

RIN #19 Personal Protection Guidelines for Veterinary Ambulatory/Mobile (i.e. house call, site visit) X-ray Practice

This RIN provides guidance for protecting persons (veterinarian, their staff, and animal owner) participating in an x-ray procedure in ambulatory/mobile veterinary practice. The purpose is to help the veterinarian take appropriate actions to ensure participants are aware of and are effectively protected against radiation exposure during x-ray procedures. This applies to situations of one-time assistance per year (e.g. by owners) or on a recurrent basis (e.g. veterinarian and their staff). The practitioner needs to be aware of [Safety Code 28: Radiation Protection in Veterinary Medicine](#) and the College of Veterinarians of BC (CVBC) *Radiation Safety Manual* and its requirements. The following operating criteria are assumed.

Operating Criteria

- The x-ray unit is operated at up to 85 kVp and 15 - 30 mAs per exposure and is equipped with a beam-limiting device.
- The x-ray workload (number of exposures) per year does not exceed 500 (~ 40 per month).
- The **maximum** film size (cassette size) is 35cm X 43cm (14" X 17"); smaller cassettes are normally used.
- The veterinarian is **no closer** than 30 cm from the x-ray film cassette; normally distances are more likely to be ~1 m.

Shielding Protection Assessment

Using the operating criteria given above, the practitioner's radiation exposure is calculated to be 0.85 mSv per week (or approximately 45 mSv per year). To reduce this exposure to below 1 mSv/year, protection equivalent to 0.46 mm of lead shielding is required. A typical lead apron of 0.5 mm lead equivalency will meet this requirement. Actual doses received by practitioners will be determined by their workload, exposure technique factors, cassette sizes used and distance.

Regarding doses to the hands, even if hands are in direct contact with the x-ray tube, the contribution of leakage radiation from the x-ray tube is small (~ 2%) compared to scatter radiation. The hand dose estimate is 0.87 mSv per week (~ 46 mSv/year). This is less than 1/10 of the dose limit (500 mSv/year) for hands, given in WorkSafeBC's [Occupational Health and Safety Regulation](#).

General Recommendations

- X-ray equipment must be operated only by individuals who are properly trained to use the equipment and familiar with the procedure(s) being performed. A holding device for the x-ray film-cassette must be used. Utilization of a clamp holder is a requirement of [WorkSafeBC OH&S Guideline](#).
- X-ray equipment that is energized and ready to produce radiation must be supervised by a qualified individual.
- Restraining devices must be used to support animals whenever practical. If possible, the animal should be sedated. However, if this is not possible and a helper must restrain/assist with the procedure, protective aprons, thyroid shields and gloves must be worn. Exposure to the direct radiation of the x-ray beam must be avoided. Personal protective clothing includes lead aprons, gloves and thyroid shields.
- Only those persons whose presence is essential when a radiological procedure is carried out shall be allowed in the immediate area (i.e. at distances closer than 3m to the x-ray equipment).
- Those persons required to be present during an x-ray procedure must take advantage of available protective devices (i.e. lead apron, thyroid shield and gloves) to ensure their exposures are kept as low as reasonably achievable. Personnel must keep as far away from the x-ray beam as is practical at all times. Exposure of personnel to the direct x-ray beam must never be allowed.
- A pregnant client involved in a one-time x-ray procedure is entitled to information and instruction on radiation protection issues and safety concerns regarding assisting during an x-ray procedure. Adherence to workplace safety protocols as instructed to the client by the Veterinarian, and observation of the CVBC Facility Practice Standards and [Safety Code 28](#) is recommended.
- **Children must not assist** during an x-ray procedure. Maximizing the distance between the child and x-ray equipment during its use is recommended.

Personal Protection

- During ambulatory practice, in order to keep whole body dose to below 1 mSv/year, a 0.5 mm lead apron with thyroid shield must be worn during x-ray exposures. The dose to the unprotected hands is estimated to be below the permitted dose limit for hands. However, use of hand protection (lead lined gloves) is a requirement of practice by the CVBC.
- If the workloads exceed those specified in this assessment, then greater protection for the body would likely be required. A reassessment of the protection required will be necessary in such situations.
- Radiation badges must be worn beneath the lead apron to verify that body doses are below WorkSafeBC Action Level of 1 mSv/year. Additional dosimeters may be worn to determine doses to other parts of the body (e.g. head; hands). Contact your dosimetry service provider for details on appropriate dosimeter types.

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X-Ray Tube Stabilization

The veterinarian may need to stabilize the portable x-ray equipment tube housing. This should be done using a lead-gloved hand on the x-ray tube housing away from the beam collimator, while activating the irradiation switch by the other gloved hand. Also, the film cassette must be stabilized by a holding device, not by hand.

Hand Protection

Lead glove protection can reduce radiation exposure to the hands as shown in the table below. The amount of protection depends on the kVp selected and the lead equivalence of the gloves used.

At 85 kVp, the percentage transmission of x-rays* through gloves of different lead equivalencies are as follows:

Lead Equivalence	% Transmitted
0.5 mm	15
0.3 mm	30
0.25 mm	40

* Assumes x-rays are heavily filtered (hardened) by the tube housing shielding.

Radiation Protection Survey

Portable x-ray equipment and related radiation safety devices must be subject to a radiation protection survey at least once every three years, and whenever the equipment or devices may have been damaged, jostled or affected in anyway that would adversely affect their performance, and when personal dosimetry results show doses greater than expected.

For further information contact:

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