

BASIC PRINCIPLES IN ESTABLISHING A CONTROLLED AREA FOR SMALL ANIMAL DIAGNOSTIC RADIOGRAPHY

The information here is designed to assist with the design and construction of a small animal diagnostic radiography area. The essential requirements are listed as well as what should be considered best practice.

Requirements for dental X-ray are addressed in a separate document.

Controlled area

- Ideally, the X-ray room alone (perhaps with enclosed processing room). Where this ideal cannot be reached it may be possible to expand the controlled area but this has its limitations and will depend on other factors such as workload and staffing levels.
- Requires boundary to have a minimum lead equivalence (LE) of 0.5mm. Brick, medium density block, lead ply, 15 mm thickness barium plaster (little used now and the least popular/practical shielding material) or Knauf Safeboard are all adequate. Two layers of Safeboard may be required. Stud (partition walls) made of plasterboard and wood are NOT sufficient, neither are light-weight Thermalite block walls – all have a very low LE. Occupied rooms below and above have to be considered. No ceiling shielding is required if there are no occupied rooms above and no immediate overlooking windows.
- Minimum number of entrance doors (1!). An entrance door will normally need to be lined with lead ply – usually Code 3 lead, 1.32 mm thick. A wooden door frame represents a barrier gap and this may need to be shielded with a thin strip of lead ply as the most superficial architrave layer. Sheet lead can be moulded round the frame to achieve a seamless/overlapping lead screen across the door and frame. Doors shielded by the peculiar geometry of some X-ray rooms or by a lead screen within the room will not need to be shielded. If in doubt – the door does not need additional shielding if there is no line of sight from the doorway to any position of the tube head or patient (with an intervening suitably attenuating structure – eg solid wall).
- Windows. Preferably none – there are advantages in having a dark examination room and natural light can obscure the light beam diaphragm. Generally, with allowance for occupancy factors, external windows do not require shielding. May be a protection issue if area immediately outside the window has either staff or public access.
- Operator position. In small rooms where the operator (gowned) cannot be more than 2 metres from the primary beam the operator has to be outside the room. This is common practice but the patient and X-ray machine should be in view when an exposure is made. This is achieved with a lead glass viewing window (usually in the door) and an exposure cable ducted through the wall to hang on a hook adjacent to the operator position. The door is closed when the area is controlled. The door may not need to be fully closed if it is hinged such that full screening beyond the doorway is still achieved. There should be a suitable viewing angle through the lead glass to the X-ray table. In large rooms, a lead screen is ideal. Again, the ungowned operator stands behind the screen which can be less than 2 metres from the table. Sometimes the screen can be positioned to shield the entrance door.

Electrical connections

- It is a requirement that red warning lights are installed by each entrance to the controlled area which illuminate automatically when ionizing radiations are produced. With most machines this is actually very hard (impossible) to do so compliance is achieved by having the lights on whenever the X-ray machine is made live. **IT MUST BE PHYSICALLY IMPOSSIBLE TO TAKE AN X-RAY WITH THE WARNING LIGHTS NOT TURNED ON.** The X-ray set will have to have a dedicated socket which has been professionally electrically connected to the warning light circuit.
- It must be possible to isolate the electrical supply to the X-ray set from a safe position in the event of a radiation emergency (eg failure of the timer to terminate the exposure). The isolator switch should NOT be adjacent or beyond the machine and should be outside the controlled area for small rooms or shielded by a screen if within the controlled area. Compliance may be possible by isolating the supply at the main circuit board but this has to be easily accessible, location known to all staff and the relevant circuit clearly marked.

HSE now require, where practicable, that all warning lights are fail-safe – ie if the bulb fails then the X-ray generator is inoperative. All sites should seek qualified advice as to the practicality of complying. If deemed impractical then defined procedural protocols must be in place to minimize any risk associated with inappropriate entry into a controlled area. Variance from the standard automatic light function should not be necessary at an entrance which requires the operator to be present (ie ducted exposure cable).

Note that a duplicate light is compliant. An LED light at each entrance may also be sufficient. All warning lights must be red, of sufficient size and intensity and be suitably placed.

