



BC Centre for Disease Control
An agency of the Provincial Health Services Authority

Guideline for Determining the X-ray Protection Requirements for Small Animal Veterinary Medicine Multi-Purpose Room Set-Up

This Guideline may be used to determine the protection required for staff in veterinary facilities that have multi-purpose rooms in which x-ray equipment is also used. Its purpose is to help ensure that doses to staff resulting from diagnostic x-ray exposures do not exceed 1 millisievert per year (1 mSv/yr), the Action Level for ionizing radiation, given in WorkSafeBC's [Occupational Health and Safety Regulation](#).*

X-Ray Procedure

- The x-ray unit is operated at up to a maximum 70 kVp and 6-15 mAs per exposure, is equipped with a beam-limiting device and the useful x-ray beam is directed away from areas occupied by staff.
- The x-ray workload (number of exposures) per year must not exceed 2000 (~ 165/month).
- The maximum film (cassette) size is 35 cm x 43 cm (14" x 17"); smaller cassettes are normally used.
- Workloads exceeding the value specified above will require a reassessment of the likely exposure.

In-Room Staff Exposure Assessment

Using the x-ray procedure information given above, the exposure to unprotected staff within the room due to secondary radiation is calculated to be 0.8 mSv/year, at a distance of three (3) meters from the x-ray tube. At two meters distance the exposure to unprotected staff is calculated at 1.8 mSv/yr. Depending on the annual workload and exposure technique factors, unprotected staff in the room could exceed 1 mSv/year, especially if they cannot maintain a distance of 3m from the x-ray tube during its operation. Therefore an exposure control plan would need to be established for these staff.

Personal Protection

- The veterinary facility owner utilizing a multipurpose room must evaluate the radiation exposure of staff working within the room by providing personal dosimeters and ensuring they are worn appropriately. The results of dosimetry must be reviewed to determine the effectiveness of the protective measures.
- Consideration should be given to the use of mobile shielding, placed between the x-ray tube and the surgical area (see diagram over page) or to provide each staff member in the room with a lead apron.
- Mobile shielding should have minimum dimensions of 75 cm W x 120 cm H (30" W x 48" H) and must provide protection to a minimum of 0.1 mm lead equivalent. Mobile shielding with adjustable heights are also acceptable. Lead aprons used should provide protection equivalent to 0.25 mm of lead.
- Workers in the room at less than three (3) meters from the x-ray tube are likely to exceed 1 mSv/yr, if additional protection (mobile shield; lead aprons) is not provided. These workers must be subject to an exposure control plan, which the veterinary facility owner must establish, to meet the regulation.
- Dosimeters used by staff to measure their body doses must be worn underneath the lead apron. Additional dosimeters may be used to determine doses to other parts of the body (e.g. head, hands). Contact your dosimetry service provider for details on suitable dosimeter types and wearing methods.

***NOTE:** If doses exceed or may exceed 1 mSv/yr, the employer must establish an exposure control plan for the worker. The exposure limit for workers, as specified in the *Regulation* is 20 mSv/yr. The *Regulation* also references Health Canada's [Safety Code 28](#), *Radiation Protection in Veterinary Medicine, Recommended Safety Procedures for Installation and Use of Veterinary X-ray Equipment*, for specific guidance on protecting veterinary staff and other persons in adjacent occupied areas.

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- Workers directly involved in taking x-rays and holding small animals must wear appropriate protection (e.g. lead aprons/gloves) to ensure their doses do not exceed the maximum permissible doses for the whole body, hands and other organs/tissues and that doses are kept as low as is reasonably achievable.
- Unexposed x-ray film is stored in a film bin lined with 0.8mm (2 lb/ft²) thickness of lead or kept outside the multi-purpose room prior to use.
- Occupancy beyond barriers: the shielding required (see below) takes into account the amount of time (occupancy) spent by persons outside the barriers (i.e. walls/doors):
 - Full occupancy** applies to areas occupied by workers or other persons for a total of more than 30 minutes per day, and applies to adjacent rooms and tenanted facilities.
 - Partial occupancy** applies to areas occupied by workers and other persons for a total of no more than 30 minutes per day, and applies to areas such as adjacent stairwells, parkades and parking lots, lanes, gardens and infrequently used rooms (storage). Areas that can be converted from **Partial Occupancy** to **Full Occupancy** (e.g. from storage to office) should be considered as **Full Occupancy** for shielding requirements.

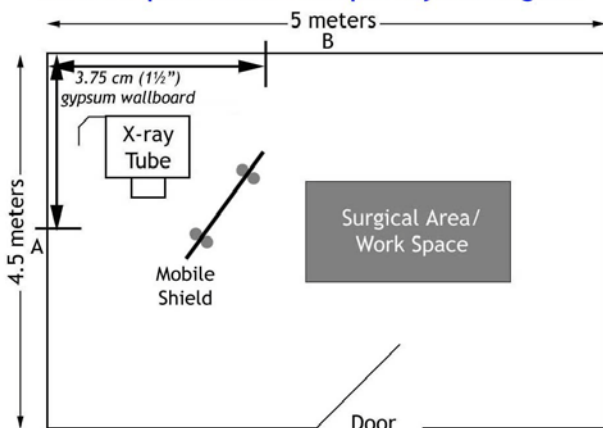
If your facility design and use meets the guideline requirements, you can use the shielding information (below) to determine the thickness of wall materials required for protecting persons outside the room. Complete the assessment and provide a copy to the responsible person on site. If this guideline does not apply, you may wish to solicit the services of a [Radiation Shielding Design and Assessment Consultant](#).

N.B. Building plans are **NOT** required to be submitted to the Radiation Protection Services.

Table 1: Shielding for up to 165 Exposures per Month

Area (see Room Layout Diagram below)	Shielding Requirements	Check <input checked="" type="checkbox"/> one as applicable
Staff outside the room, in adjacent areas		
Walls Labeled 'A' and 'B' on diagram		
or	Full Occupancy (1 mSv/year)	3.75 cm (1½") standard drywall construction <input type="checkbox"/>
	Partial Occupancy (1 mSv/year)	No additional shielding required <input type="checkbox"/>
Staff working within the multi-purpose room		
Surgical Area/Work Space at Full Occupancy (1 mSv/year)	Mobile lead shielding and/or lead aprons	<input type="checkbox"/>
	and Dosimeters worn by all staff members	<input type="checkbox"/>

Multi-Purpose Room - Sample Layout Diagram



Veterinary Practice Name & Address:

Number of Exposures per Week: _____

Date: _____

Signed: _____

Name: _____

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Keep a copy of this signed document on record for future reference/inspection. Attach a copy of room plan showing adjacent areas and their function with this document.