding text appears at serial page (203902).

## § 223.13a. Therapeutic systems.

(a) When the tube is operated at its maximum technique factors, the leakage radiation may not exceed any of the following:

(1) One hundred milliroentgens (25.8 μC/kg) per hour at 5 centimeters from the surface of the tube housing assembly for contact therapy systems.

(2) One roentgen (.258 mC/kg) per hour at 1 meter from the source for 0-500 kVp systems.

(3) One-tenth percent of the exposure rate of the primary beam at 1 meter from the source for 501-999 kVp systems.

(b) Beam limiting devices used for limiting the primary beam shall provide at least the same protection as required by the tube housing assembly.

(c) Therapeutic X-ray systems shall be secured to prevent unauthorized use whenever the system is unattended.

(d) Interlocks shall be provided so that, when a door of the treatment room is opened, either the machine will shut off automatically or the radiation level within the room will be reduced to an average of not more than 2 milliroentgens (0.516 μC/kg) per hour and a maximum of 10 milliroentgens (2.58 μC/kg) per hour at a distance of 1 meter in any direction from the target; or interlocks will energize a conspicuous visible or audible alarm signal so that the individual entering and the operator are made aware of the entry. After a shut-off or reduction in output, it shall be possible to restore the machine to full operation only from the control panel.

(e) Interlocks, on-off beam control mechanisms and safety and warning devices shall be checked and appropriately serviced at least once in a calendar year.

(f) Treatment room entrances shall be provided with warning lights, which will indicate when the primary beam is on, in a readily observable position near the outside of access doors.

(g) Exposure factors shall be displayed on the control panel.

(h) Provision shall be made to permit continuous observation of the animal patient from the control panel during irradiation.

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

**Authority**

The provisions of this § 223.13a issued 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).

**Source**

The provisions of this § 223.13a adopted October 2, 1998, effective October 3, 1998, 28 Pa.B. 4894.

## RADIOACTIVE MATERIAL

### § 223.21. In vitro testing.

A veterinarian who uses radioactive material for in vitro testing shall comply with 10 CFR 31.11 (relating to general license for use of by-product material for certain in vitro clinical or laboratory testing) but is exempt from 10 CFR Part 20 Subpart K (relating to waste disposal).

**Authority**

The provisions of this § 223.21 issued under section 302 of the Radiation Protection Act (35 P. S. § 7110.302); and section 1920-A of The Administrative Code of 1929 (71 P. S. § 510-20); amended under the Radiation Protection Act (35 P. S. §§ 7110.101—7110.703); and the Low-Level Radioactive Waste Disposal Act (35 P. S. §§ 7130.101—7130.906); and 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).

**Source**

The provisions of this § 223.21 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; amended July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823. Immediately preceding text appears at serial page (282396).

### § 223.22. Sealed and unsealed sources.

A veterinarian who uses sealed or unsealed sources for therapeutic treatment of animals shall comply with 10 CFR Parts 30 and 31.11 (relating to rules of general applicability to domestic licensing of byproduct material; and general license for use of byproduct material for certain in vitro clinical or laboratory testing).

**Authority**

The provisions of this § 223.22 issued under section 302 of the Radiation Protection Act (35 P.S. § 7110.302); and section 1920-A of The Administrative Code of 1929 (71 P.S. § 510-20); amended under the Radiation Protection Act (35 P.S. §§ 7110.101—7110.703); the Low-Level Radioactive Waste Disposal Act (35 P.S. §§ 7130.101—7130.906); and section 1920-A of The Administrative Code of 1929 (71 P.S. § 510-20).

**Source**

The provisions of this § 223.22 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 July 16, 2004, effective July 17, 2004, 34 Pa.B. 3823; amended October 26, 2018, effective January 24, 2019, 48 Pa.B. 6791. Immediately preceding text appears at serial pages (304526) to (304527).

## ADMINISTRATIVE CONTROLS

### § 223.31. Registrant responsibilities.

(a) The registrant is responsible for directing the operation of X-ray systems under the registrant's administrative control and shall assure that the requirements of this article are met for the operation of the X-ray systems.

(b) A person who operates an X-ray system shall be instructed adequately about safe X-ray operating procedures and be competent in the safe use of X-ray equipment. The instructions must include the subjects listed in Chapter 221, Appendix A (relating to determination of competence). The person shall receive continuing education at least every 4 years in radiation safety, biological effects of radiation, species-specific positioning techniques, QA and QC.

(c) Written safety procedures and rules shall be available at the facility and include restrictions of the operating technique required for the safe operation of the particular X-ray system. The operator shall be able to demonstrate familiarity with these procedures and rules.

(d) Only the staff, ancillary facility personnel or other persons required for the medical procedure or training may be within 2 meters of the device during the radiographic exposure. All of the following requirements apply to persons involved with the examination:

(1) An individual or extremity may not be positioned in the useful beam unless required to conduct the procedure.

(2) Individuals shall be positioned so that no part of the body will be struck by the useful beam unless protected by at least 0.5 millimeter lead equivalent material. The lead equivalent of the material is to be determined at 60 kV.

(3) Each person shall be protected from stray radiation by protective aprons or whole protective barriers of at least 0.25 millimeter lead equivalent or shall be positioned so that no person is in the direct line of the useful beam and the nearest portion of the body is at least 2 meters from both the tube head and the nearest edge of the image receptor.

(e) If an animal or image receptor requires auxiliary support during a radiation exposure, all of the following requirements apply:

(1) Mechanical holding devices or chemical restraint shall be used when the technique permits.

(2) An individual may not be used routinely to hold image receptors or subjects. Procedures and auxiliary equipment designed to minimize personnel exposure commensurate with the needed diagnostic information shall be used.

(3) An individual who holds the animal or image receptor shall be protected as required under subsection (d).

(f) The registrant shall have a QA program. The QA program must be documented and be in accordance with guidelines established by the Department or by another appropriate organization recognized by the Department. At a minimum, the QA program must address radiation safety to personnel and modifications to the QA program.

(g) Neither the X-ray tube housing nor the collimating device may be handheld during the exposure unless specifically designed and shielded to be handheld.

(h) CT systems used solely for nonhuman imaging are exempt from §§ 221.202—221.205.

**Authority**

The provisions of this § 223.31 issued 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 (71 P.S. § 510.20).

**Source**

The provisions of this § 223.31 adopted October 26, 2018, effective January 24, 2019, 48 Pa.B. 6791.

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