

**RADIATION MACHINE SHIELDING PLAN REVIEW**  
**West Virginia Code of State Regulations 64-CSR-23, Section 7.4**

7.4.a. Prior to construction, the floor plans, shielding specifications and equipment arrangement of all new installations, or modifications of existing installations, utilizing ionizing radiation machines shall be submitted to the Agency for review and approval. The required information is denoted in Appendix C and D.

7.4.b. The Agency may require the applicant to utilize the services of a qualified expert to determine the shielding requirements prior to the plan review and approval.

7.4.c. The approval of such plans shall not preclude the requirement of additional modifications should a subsequent analysis of operating conditions indicate the possibility of an individual receiving a dose in excess of the limits prescribed in Subsections 6.5., 6.9. - 6.12., 6.13. and 6.14. Of this rule.

7.4.d. After installation of a radiation machine, the registrant shall maintain for inspection by the Agency:

7.4.d.1. The maximum rated technique factors of each machine;

7.4.d.2. A scale drawing of the room in which a stationary radiation machine system is located with such drawing indicating the use of areas adjacent to the room and an estimation of the extent of occupancy by an individual in such areas. In addition, the drawing shall include:

7.4.d.2.A. The results of a survey for radiation levels present at the operator's position and at pertinent points outside the room at specified test conditions; or

7.4.d.2.B. The type and thickness of materials, or lead equivalency, of each protective barrier.

7.5. Prohibited Use - No registrant shall operate or permit the operation of x-ray equipment unless the equipment and installation meet the applicable requirements of this rule.

## APPENDIX C

### INFORMATION ON RADIATION SHIELDING REQUIRED FOR PLAN REVIEWS

In order for the Agency to provide an evaluation, technical advice, and official approval on shielding requirements for a radiation installation, the following information must be submitted.

a. The plans showing, as a minimum, the following:

1. The normal location of the system's radiation port; the port's travel and traverse limits; general direction or directions of the useful beam; locations of any windows and doors or other openings; the location of the operator's booth; and the location of the control panel;

2. The structural composition and thickness or lead equivalent of all walls, doors, partitions, floor, and ceiling of the room or rooms concerned;

3. The dimensions of the room or rooms concerned;

4. The type of occupancy of all adjacent areas inclusive of space above and below the room or rooms concerned. If there is an exterior wall, show distance to the closest areas where it is likely that individuals may be present;

5. The make and model of the equipment, the maximum technique factors, and the energy formed waveform (single phase, three phase, etc.);

6. The type of examination or examinations or treatment or treatments which will be performed with the equipment.

b. Information on the anticipated workload of the system or systems in mA-minutes per week.

c. A report showing all basic assumptions used in the development of the shielding specifications.

## APPENDIX D

### DESIGN REQUIREMENTS FOR AN OPERATOR'S BOOTH

#### a. Space Requirements:

1. The operator shall be allotted not less than 0.70 m<sup>2</sup> (7.5 square feet) of unobstructed floor space in the booth;
2. The operator's booth may be any geometric configuration with no dimension of less than 0.6 m (2 feet);
3. The space shall be allotted excluding any encumbrance by the x-ray control panel, such as overhang, cables, or other similar encroachments;
4. The booth shall be located or constructed such that unattenuated direct scatter radiation originating on the examination table or at the wall-mounted image receptor will not reach the operator's position in the booth.

#### b. Structural Requirements;

1. The booth walls shall be permanently fixed barriers of at least 2 m (7 feet) high;
2. When a door or movable panel is used as an integral part of the booth structure, it must have an interlock which will prevent an exposure when the door or panel is not closed;
3. Shielding shall be provided to meet the requirements of Section 6. Of this rule.

#### c. Radiation Exposure Control Placement:

1. The radiation exposure control for the system shall be fixed within the booth and:
  - A. Shall be at least 1.0 m (40 inches) from any point subject to direct scatter, leakage or primary beam radiation;
  - B. Shall allow the operator to use the majority of the available viewing windows.

#### d. Viewing System Requirements:

1. Each booth shall have at least one viewing device which will:
  - A. Be so placed that the operator can view the patient during any exposure; and
  - B. Be so placed that the operator can have full view of any occupant of the room and should be so placed that the operator can view any entry into the room. If any door which allows access to the room cannot be seen from the booth, then outside that door there shall be an "x-rayon"

warning sign that will be lighted anytime the rotor of the x-ray tube is activated. Alternatively, an interlock shall be present such that exposures are prevented unless the door is closed.

2. When the viewing system is a window, the following requirements also apply:

A. The window shall have a viewing area of at least 0.09 m<sup>2</sup> (1 square foot);

B. Regardless of size or shape, at least 0.09 m<sup>2</sup> (1 square foot) of the window area must be centered no less than 0.6 m (2 feet) from the open edge of the booth and no less than one and 1.5 m (5.0 feet) from the floor;

C. The window shall have at least the same lead equivalence as that required in the booth's wall in which it is mounted.

3. When the viewing system is by mirrors, the mirror or mirrors shall be so located as to accomplish the general requirements of Subsection 6.5.

4. When the viewing system is by electronic means:

A. The camera shall be so located as to accomplish the general requirements of Subsection 6.5.; and

B. There shall be an alternate viewing system as a backup for the primary system.