4732.0800 GENERAL EQUIPMENT REQUIREMENTS FOR ALL DIAGNOSTIC RADIATION-PRODUCING SYSTEMS.

Subpart 1. **Applicability.** All diagnostic radiation-producing systems must comply with nationally recognized standards, such as:

A. Code of Federal Regulations, title 21, sections 1020.30 to 1020.33;

B. manufacturer's specifications;

C. in part 4732.1100; or

D. all equipment manufactured before the effective date of Code of Federal Regulations, title 21, sections 1020.30 to 1020.33, must meet the requirements of a nationally recognized standard, or this chapter.

Subp. 2. **Radiation exposure x-ray control.** An x-ray control must be incorporated into each x-ray system to comply with Code of Federal Regulations, title 21, section 1020.31. In addition, the x-ray control must meet the requirements in this subpart.

A. The exposure control switch must be a dead-man type, which requires continuous pressure to complete the exposure.

B. Each x-ray control console other than dental intraoral systems must be located in such a way as to meet the requirements in subitems (1) to (3).

(1) Stationary x-ray systems must have the x-ray control permanently mounted behind the protective barrier so that the operator remains behind the barrier during the entire exposure.

(2) Portable x-ray systems that produce more than 25 milliampere-minutes per week at the same location must meet the requirement of subitem (1).

(3) Portable x-ray systems that produce less than 25 milliampere-minutes per week at the same location, must meet the requirement of subitem (1), or have a 6.5 foot (2.0 m) high lead equivalent protective barrier which is placed at least six feet (1.8 m) from the tube housing assembly and at least six feet (1.8 m) from the patient.

C. The x-ray control console must provide visual indication observable at or from the operator's protected position whenever x-rays are produced.

D. The control panel containing the main power switch must bear the warning statement which is legible and accessible to view: "WARNING This x-ray unit may be dangerous to patient and operator unless safe exposure factors, operating instructions, and maintenance schedules are observed."

E. Any deviation of technique factors for kVp must be those specified by the manufacturer. For other technique factors, the deviation must have a coefficient of variation of no more than five percent.

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F. The x-ray control console must provide a signal audible to the operator that the exposure has terminated.

G. Automatic or semiautomatic collimators (PBL) may be permanently changed to a manual mode, if the facility chooses. This requires the automatic system to be permanently disabled. The collimator must be relabeled with a durable sign that is clearly observable to the operator that states "manual operation required."

Subp. 3. **Radiation exposure automatic exposure controls.** When an automatic exposure control is provided, the control must meet Code of Federal Regulations, title 21, section 1020.31.

Subp. 4. **Radiation from capacitor energy storage equipment.** Radiation emitted from the x-ray tube must comply with Code of Federal Regulations, title 21, section 1020.31.

Subp. 5. **Diagnostic radiographic systems designed for one image receptor size.** These systems must meet Code of Federal Regulations, title 21, section 1020.31.

Subp. 6. **Beam quality, half-value layer.** The half-value layer of the useful beam for a given kVp must not be less than the values shown in item A. If it is necessary to determine a half-value layer at a kVp, which is not listed in item A, linear interpolation or extrapolation may be made.

A. Values for half-value layer of useful beam for x-ray tube:

Design operating range (kVp)	Measured kVp	Half-value layer (millimeter of aluminum) Other x-ray Systems*	Specified Dental Systems
Below 50	30	0.3	1.5
	40	0.4	1.5
	50	0.5	1.5
51-70	51	1.2	1.5
	60	1.3	1.5
	70	1.5	1.5
Above 70	71	2.1 [2.5]	2.1
	80	2.3 [2.9]	2.3
	90	2.5 [3.2]	2.5

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100	2.7 [3.6]	2.7
110	3.0 [3.9]	3.0
120	3.2 [4.3]	3.2
130	3.5 [4.7]	3.5
140	3.8 [5.0]	3.8
150	4.1 [5.4]	4.1

*Systems manufactured after June 10, 2006, are in brackets. All other systems were manufactured before June 10, 2006.

B. All intraoral dental radiographic systems installed on and after December 1, 1980, must have a minimum half-value layer not less than 1.5 millimeters aluminum.

C. For capacitor energy storage equipment, compliance with the requirements of this subpart must be determined with the capacitors fully charged and with a technique that discharges at least half of the energy stored in the capacitors, half of the maximum milliampere-second.

D. The half-value layer of the useful beam must be measured with all the materials in the beam that normally are present between the source and the patient.

Statutory Authority: *MS s 144.12*

History: *32 SR 777*

Published Electronically: *December 10, 2007*

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