

**University of Pennsylvania
Environmental Health and Radiation Safety**

**Veterinary Energized Equipment
User's Guide**

(2012 edition)

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I. Proper Operating Procedures

A. Proper Operating Procedures for Radiographic Units

1. Limit the X-ray primary beam limited to the smallest area possible consistent with the objectives of the clinical examination.
2. Align the X-ray beam properly with the animal and the image receptor.
3. Remain behind a protective barrier (i.e., a leaded glass wall, a leaded door, etc.) during the entire radiographic exposure.
4. Whenever possible use restraining, supporting, or positioning devices for the animal and film or image receptors. [PA 223.8.(b)]
5. X-ray tubes may only be hand-held during an exposure if it is specifically designed for hand-held operation.
6. No individual may be regularly employed to hold or support animals, or film during radiation exposures. An individual holding or supporting an animal or film during radiation exposure shall wear protective gloves and apron having a lead equivalent of not less than 0.5 millimeter and shall be positioned so that no part of that individual's body will be struck by the useful beam.
7. All x-ray procedures must be authorized by a Veterinarian. [PA 223.8.(d)]

B. Proper Operating Procedures for Fluoroscopic Units

1. Only persons required for a fluoroscopic procedure should be in the room during the procedure.
2. As in a radiographic procedure, use the smallest possible beam area, thereby reducing the scatter radiation to personnel.
3. Fluoroscopic doses can also be minimized by reduction in the fluoroscopic time used.
4. Use the timing device to indicate a preset time to serve as a reminder to keep it as short as possible. According to state regulations, the predetermined time should not exceed 5 minutes [PA223.12a.(f)].
5. Use the shortest possible distance from the image intensifier to the animal to reduce scattered radiation levels.

C. Proper Operating Procedures for Mobile Energized Units

If proper care is not taken, mobile equipment has a greater potential than standard equipment for unnecessary radiation exposure of personnel. Stand well away from the useful beam and the animal during the radiographic exposures. Distance is often the best possible protection from radiation.

1. Individuals, other than those whose presence is necessary to conduct the x-ray procedures, must be outside the x-ray room or, for field procedures, shall stand at least 5 meters away from the x-ray tube and from the animal.

2. Operators should wear protective garments with lead equivalent of at least 0.25 millimeter. In cases where the operator is less than 120 cm from the x-ray field, 0.5 mm of lead equivalent shielding is required.

D. Proper Operating Procedures for Dental Units

1. Only persons required for radiographic procedure should be in the radiographic room during exposure. Everyone in the room must be adequately protected by protective garments.
2. Align the x-ray beam and film very carefully with the area to be radiographed.
3. Stand behind a protective barrier and observe the animal during the dental exposure.
4. The operator or the assistant must not hold the film in place during the exposure. Film holder devices must be used to hold the film in the place.

II. Techniques of External Radiation Protection

Radiation exposure levels can be controlled via four basic methods:

1. Maximization of distance from radiation source.
2. Minimization of radiation exposure time.
3. Proper shielding of radiation source.
4. Proper shielding for personnel.

III. Shielding

A. Personnel Shielding

For personnel who remain in the room during examinations, it is important that they be protected by proper shielding, such as the following:

1. A leaded apron must be worn any time personnel are in a room during an exposure.
2. Thyroid shields: anyone likely to be exposed to high levels of scattered radiation to the thyroid during any procedure should wear this shield.
3. Leaded glasses: in fluoroscopy, the lens of the eye can often be exposed to high levels of scattered radiation. The use of leaded glasses can greatly reduce this exposure.
4. Leaded gloves: anyone who must have his/her hand near the primary beam (as in the case where no other means is available to immobilize an animal) should wear leaded gloves to reduce exposure to the extremities.

B. Structural Shielding

Each radiographic room has been designed with sufficient shielding in the walls to provide protection to anyone on the outside of the room. It is important that the integrity of the shielded walls not be tampered with. Therefore, if any personnel notice structural changes, such as holes drilled into walls, Environmental Health and Radiation Safety office (EHRS) should be notified as soon as possible.

IV. Pregnant Worker Policy

An employee should contact EHRS either directly or through the supervisor when she knows or suspects that she is pregnant. If for personal reasons an employee does not wish to disclose pregnancy to her supervisor, confidential disclosures can be made directly to EHRS.

V. Badging and Dosimetry Policy

A. Personnel Dosimeter Policy

EHRS uses personnel monitoring to identify inadequate or improper radiation safety practices and potentially serious radiation exposure situations. EHRS will issue proper personnel dosimeters when evaluation of equipment reveals that the radiation dose to personnel could potentially be larger than ALARA limits per calendar quarter to the whole body (125 mrem).

Radiation workers are monitored by EHRS. All radiation workers must conscientiously wear the radiation monitoring devices provided by the RSO. These devices may include the following:

1. A Film Badge to monitor doses to the whole body
2. A Ring Dosimeter to monitor extremity doses

B. Dosimeter Placement

Interpretation of the measured dose is dependent upon the placement of the dosimeter. All personnel must wear their dosimeters correctly. The following list indicates where the dosimeters are to be worn:

1. Film Badges are to be worn above any protective clothing at collar level.
2. Ring Dosimeters are to be worn so that the employee's name is facing the source of radiation. For x-ray equipment, the name would typically be facing out.

Personnel must return all monitoring devices promptly at the end of each wear period, so that the radiation exposure can be evaluated.

Do not expose personnel monitoring devices to extreme heat or humidity. If any dosimeter has received a dose higher than the ALARA trigger level, the employee will be notified and the reason for the high reading will be investigated. Measures will be taken to keep radiation doses below these limits whenever possible:

Whole Body: 125 mrem/calendar quarter

Extremities: 1875 mrem/calendar quarter

C. Dose Reports

EHRIS sends dose summary reports for each wear period and on an annual basis. These reports will be available in the department. Personnel dosimetry information may also be obtained by contacting EHRIS at (215) 898-7187.

D. Pick-up and Drop-off of Dosimeters

EHRIS delivers new dosimeters to each department on the last Wednesday of the final month of your wear period. Each group should have one person who is responsible for the distribution of dosimeters. The old dosimeters should be returned to the designated personnel. EHRIS will pick these up by the first Wednesday of the following month for analysis

VI. Radiation Survey of Equipment

Radiation survey of equipment checks the radiation safety characteristics of the machine comply with FDA and PA state regulations.

All safety problems observed by personnel, including conspicuous problems with energized equipment or with shielded rooms should be reported immediately to EHRIS.

VII. Diagnostic Equipment

A. Registration of Diagnostic Units

The State of Pennsylvania requires that all radiation producing equipment be registered with the Department of Environmental Protection. This registration is performed by EHRIS on an annual basis. EHRIS maintains a listing of all units currently registered. [PA 216.2]

B. Acquisition of New Diagnostic Units

It is the responsibility of clinical personnel to notify EHRIS upon acquisition of any new diagnostic equipment. Authorized EHRIS personnel will conduct a radiation safety survey on all new units prior to use.

C. Disposal or Transfer of Diagnostic Units

It is the responsibility of clinical personnel to notify EHRIS of any diagnostic equipment intended for disposal or transfer to another facility. EHRIS will ensure that proper notifications to State Agencies are made.

VIII. Important Phone Numbers

University of Pennsylvania, Environmental Health and Radiation Safety:

Monday – Friday during business hours **(215) 898-7187**

On-Call Pager for assistance after hours **(215) 980-0035**