

**TITLE 20 ENVIRONMENTAL PROTECTION**  
**CHAPTER 3 RADIATION PROTECTION**  
**PART 6 ~~[X-RAYS IN THE HEALING ARTS]~~ MEDICAL DIAGNOSTIC AND INTERVENTIONAL X-RAY AND IMAGING SYSTEMS**

**20.3.6.1 ISSUING AGENCY:** Environmental Improvement Board.  
[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.2 SCOPE:** ~~[This subpart (now 20.3.6 NMAC) establishes requirements, for which a registrant is responsible, for use of x ray equipment by or under the supervision of an individual authorized by and licensed in accordance with state statutes to engage in the healing arts or veterinary medicine. The provisions of this subpart [now part] are in addition to, and not in substitution for, other applicable provisions of these regulations.] This Part establishes requirements, for which a registrant or licensee is responsible, for use of diagnostic and interventional x-ray equipment and imaging systems by, or under the supervision of, an individual authorized by and licensed in accordance with State statutes to engage in the healing arts or veterinary medicine. The provisions of this Part are in addition to, and not in substitution for, other applicable provisions of Parts 1, 2, 4, 7, 9, 10, 19, and 20 of 20.3 NMAC.~~  
[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.3 STATUTORY AUTHORITY:** Sections 74-1-9, 74-3-5 and 74-3-9 NMSA 1978.  
[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.4 DURATION:** Permanent.  
[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.5 EFFECTIVE DATE:** Effective [XXXXX X, XXXX,][June \_\_\_\_\_, 2026 unless a later date is cited at the end of a section or paragraph of this Part, this part, less Subpart 14 (now 20.3.14 NMAC), superseded EIB RPR 1, Radiation Protection Regulations, filed March 10, 1989. Any reference to EIB RPR 1 on any other regulations shall be construed to mean these regulations. Effective July 30, 1999, this part has been internally renumbered and history notes have been added for inclusion into the New Mexico Administrative Code.  
**A.** Subpart 14 (now 20.3.14 NMAC) is effective August 2, 1995.  
**B.** Supersession of EIB RPR 1 shall not affect any administrative or judicial enforcement action pending on the effective date of these regulations, nor the validity of any license issued pursuant to EIB RPR 1.]  
[[5/3/95; 8/2/95; 7/30/99; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]  
[Compiler's note: The words *or paragraph*, above, are no longer applicable. Later dates are now cited only at the end of sections, in the history notes appearing in brackets.]

**20.3.6.6 OBJECTIVE:**  
**A.** To protect the public and occupationally exposed individuals from unnecessary exposure to ionizing radiation.  
**B.** To provide for the safe possession and use of radioactive materials and radiation machines in keeping with the As Low As Reasonably Possible (ALARA )principle.  
[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.7 DEFINITIONS:** As used in this subpart (now part):  
**A.** "Accessible surface" means the external surface of the enclosure or housing provided by the manufacture;  
**B.** [~~"added filter"~~ means the filter added to the inherent filtration;] "Air kerma" means kerma in air (see definition of Kerma).  
**C.** "Air kerma rate (AKR)" means the air kerma per unit time.  
**D.** "Alert value" means a dose index (e.g., of CTDIvol(mGy) or DLP(mGy-cm)) that is set by the registrant or licensee to trigger an alert to the CT operator prior to scanning within an ongoing examination. The Alert value represents a universal dose index value well above the registrant or licensee's established range for the examination that warrants more stringent review and consideration before proceeding.

~~[C.]E.~~ **“Aluminum equivalent”** means the thickness of aluminum (type 1100 alloy) affording the same attenuation, under specified conditions as the material in question; (the nominal chemical composition of type 1100 aluminum alloy is 99.00 percent minimum aluminum, 0.12 percent copper);

F. **“Articulated joint”** means a joint between two separate sections of a tabletop where the joint provides the capacity of one of the sections to pivot on the line segment along which the sections join.

~~[D.]G.~~ **“Attenuation block”** means a block or stack 3.8 cm thick of type 1100 aluminum alloy or other material having equivalent attenuation;

[E.]H. **“Automatic exposure control (AEC)”** means a device which automatically controls one or more technique factors in order to obtain at a preselected location(s) a required quantity of radiation (see also “phototimer”);

I. ~~“changeable filter” means any filter, exclusive of inherent filtration, which can be removed from the useful beam through any electronic, mechanical or physical process;~~ **[Reserved]**

J. **“Automatic exposure rate control (AERC)”** means a device which automatically controls one or more technique factors in order to obtain, at a preselected location(s), a required quantity of radiation per unit time.

~~[F.]K.~~ **“Barrier”** (see “protective barrier”);

~~[G.]L.~~ **“Beam axis”** means a line from the source through the center of the x-ray field;

~~[H.]M.~~ **“Beam-limiting device”** means a device which provides a means to restrict the dimensions of the x-ray field;

N. **“Bone densitometer”** means a device intended for medical purposes to measure bone density and mineral content by x-ray or gamma ray transmission measurements through the bone and adjacent tissues. This generic type of device may include signal analysis and display equipment, patient and equipment supports, component parts, and accessories.

O. **“Bone densitometry”** means a noninvasive measurement of certain physical characteristics of bone that reflect bone strength. Test results are typically reported as bone mineral content or density and are used for diagnosing osteoporosis, estimating fracture risk, and monitoring changes in bone mineral content.

P. **[Reserved]**

Q. **“C-arm fluoroscope”** means a fluoroscopic x-ray system in which the image receptor and the x-ray tube housing assembly are connected or coordinated to maintain a spatial relationship. Such a system allows a change in the direction of the beam axis with respect to the patient without moving the patient.

R. **“Cantilevered tabletop”** means a tabletop designed such that the unsupported portion can be extended at least 100 cm beyond the support.

S. **“Cassette holder”** means a device, other than a spot-film device, that supports and/or fixes the position of the image receptor during a radiographic exposure.

~~[J.]T.~~ **“Coefficient of variation (SA)”** means the ratio of the standard deviation to the mean value of a population of observations. It is estimated using the following equation:  
where:

[ $\bar{x}$  = mean value of observations in sample

$x_i$  =  $i$ th observation in sample

$N$  = number of observations in sample]

$$C = \frac{s}{\bar{x}} = \frac{1}{\bar{x}} \left[ \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1} \right]^{1/2}$$

$s$  = Estimated standard deviation of the population.

$\bar{x}$  = Mean value of observations in sample;

$x_i$  =  $i$ th observation in sample;

$n$  = Number of observations sampled.<sup>27</sup>

~~[K.]U.~~ **“Collimator”** means a device or mechanism by which the x-ray beam is restricted in size;

V. **“Computed radiography (CR; also see DR)”** means a digital x-ray imaging method in which a photo-stimulable phosphor is used to capture and store a latent image. The latent image is read out by stimulating the phosphor with a laser. Computed radiography systems may use cassettes to house the phosphor, or it may be integrated into a digital radiography system.

W. **"Computed tomography (CT)"** means the production of a tomogram by the acquisition and computer processing of x-ray transmission data.

X. **"Computed tomography dose index(CTDI)"** means the average absorbed dose, along the z-axis, from a series of contiguous irradiations. It is measured from one axial CT scan (one rotation of the x-ray tube), and is calculated by dividing the integrated absorbed dose by the nominal total beam collimation. The scattering media for CTDI consist of two (16 and 32 cm in diameter) polymethylmethacrylate (PMMA, e.g., acrylic or Lucite) cylinders of 14 cm length. The equation is:

$$CTDI = \frac{1}{NT} \int_{-\infty}^{\infty} D(z)dz ,$$

Where:

D(z) = the radiation dose profile along the z-axis,

N = the number of tomographic sections imaged in a single axial scan. This is equal to the number of data channels used in a particular scan. The value of N may be less than or equal to the maximum number of data channels available on the system, and

T = the width of the tomographic section along the z-axis imaged by one data channel. In multiple-detector-row (multislice) CT scanners, several detector elements may be grouped together to form one data channel. In single-detector-row (single-slice) CT, the z-axis collimation (T) is the nominal scan width.

Y. **"CTDI<sub>100</sub>"** means the accumulated multiple scan dose at the center of a 100-mm scan and underestimates the accumulated dose for longer scan lengths. It is thus smaller than the equilibrium dose. The CTDI<sub>100</sub>, requires integration of the radiation dose profile from a single axial scan over specific integration limits. In the case of CTDI<sub>100</sub>, the integration limits are +50 mm, which corresponds to the 100-mm length of the commercially available "pencil" ionization chamber. CTDI<sub>100</sub> is acquired using a 100-mm long, 3-cc active volume CT "pencil" ionization chamber and one of the two standard CTDI acrylic phantoms (16 and 32 cm diameter) and a stationary patient table. The equation is:

$$CTDI_{100} = \frac{1}{NT} \int_{-50mm}^{50mm} D(z)dz$$

Z. **"CTDI<sub>vol</sub>"** see "Volume Computed Tomography Dose Index (CTDI<sub>vol</sub>) "

AA. **"CTDI<sub>w</sub>"** see "Weighted Computed Tomography Dose Index (CTDI<sub>w</sub>) "

BB. **"Cone Beam Computed Tomography (CBCT)"** is a volumetric imaging modality. Volumetric data are acquired using two dimensional digital detector arrays, and a cone-shaped x-ray beam (instead of fan-shaped) that rotates around the patient. Reconstruction algorithms can be used to generate images of any desired plane.

[L-]CC. **"Contact therapy system"** means that the x-ray tube port is put in contact with, or within 5 centimeters of, the surface being treated;

[M-]DD. **"Control panel"** means that part of the x-ray control upon which are mounted the switches, knobs, pushbuttons and other hardware necessary for manually setting the technique factors;

[N-]EE. **"Cooling curve"** means the graphical relationship between heat units stored and cooling time;

FF. **"Cradle"** means:

(1) A removable device which supports and may restrain a patient above an x-ray table; or

(2) A device;

(i) Whose patient support structure is interposed between the patient and the image receptor during normal use;

(ii) Which is equipped with means for patient restraint; and

(iii) Which is capable of rotation about its long (longitudinal) axis.

GG. **"CT"** (See "Computed tomography").

HH. **"CT conditions of operation"** means all selectable parameters governing the operation of a CT x-ray system including nominal tomographic section thickness, filtration, and the technique factors as defined in F.2.

II. **"CT gantry"** means tube housing assemblies, beam-limiting devices, detectors, and the supporting structures, frames, and covers which hold and/or enclose these components within a computed tomography system.

**JJ.** "CT number" means the number used to represent the x-ray attenuation associated with each elemental area of the CT image:

$$\overline{\text{CTN}} = \frac{k(\mu_x - \mu_w)}{\mu_w}$$

Where:

- k = A constant, a normal value of 1,000 when the Hounsfield scale of CT number is used;
- $\mu_x$  = Linear attenuation coefficient of the material of interest;
- $\mu_w$  = Linear attenuation coefficient of water.

**KK.** "Cumulative air kerma" means the total air kerma accrued from the beginning of an examination or procedure and includes all contributions from fluoroscopic and radiographic irradiation.

**[O-]LL.** "Dead man switch" means a switch so constructed that a circuit closing contact can be maintained only by continuous pressure on the switch by the operator;

**[P-]MM** "Density (D)" (as used in conjunction with image receptors) means the logarithm to the base 10 of the ratio of the incident to the transmitted luminous flux, where I is luminous flux;  $D = \text{LOG}_{10} (I \text{ Incident} / I \text{ Transmitted})$

**NN.** "Detector" (see Radiation detector).

**OO.** "Department" means the New Mexico Environment Department

**PP.** "Diagnostic reference level (DRL)" is an investigational level used to identify unusually high radiation doses or dose rates for common medical X-ray imaging procedures. DRLs are suggested action levels above which a facility should review its methods and determine if acceptable image quality can be achieved at lower doses. DRLs should not be applied to an individual patient.

**[Q-]QQ.** "Diagnostic source assembly" means the tube housing assembly with a beam-limiting device attached;

**[R-]RR** "Diagnostic x-ray system" means an x-ray system designed for irradiation of any part of the human body for the purpose of diagnosis or visualization;

**SS.** "Digital radiography (DR)" means an x-ray imaging method (or radiography) which produces a digital rather than analog image. DR includes both computed radiography and direct digital radiography.

**TT.** "Direct digital radiography (DDR; also see CR and DR)" means an x-ray imaging method in which a digital sensor, usually incorporating a thin-film transistor, is used to capture an x-ray image. Some DDR systems use a scintillator to convert x-rays to light and a photodiode array to convert light to charge, while others use a photoconductor to convert x-rays directly to charge, which is stored on the thin-film transistor.

**[S-]UU.** "Direct scattered radiation" means that scattered radiation which has been deviated in direction only by materials irradiated by the useful beam (see also "scattered radiation");

**VV.** "Direct supervision" means a qualified practitioner must exercise general supervision and be present in the facility and immediately available to furnish assistance and direction throughout the performance of the procedure. It does not mean that the licensed practitioner must be present in the room when the procedure is being performed.

**WW.** "Dose" means the absorbed dose as defined by the International Commission on Radiation Units and Measurements. The absorbed dose, D, is the quotient of de by dm, where de is the mean energy imparted to matter of mass dm; thus  $D = de/dm$ , in units of J/kg, where the special name of the unit of absorbed dose is gray (Gy).

**XX.** "Dose area product (DAP) (aka kerma-area product (KAP) )" means the product of the air kerma and the area of the irradiated field and is typically expressed in Gy-cm<sup>2</sup>, so it does not change with distance from the x-ray tube.

**YY.** "Dose length product (DLP)" means the indicator of the integrated radiation dose from a complete CT examination. It addresses the total scan length by the formula:

$$\text{DLP (mGy-cm)} = \text{CTDIvol (mGy)} \times \text{scan length (cm)}$$

**ZZ.** "Dose profile" means the dose as a function of position along a line.

**AAA.** "Effective dose (E)" means the sum of the tissue-weighted equivalent doses for the radiosensitive tissues and organs of the body. It is given by the expression  $E = \sum T (w_T HT)$ , in which HT is the equivalent dose in tissue or organ T and  $w_T$  is the tissue weighting factor for tissue or organ T. The unit of E and HT is joule per kilogram ( $J \cdot \text{kg}^{-1}$ ), with the special name sievert (Sv).

~~[T.]~~ **BBB.** "Entrance exposure rate" means the roentgens per unit time at the point where the center of the useful beam enters the patient;

~~[U.]~~ **CCC.** "Equipment" (see "x-ray equipment");

~~[V.]~~ **DDD.** "Exposure" means the quotient of dQ by dm where dQ is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated or created by photons in a volume element of air having mass dm are completely stopped in air, thus  $X = dQ/dm$ , in units of C/kg. (The special unit of exposure is the roentgen,  $1R = 2.58 \times 10^{-4} \text{ C/Kg}$ ). A second meaning of exposure is the process or condition during which the x-ray tube produces x-ray radiation.

~~[W.]~~ **EEE.** "Field emission equipment" means equipment which uses an x-ray tube in which electron emission from the cathode is due solely to the action of an electric field.

~~[X.]~~ **FFF.** "Filter" means material placed in the useful beam to absorb preferentially the less penetrating components.

~~[Y.]~~ **GGG.** "Fluoroscopic imaging assembly" means a component which comprises a reception system in which x-ray photons produce a fluoroscopic image. It includes equipment housings, electrical interlocks if any, the primary protective barrier, and structural material providing linkage between the image receptor and the diagnostic source assembly.

**HHH.** "Fluoroscopic irradiation time" means the cumulative duration during an examination or procedure of operator-applied continuous pressure to the device, enabling x-ray tube activation in any fluoroscopic mode of operation.

**III.** "Fluoroscopically-Guided Interventional (FGI) Procedures" means an interventional diagnostic or therapeutic procedure performed via percutaneous or other access routes, usually with local anesthesia or intravenous sedation, which uses external ionizing radiation in the form of fluoroscopy to localize or characterize a lesion, diagnostic site, or treatment site, to monitor the procedure, and to control and document therapy.

**JJJ.** "Fluoroscopy" means a technique for generating x-ray images and presenting them simultaneously and continuously as visible images. This term has the same meaning as the term "radioscopy" in the standards of the International Electrotechnical Commission.

**KKK.** "Focal spot (actual)" means the area projected on the anode of the x-ray tube bombarded by the electrons accelerated from the cathode and from which the useful beam originates.

~~[Z.]~~ **LLL.** "General purpose radiographic x-ray system" means any radiographic x-ray system which, by design, is not limited to radiographic examination of specific anatomical regions.

**MMM.** "General supervision" means the procedure is performed under the overall direction and control of the qualified practitioner but who is not required to be physically present during the performance of the procedure.

~~[AA.]~~ ["Gonad shield" means a protective barrier for the testes or ovaries.]

~~[AB.]~~ **NNN.** "Half-value layer (HVL)" means the thickness of specified material which attenuates the beam of radiation to an extent such that the exposure rate is reduced to one-half of its original value. In this definition the contribution of all scattered radiation, other than any which might be present initially in the beam concerned, is deemed to be excluded.

**OOO.** "Hand-held x-ray equipment" means x-ray equipment that is designed to be hand-held during operation.

**PPP.** "Healing arts screening" means the testing of human beings using x-ray machines for the detection or evaluation of health indications when such tests are not specifically and individually ordered by a licensed practitioner of the healing arts legally authorized to prescribe such x-ray tests for the purpose of diagnosis or treatment.

**QQQ.** "Heat unit" means a unit of energy equal to the product of the peak kilovoltage, milliamperes, and seconds, i.e.,  $kVp \times mA \times \text{second}$ .

**RRR.** "HVL" (See "Half-value layer").

~~[AC.]~~ **SSS.** "Image intensifier" means a device which produces an image of greater contrast than would be produced without the device present.

~~[AD.]~~ **TTT.** "Image receptor" means any device, such as a fluorescent screen or radiographic film, x-ray image intensifier tube, solid-state detector, or gaseous detector which transforms incident x-ray photons either into a visible image or into another form which can be made into a visible image by further transformations. In those cases where means are provided to preselect a portion of the image receptor, the term "image receptor" shall mean the preselected portion of the device.

~~[AE.]~~ **UUU.** "Inherent filtration" means filtration permanently in the useful beam; it includes the window of the x-ray tube and any permanent tube or source enclosure.

~~AF-IVVV.~~ **"Interlock"** means a device for precluding access to a radiation area by automatically terminating exposure upon entry by personnel.

~~WWW.~~ **"Irradiation"** means the exposure of matter to ionizing radiation.

~~XXX.~~ **"Isocenter"** means the center of the smallest sphere through which the beam axis passes when the equipment moves through a full range of rotations about its common center.

~~YYY.~~ **"Kerma"** means the quantity defined by the International Commission on Radiation Units and Measurements. The kerma, K, is the quotient of dE<sub>tr</sub> by dm, where dE<sub>tr</sub> is the sum of the initial kinetic energies of all the charged particles liberated by uncharged particles in a mass dm of material; thus  $K = dE_{tr}/dm$ , in units of J/kg, where the special name for the unit of kerma is gray (Gy). When the material is air, the quantity is referred to as "air kerma."

~~ZZZ.~~ **"Kerma-area product (KAP)"** (See "dose area product")

~~AG-AAAA.~~ **"Kilovolts peak (kVp)"** (see "Peak tube potential").

~~BBB.~~ **"kV"** means kilovolts.

~~AH-CCCC.~~ **"kWs"** means kilowatt second which is equal to the product of peak kilovolts, amperes, and seconds or 103 kVmA sec.

~~DDD.~~ **"Last-image hold (LIH) radiograph"** means an image obtained either by retaining one or more fluoroscopic images, which may be temporarily integrated, at the end of a fluoroscopic exposure or by initiating a separate and distinct radiographic exposure automatically and immediately in conjunction with termination of the fluoroscopic exposure.

~~AI-EEEE.~~ **"Lead equivalent"** means the thickness of material in question affording the same attenuation, under specified conditions, as the lead in question.

~~AJ-FFFF.~~ **"Leakage radiation"** means radiation emanating from the diagnostic or therapeutic source assembly except for:

- (1) the useful beam; and
- (2) radiation produced when the exposure switch or timer is not activated.

~~AK-GGGG.~~ **"Leakage technique factors"** means the technique factors associated with the diagnostic tube housing source assembly which are used in measuring leakage radiation. They are defined as follows:

(1) For diagnostic source assemblies intended for capacitor energy storage equipment, the maximum rated peak tube potential and the maximum rated number of exposures in an hour for operation at the maximum rated peak tube potential with the quantity of charge per exposure being 10 millicoulombs (or 10 mAs) or the minimum obtainable from the unit, whichever is larger; ;

(2) For diagnostic source assemblies intended for field emission equipment rated for pulsed operation, the maximum rated number of x-ray pulses in an hour for operation at the maximum rated peak tube potential; ; and

(3) For all other ~~equipment~~ diagnostic source assemblies, the maximum-rated peak tube potential and the maximum rated continuous tube current for the maximum rated peak tube potential.

~~AL-HHHH.~~ **"Light field"** means that area of the intersection of the light beam from the beam-limiting device and one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the illumination is one-fourth of the maximum in the intersection.

~~AM-IIII.~~ **"Line pair"** means an object in which parallel wires or strips are placed so that the space between each wire or strip is equal to the width of the wire or strip. A line pair is one space and a strip or wire.

~~AN-IJJJ.~~ **"Linear Accelerator"** means a device for accelerating particles employing alternate electrodes and gaps arranged in a straight line, so proportioned that when their potentials are varied in the proper amplitude and frequency, particles passing through them receive successive increments of energy.

~~AO-KKKK.~~ **"Line-voltage regulation"** means the difference between the no-load and the load potentials expressed as a percent of the load line potential, that is: Percent line-voltage regulation =  $100 (V_n - V_l) / V_l$  where:

- (1)  $V_n$  = No-load line potential; and
- (2)  $V_l$  = Load line potential

~~LLL.~~ **"mAs"** means milliamperere second.

~~AP-MMMM.~~ **"Maximum line current"** means the root mean square current in the supply line of an x-ray machine operating at its maximum rating.

~~NNN.~~ **"Medical event"** means one or more of the following criteria have occurred:

- (1). Unintended skin dose to the same area in a single procedure greater than 2 Gy (200 rad);
- (2). Unintended dose other than skin dose in a single procedure greater than:
  - (a). 5 times the facility's established protocol, and > 0.5 Gy (50 rad) to any organ; or

- (b). 5 times the facility's established protocol, and > 0.05 Sv (5 rem) effective dose;
- (3). Wrong patient or wrong site for entire procedure when the resultant dose is:
- (a). Dose > 0.5 Gy (50 rad) to any organ; or
- (b). Effective dose ≥ 0.05 Sv (5 rem).

~~AA.~~OOOO. **"Mobile x-ray equipment"** (see "X-ray equipment").

**PPPP.** **"Mode of operation"** means, for fluoroscopic systems, a distinct method of fluoroscopy or radiography provided by the manufacturer and selected with a set of several technique factors or other control settings uniquely associated with the mode. The set of distinct technique factors and control settings for the mode may be selected by the operation of a single control. Examples of distinct modes of operation include normal fluoroscopy (analog or digital), high-level control fluoroscopy, cineradiography (analog and digital), digital subtraction angiography, electronic radiography using the fluoroscopic image receptor, and photospot recording. In a specific mode of operation, certain system variables affecting kerma, AKR, or image quality, such as image magnification, x-ray field size, pulse rate, pulse duration, number of pulses, source-image receptor distance (SID), or optical aperture, may be adjustable or may vary; their variation per se does not comprise a mode of operation different from the one that has been selected.

**QQQQ.** **"Multiple tomogram system"** means a computed tomography x-ray system which obtains x-ray transmission data simultaneously during a single scan to produce more than one tomogram.

**RRRR.** **"Noise"** in CT means the standard deviation of the fluctuations in CT number expressed as a percentage of the attenuation coefficient of water. Its estimate ( $S_n$ ) is calculated using the following expression:

$$S_n = \frac{100 \cdot \overline{CS} \cdot s}{\mu_w}$$

where:

$\overline{CS}$  = Linear attenuation coefficient of the material of interest.

$\mu_w$  = Linear attenuation coefficient of water.

$s$  = Estimated [S]standard deviation of the CT numbers of picture elements in a specified area of the CT image.<sup>2/</sup>

**SSSS.** **"Nominal tomographic section thickness"** means the full width at half-maximum of the sensitivity profile taken at the center of the cross-sectional volume over which x-ray transmission data are collected.

**TTTT.** **"Notification value"** means a protocol-specific dose index (e.g. CTDIvol(mGy)) or of DLP (mGy-cm) that is set by the registrant to trigger a notification to the CT operator prior to scanning when the dose index exceeds the established range for the examination.

**UUUU.** **"Patient"** means an individual or animal subjected to healing arts examination, diagnosis or treatment.

**VVVV.** **"PBL"** See "Positive beam limitation."

~~AR.~~**WWWW.** **"Peak tube potential"** means the maximum value of the potential difference across the x-ray tube during an exposure.

~~AS.~~**XXXX.** **"Personal monitoring"** means the estimation of dose to a person.

**YYYY.** **"Personal supervision"** means a qualified expert must exercise General Supervision and be present in the room or adjacent control area during the performance of the procedure.

**ZZZZ.** **"Phantom"** means a volume of material behaving in a manner similar to tissue with respect to the attenuation and scattering of radiation. This requires that both the atomic number (Z) and the density of the material be similar to that of tissue.

**AAAAA.** **"Photostimulable storage phosphor (PSP)"** means a material used to capture and store radiographic images in computed radiography systems.

~~AT.~~**BBBBB.** **"Phototimer"** means a method for controlling radiation exposures to image receptors by the amount of radiation which reaches a radiation monitoring device(s). The radiation monitoring device(s) is part of an electronic circuit which controls the duration of time the tube is activated (see also "Automatic exposure control").

**CCCCC.** [reserved]

**DDDDD.** **"Pitch"** means the table incrementation, in CT, per x-ray tube rotation, divided by the nominal x-ray beam width at isocenter.

~~AU.~~**EEEEEE.** **"Portable x-ray equipment"** (see "X-ray equipment").

~~{AV-}~~FFFFF. **"Position indicating device (PID)"** means a device on dental x-ray equipment used to indicate the beam position and to establish a definite source-surface (skin) distance. It may or may not incorporate or serve as a beam-limiting device.

GGGGG. **"Positive beam limitation"** means the automatic or semi-automatic adjustment of an x-ray beam to the size of the selected image receptor, whereby exposures cannot be made without such adjustment.

~~{AX-}~~HHHHH. **"Protective apron"** means an apron made of radiation absorbing materials, used to reduce radiation exposure.

~~{AY-}~~IIIII. **"Protective barrier"** means a barrier of radiation absorbing material(s) used to reduce radiation exposure. The types of protective barriers are as follows:

(1) **"Primary protective barrier"** means the material, excluding filters, placed in the useful beam, for protection purposes, to reduce the radiation exposure; and

(2) **"Secondary protective barrier"** means a barrier sufficient to attenuate the stray radiation to the required degree.

~~{AZ-}~~JJJJJ. **"Protective glove"** means a glove made of radiation absorbing materials used to reduce radiation exposure.

KKKKK. **"Protocol"** means a collection of settings and parameters that fully describe an examination.

LLLLL. **"Pulsed mode"** means operation of the x-ray system such that the x-ray tube current is pulsed by the x-ray control to produce one or more exposure intervals of duration less than one-half second.

~~{BA-}~~MMMMM. **"Qualified expert (QE)"** means an individual who is granted professional privileges based on education and experience to provide clinical services in diagnostic medical physics by the department. (see [Subsection RR. of Section 7 of 20.3.1.7 NMAC]).

NNNNN. **"Quality Assurance"** means a program providing for verification by written procedures such as testing, auditing, and inspection to ensure that deficiencies, deviations, defective equipment, or unsafe practices, or a combination thereof, relating to the use, disposal, management, or manufacture of radiation devices are identified, promptly corrected, and reported to the appropriate regulatory authorities as required.

OOOOO. **"Qualified medical physicist (QMP)"** means an individual who meets each of the following credentials:

(1). Has earned a master's and/or doctoral degree in physics, medical physics, biophysics, radiological physics, medical health physics, or equivalent disciplines from an accredited college or university; and

(2). Has been granted certification in the specific subfield(s) of medical physics with its associated medical health physics aspects by an appropriate national certifying body and abides by the certifying body's requirements for continuing education;

PPPPP. **"Radiation detector"** means a device which in the presence of radiation provides a signal or other indication suitable for use in measuring one or more quantities of incident radiation.

QQQQQ. **"Radiation Protocol Committee (RPC)"** means the representative group of qualified individuals in a CT or FGI facility responsible for the ongoing review and management of CT or FGI protocols to ensure that exams being performed achieve the desired diagnostic image quality at the lowest radiation dose possible while properly exploiting the capabilities of the equipment being used.

RRRRR. **"Radiation therapy simulation system"** means a radiographic or fluoroscopic x-ray system intended for localizing the volume to be exposed during radiation therapy and confirming the position and size of the therapeutic irradiation field.

~~{BB-}~~SSSSS. **"Radiograph"** means an image receptor on which the image is created directly or indirectly by an x-ray pattern and results in a permanent record.

TTTTT. **"Radiography"** means a technique for generating and recording an x-ray pattern for the purpose of providing the user with an image(s) after termination of the exposure.

~~{BC-}~~UUUUU. **"Radiographic imaging system (RIS)"** means any system whereby a permanent or semi-permanent image is recorded on an image receptor by the action of ionizing radiation.

~~{BD-}~~VVVVV. **"Recording"** means producing a retrievable ~~[permanent]~~ form of an image resulting from x-ray photons [(e.g., film, video tape).]

WWWWW. **"Reference plane"** means a plane which parallel to and which can be offset (as specified in manufacturer information provided to users) from the location of the tomographic plane(s).

~~{BE-}~~XXXXX. **"Registrant"**, as used in this Subpart [Part], means any person who owns or possesses and administratively controls an x-ray system which is used to deliberately expose humans or animals to the useful beam of the system and is required by the provisions in Subpart 1 and 2 [Part 1 and 2] of these regulations to register with this department.

~~{BF.}~~ YYYYY. **"Repair person (Service person)"** means an individual who maintains an x-ray system; not limited to a manufacturer, assembler or user.

~~{BG.}~~ ZZZZZ. **"Response time"** means the time required for an instrument system to reach 90 percent of its final reading when the radiation-sensitive volume of the instrument system is exposed to a step change in radiation flux from zero sufficient to provide a steady state midscale reading.

AAAAA. **"Scan"** means the complete process of collecting x-ray transmission data for the production of a tomogram. Data may be collected simultaneously during a single scan for the production of one or more tomograms.

BBBBB. **"Scan increment"** means the amount of relative displacement of the patient with respect to the CT x-ray system between successive scans measured along the direction of such displacement.

CCCCC. **"Scan sequence"** means a pre-selected set of two or more scans performed consecutively under pre-selected CT conditions of operation.

DDDDD. **"Scan time"** means the time elapsed during the accumulation of x-ray transmission data for a single scan.

EEEEE. [Reserved]

~~{BH.}~~ FFFFFF. **"Scattered radiation"** means radiation that, during passage through matter, has been deviated in direction (see also "Direct scattered radiation").

~~{BI.}~~ GGGGG. [Reserved]

HHHHH [Reserved]

IIIII. **"Sensitivity profile"** means the relative response of the CT x-ray system as a function of position along a line perpendicular to the tomographic plane.

JJJJJ. **"Shutter"** means a device attached to the tube housing assembly which can intercept the entire cross-sectional area of the useful beam and which has a lead equivalency not less than that of the tube housing assembly.

KKKKK. [Reserved]

~~{BJ.}~~ LLLLL. **"Single tomogram system"** means a CT x-ray system which obtains x-ray transmission data during a scan to produce a single tomogram.

MMMMM. **"Size-specific dose estimate (SSDE)"** means a patient dose estimate which takes into consideration corrections based on the size of the patient, using linear dimensions measured on the patient or patient images.

~~{BK.}~~ NNNNN. **"Source"** means the focal spot of the x-ray tube.

~~{BL.}~~ OOOOO. **"Source-image receptor distance (SID)"** means the distance from the source to the center of the input surface of the image receptor.

PPPPP. **"Source-skin distance (SSD)"** means the distance from the source to the center of the entrant x-ray field in the plane tangent to the patient skin surface.

~~{BM.}~~ QQQQQ. **"Spot film"** means a radiograph which is made during a fluoroscopic examination to permanently record conditions which exist during that fluoroscopic procedure.

RRRRR. **"Spot-film device"** means a device intended to transport and/or position a radiographic image receptor between the x-ray source and fluoroscopic image receptor. It includes a device intended to hold a cassette over the input end of the fluoroscopic image receptor for the purpose of producing a radiograph.

~~{BN.}~~ SSSSS. **"Stationary x-ray equipment"** (see "X-ray equipment").

~~{BO.}~~ TTTTT. **"Stray radiation"** means the sum of leakage and scattered radiation.

UUUUU. **"Substantial radiation dose level (SRDL)"** means an appropriately-selected dose used to trigger additional dose-management actions during a procedure and medical follow-up for a radiation level that might produce a clinically-relevant injury in an average patient.

~~{BP.}~~ VVVVV. **"Technique factors"** means the conditions of operation. They are specified as follows:

- (1) For capacitor energy storage equipment, peak tube potential in (kVp) and quantity of charge in milliamperere-seconds (mAs);
- (2) For field emission equipment rated for pulsed operation, peak tube potential in kVp and number of x-ray pulses; ~~and~~
- (3) For CT equipment designed for pulsed operation, peak tube potential in kV, scan time in seconds, and either tube current in milliamperes (mA), x-ray pulse width in seconds, and the number of x-ray pulses per scan, or the product of tube current, x-ray pulse width, and the number of x-ray pulses in mAs;
- (4) For CT equipment not designed for pulsed operation, peak tube potential in kV, and either tube current in mA and scan time in seconds, or the product of tube current and exposure time in mAs and the scan time when the scan time and exposure time are equivalent; and

~~[(3)]~~ (5) For all other equipment, peak tube potential in kVp and either tube current in mA and exposure time in seconds, or the product of tube current and exposure time in mAs.

~~[BQ.]~~WWWWW. "Therapeutic-type protective tube housing" means the tube housing with tube installed and it includes high voltage or filament transformers and other appropriate elements when they are contained within that housing.

~~[XXXXX.]~~ "Tomogram" means the depiction of the x-ray attenuation properties of a section through the body.

~~[YYYYY.]~~ "Tomographic plane" means that geometric plane which the manufacturer identified as corresponding to the output tomogram.

~~[ZZZZL.]~~ "Tomographic section" means the volume of an object whose x-ray attenuation properties are imaged in a tomogram.

~~[BR.]~~AAAAAAA. "Tube" means an x-ray tube, unless otherwise specified.

~~[BS.]~~BBBBBBB. "Tube housing assembly" means the tube housing with tube installed. It includes high-voltage or filament transformers and other appropriate elements when they are contained within the tube housing.

~~[BT.]~~CCCCCCC. "Tube rating chart" means the set of curves which specify the rated limits of operation of the tube in terms of the technique factors.

~~[DDDDDD.]~~ "Unintended" means a patient radiation dose resulting from a human error or equipment malfunction during the procedure.

~~[BU.]~~EEEEEEE. "Useful beam" means the radiation which passes through the tube housing port and the aperture of the beam-limiting device when the exposure switch or timer is activated.

~~[BV.]~~FFFFFFF. "Variable-aperture beam-limiting device" means a beam-limiting device which has capacity for stepless adjustment of the x-ray field size at a given SID.

~~[BW.]~~GGGGGGG. "Visible area" means that portion of the input surface of the image receptor over which incident x-ray photons produce a visible image.

~~[HHHHHHH.]~~ "Volume Computed Tomography Dose Index (CTDI<sub>vol</sub>)" means a radiation dose parameter derived from the CTDI<sub>w</sub> (weighted or average CTDI given across the field of view). The formula is:

$CTDI_{vol} = (N)(T)(CTDI_w)/I$ , where

N = number of simultaneous axial scans per x-ray source rotation,

T = thickness of one axial scan (mm), and

I = table increment per axial scan (mm).

Thus,

$CTDI_{vol} = CTDI_w / \text{pitch}$

~~[IIIIII.]~~ "Weighted Computed Tomography Dose Index (CTDI<sub>w</sub>)" means the estimated average CTDI<sub>100</sub> across the field of view (FOV). The equation is:

$$CTDI_w = 1/3 CTDI_{100,center} + 2/3 CTDI_{100,edge}$$

Where 1/3 and 2/3 approximate the relative areas represented by the center and edge values derived using the 16 or 32 cm acrylic phantom. CTDI<sub>w</sub> uses CTDI<sub>100</sub> and an f-factor for air (0.87 rad/R or 1.0 mGy/mGy).

~~[BX.]~~JJJJJJJ. "X-ray control" means a device which controls input power to the x-ray high-voltage generator of the x-ray tube. It includes equipment such as timers, phototimers, automatic brightness stabilizers, and similar devices, which controls the technique factors of an x-ray exposure.

~~[KKKKKKK.]~~ "X-ray equipment" means an x-ray system, subsystem or component thereof. Types of x-ray equipment are as follows:

(1) "Mobile x-ray equipment" means x-ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled;

(2) "Portable x-ray equipment" means x-ray equipment designed to be hand-carried;

(3) "Stationary x-ray equipment" means x-ray equipment which is installed in a fixed location; ~~and~~

(4) "Transportable" means x-ray equipment installed in a vehicle or trailer; ~~and~~

(5) "Hand-held x-ray equipment" means x-ray equipment that is designed to be hand-held during operation.

~~{BY-}~~LLLLLLL. **"X-ray exposure control"** means a device, switch, button or other similar means by which an operator initiates and/or terminates the radiation exposure. The x-ray exposure control may include such associated equipment as timers and back-up timers.

~~{BZ-}~~MMMMMMM. **"X-ray field"** means that area of the intersection of the useful beam and any one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the exposure rate is one-fourth of the maximum in the intersection.

~~{CA-}~~NNNNNNN. **"X-ray high-voltage generator"** means a device which transforms electrical energy from the potential supplied by the x-ray control to the tube operating potential. The device may also include means for transforming alternating current to direct current, filament transformers for the x-ray tube(s), high-voltage switches, electrical protective devices, and other appropriate elements.

~~{CB-}~~OOOOOOO. **"X-ray subsystem"** means any combination of two or more components of an x-ray system for which there are requirements specified in this Subpart [Part].

PPPPPPP. [Reserved]

~~{CC-}~~QQQQQQQ. **"X-ray system"** means an assemblage of components for the controlled production of x-rays. It includes minimally an x-ray high-voltage generator, an x-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components which function with the system are considered integral parts of the system.

RRRRRRR. **"X-ray table"** means a patient support device with its patient support structure (tabletop) interposed between the patient and the image receptor during radiography and/or fluoroscopy. This includes, but is not limited to, any stretcher equipped with a radiolucent panel and any table equipped with a cassette tray (or bucky), cassette tunnel, fluoroscopic image receptor, or spot-film device beneath the tabletop.

~~{CD-}~~SSSSSSS. **"X-ray tube"** means any electron tube which is designed for the conversion of electrical energy into x-ray energy.

[~~{5/3/95; Recompiled 11/27/01}~~]-20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

#### **20.3.6.8 - 20.3.6.601 [RESERVED]**

#### **20.3.6.602 GENERAL AND ADMINISTRATIVE REQUIREMENTS:**

A. ~~[Administrative controls:]~~ **Radiation Safety Requirements.** The registrant shall be responsible for directing the operation of the x-ray system(s) under his or her administrative control and shall assure that the requirements of these regulations are met in the operation of the x-ray system(s).

(1) ~~[Registrant: The registrant shall be responsible for directing the operation of the x-ray machines which he has registered with the department. He or his agent shall assure that the following provisions are met in the operation of the x-ray machine(s).]~~ The registrant shall have a radiation safety program. The radiation safety program shall include but not be limited to the following requirements:

(a) ~~[An x-ray machine which does not meet the provision of these regulations shall not be operated for diagnostic or therapeutic purposes, if so directed by the department.]~~ The use of ionizing radiation within its purview is performed in accordance with existing laws and regulations.

(b) ~~[Individuals who will be operating the x-ray equipment shall be adequately instructed in the safe operating procedures and be competent in the safe use of the equipment.]~~ All persons are protected as required by 20.3.4 NMAC, Standards for Protection Against Radiation.

(c) ~~[In the vicinity of each x-ray system's control panel, a chart shall be provided which specifies for all examinations which are performed by that system a listing of information, including, but not limited to, the following, for each projection within that examination:]~~ Upon discovery of a medical event, the registrant shall:

(i) ~~[patient's anatomical size versus technique factors to be utilized;]~~  
Contact the department regarding the medical event within one business day;

(ii) ~~[type of and size of the film or film-screen combination to be used;]~~  
Provide a written report, including the analysis of the medical event, by a QMP [QE] to the department within 15 business days;

(iii) ~~[type of grid to be used, if any, and focal distance;]~~ Provide a clinical summary to the prescribing physician and patient within 15 business days; and

(iv) ~~[source to image receptor distance to be used; and]~~ Maintain a record of the medical event as part of the patient's permanent medical record.

(v) ~~— type and location of placement of gonad shielding to be used.]~~

(2) An x-ray machine which does not meet the provisions of these regulations shall not be operated for diagnostic or therapeutic purposes, unless the department or a QMP [QE] determines that the non-compliance shall not pose a significant radiation risk or significantly affect image quality, and arrangements have been made to correct the non-compliance within 30 calendar days.

(3) The QMP [QE], if required in this Part, shall complete initial and routine compliance evaluations following nationally recognized procedures or those recognized by the department. These evaluations shall include a review of the required QC tests.

(4) Individuals who will be operating the x-ray equipment shall be adequately instructed in the safe operating procedures and be competent in the safe use of the equipment.

(5) Individuals operating the x-ray systems shall meet the qualifications required by the department.

(6) A chart shall be maintained in the vicinity of each x-ray system's control panel for all examinations which are performed by that system. For each examination, the chart shall contain a list of information that includes, but is not limited to the following:

[(+)](a) patient's (adult and pediatric, if appropriate) body part and anatomical size

[(+)](b) technique factors

[(+)](c) type of image receptor used

[(+)](d) source to image receptor distance to be used (except for dental intraoral

radiography); and

[(+)](e) type of grid if any.

(7) The registrant shall create and make available to x-ray operators written safety procedures including instructions for patient holding and any restrictions of the operating technique required for the safe operation of the particular x-ray system.

~~[(d) Written safety procedures and rules shall be provided to each individual operating x-ray equipment under his control, including any restrictions of the operating technique required for the safe operation of the particular x-ray system. The operator shall be able to demonstrate familiarity with these rules.]~~

(8) A sufficient number of protective apparel (e.g., aprons, gloves, collars) and shields shall be available to provide the necessary radiation protection for all patients and personnel who are involved with x-ray operations.

(9) All protective apparel and auxiliary shields shall be evaluated annually for integrity and clearly labeled with their lead equivalence.

(10) Each registrant shall have a mechanism in place for the referring physician to access information on selecting the most appropriate diagnostic procedure to answer the clinical question.

(11) Nationally recognized diagnostic reference levels (DRLs) shall be utilized when applicable.

(12) The registrant shall use auxiliary equipment designed to minimize patient and personnel exposure commensurate with the needed diagnostic information.

(13) Portable or mobile x-ray equipment shall be used only for examinations where it is impractical to transfer the patient to a stationary x-ray installation.

(14) Neither the x-ray tube housing nor the collimating device shall be held during an exposure. Exceptions are allowed for [Department approved] devices specifically designed to be hand-held.

(15) The useful x-ray beam shall be limited to the area of clinical interest.

(16) Consideration shall be given to selecting the appropriate technique and employing available dose reduction methods and technologies across all patient sizes and clinical indications.

(17) A facility shall have a documented procedure in place for verification of patient identity and exam to be performed, including identification of the appropriate body part.

~~[(e) Except for patients who cannot be moved out of the room, only the staff and ancillary personnel required for the medical procedure or training shall be in the room during the radiographic exposure. Other than the patient being examined:]~~

(18) The registrant shall restrict the presence of individuals in the immediate area of the patient being examined to those required or in training for the medical procedure, or the parent or guardian of a patient while the x-ray tube is energized. The following applies to all individuals, other than the patient being examined:

[(+)](a) All individuals shall be positioned such that no part of the body, including the extremities will be struck by the useful beam unless [not] protected by 0.5 mm lead equivalent material[- will be struck by the useful beam];

~~[(ii)](b)~~ ~~[staff and ancillary personnel]~~ All individuals shall be protected from the ~~[direct and scatter radiation]~~ secondary radiation by protective aprons or whole body protective barriers of not less than 0.25 mm lead equivalent material; and

~~[(iii)](c)~~ Instances may warrant having human patients ~~[who cannot be removed from the room]~~ other than the one being examined in the room during the exam. If the procedure results in scatter radiation in excess of 0.02 mSv (2 mR) in any one hour at the position of these patients, they shall be protected from the direct scatter radiation by whole body protective barriers of 0.25 mm lead equivalent material, or shall be so positioned that the ~~[nearest portion of the body is at least 2 meters from both the tube head and the nearest edge of the image receptor]~~ 0.02 mSv (2 mR) in any one hour limit is met.

~~[(iv)]~~ — when a portion of the body of any staff or ancillary personnel is potentially subjected to stray radiation which could result in that individual receiving one quarter of the maximum permissible dose as defined in Subpart 4 (now 20.3.4 NMAC), additional protective devices may be required by the department.

~~[(f)]~~ Gonad shielding of not less than 0.25 mm lead equivalent shall be used for patients who have not passed the reproductive age during radiographic procedures in which the gonads are in the direct (useful) beam, except for cases in which this would interfere with the diagnostic procedures.]

~~[(g)](19)~~ ~~[Patients]~~ Individuals shall not be exposed to the useful beam, except for healing arts purposes, and each exposure of which has been authorized by a licensed practitioner of the healing arts. This provision specifically prohibits deliberate exposure for the following purposes:

~~[(i)](a)~~ exposure of an individual for training, demonstration or other non-healing art purposes, ~~[unless there are also healing arts requirements and proper prescription has been provided]; and~~

~~[(ii)](b)~~ exposure of an individual for the purpose of healing arts screening without prior written approval of the department. (Screening means an exposure of a person without a prior examination by a licensed practitioner).

~~[(h)](20)~~ When a patient or film must be provided with auxiliary support during a radiation exposure:

~~[(i)](a)~~ mechanical holding devices shall be used when the technique permits; the safety ~~[rules]~~ procedures, required by Section 602, shall list individual projections where holding devices cannot be utilized;

~~[(ii)](b)~~ written safety procedures, as required by Paragraph 7 of Subsection A of 20.3.6.602 NMAC. ~~[1.d 8 Subparagraph (d), Paragraph (18), Subsection A., Section 602 of 20.3.6.602 NMAC]~~, shall indicate the requirements for selecting a holder and the procedure the holder shall follow;

~~[(iii)](c)~~ the human holder shall be protected as required by Subsection A of 20.3.6.602 NMAC. ~~[1.e (now Subparagraph (e) of Paragraph (1) of Subsection A of 20.3.6.602 NMAC)];~~

~~[(iv)](d)~~ no ~~[person]~~ individual shall be used routinely to hold ~~[film]~~ the image receptor or patients;

~~[(v)](e)~~ such holding shall be permitted only in very unusual and rare situations; and

~~[(vi)](f)~~ all x-ray room doors shall be closed before an exposure is made.

~~(21)~~ In those cases where the patient must hold the image receptor, except during intraoral examinations, any portion of the body other than the area of clinical interest struck by the useful beam shall be protected by not less than 0.5 millimeter lead equivalent material.

~~[(i)](22)~~ Procedures and auxiliary equipment designed to minimize patient and personnel exposure commensurate with the needed diagnostic information shall be utilized. This is interpreted to include, but is not limited to:

~~[(i)]~~ the speed of film or screen and film combinations shall be the fastest speed consistent with the diagnostic objective of the examinations;]

~~[(ii)](a)~~ ensuring minimum radiation exposure required to produce images of good diagnostic quality for a patient; and

~~[(iii)](b)~~ ensuring portable or mobile equipment is only used for examinations where it is impractical to transfer the patient(s) to a stationary installation.

~~[(j)](23)~~ ~~[Personnel monitoring:]~~ All persons who are associated with the operation of an x-ray system are subject to ~~[the occupational exposure limits and the requirements for the determination of the doses which are stated in Sections 405 and 412. In addition, the following requirements are made:~~

~~(i)~~ — when protective clothing or devices are worn on portions of the body and a monitoring device(s) is required, at least one such device shall be utilized as follows: 1) when an apron is worn, the monitoring device shall be worn at collar level outside of the apron; and 2) the dose to the whole body

~~based on the maximum dose attributed to any one critical organ (which are the gonads, the blood forming organs, head and trunk, or lens of the eye) shall be recorded in the reports required by Section 452. If more than one device is used, each dose shall be identified with the area of the body where the device was worn;] requirements of Part 4 of these regulations.~~

~~[(ii)](24) exposure of a personnel monitoring device to deceptively indicate a dose delivered to an individual is prohibited.~~

~~[(2)](25) Information and maintenance record [and associated information]: The registrant shall maintain [at least] the following information for each x-ray [machine] system for inspection by the department for a minimum of 5 years or as noted below:~~

~~(a) maximum rating of technique factors; model and serial numbers of all major components, and user's manuals for those components, including software, shall be maintained for the life of the system;~~

~~[(b)] model numbers of all certifiable components;~~

~~[(c)] aluminum equivalent filtration of the useful beam; including any routine variation;~~

~~[(d)] tube rating charts and cooling curves;]~~

~~[(e)](b) record of surveys, calibrations, maintenance, modifications [(from the original schematics and drawings)] (e.g., major software and hardware upgrades) performed on the x-ray [machine after the effective date of these regulations, along with the names of persons who performed the service] system;~~

~~[(f)](c) a scale drawing of the room in which a stationary x-ray system is located; the drawing shall denote the type of materials and their thickness (or lead equivalence) provided by each barrier of the room (walls, ceilings, floors, doors, windows); the drawing shall also denote the type of occupancy of adjacent areas to include above and below the x-ray room of concern (e.g., hallways, office, parking lots and toilets); estimates of the frequency of such occupancy shall also be noted on the drawing; and~~

~~[(g)](d) a copy of all correspondence with this department regarding that x-ray [machine] system.~~

~~[(3)](26) X-ray log. Each facility shall maintain an x-ray log containing the examinations and the dates those examinations were performed. The log shall indicate when techniques for procedures vary from those specified in the technique chart required in [Section 602.A.1.e (now Subparagraph (e) of Paragraph (1) of Subsection A of 20.3.6.602 NMAC)] Paragraph 6 of Subsection A of 20.3.6.602 NMAC.~~

~~(27) Healing Arts Screening. Any person proposing to conduct a healing arts screening program shall not initiate such a program without prior approval of the department. When requesting such approval, that person shall submit the information outlined in Appendix A of this Part. If any information submitted to the department becomes invalid or outdated, the department shall be immediately notified. FDA/MQSA-certified facilities are registered with the department for the use of dedicated mammographic equipment to conduct mammography screening.~~

~~(28) All x-ray equipment shall be installed and used in accordance with the equipment manufacturer's specifications.~~

**B. Quality Assurance.**

~~(1) The registrant shall establish and maintain a quality assurance (QA) program. In addition to the standards in the modality specific sections, the registrant shall:~~

~~(a) maintain documentation of minimum qualifications for practitioners, medical physicists, and x-ray equipment operators;~~

~~(b) designate an appropriately trained individual to manage the QA program;~~

~~(c) establish and maintain written QA and quality control (QC) procedures, including evaluation frequencies and tolerances;~~

~~(d) check each study for artifacts. If an artifact is present, the source shall be identified and appropriate action taken;~~

~~(e) perform repeat / reject analysis of radiographic images at least quarterly following specifications of a nationally recognized organization;~~

~~(f) complete preventative maintenance on the x-ray systems in accordance with manufacturer specifications at intervals not to exceed 12 months;~~

~~(g) maintain documentation showing the testing instruments used in determining compliance with the provisions of this section are properly calibrated and maintained in accordance with the department minimum standard or accepted professional standards when no department minimum is defined;~~

~~(h) complete and document an annual review of the QA program; and~~

**(i)** retain QA/QC records of evaluations and reviews in accordance with state statutes, regulations, but in no case less than three years.

**(2)** X-Ray Film Processing Facilities. A registrant using analog image receptors (e.g. radiographic film) shall have available suitable equipment for handling and processing radiographic film in accordance with the following provisions:

**(a)** Manually developed film:

**(i)** Processing tanks shall be constructed of mechanically rigid, corrosion resistant material;

**(ii)** Developing solutions shall be prepared, replenished, and replaced following manufacturer recommendations;

**(iii)** The temperature of solutions in the tanks shall be maintained within the range of 60° F to 80° F (16° C to 27° C). Film shall be developed in accordance with the time-temperature relationships recommended by the film manufacturer, or, in the absence of such recommendations, with the following time-temperature chart; and

Developer Temperature °C / °F	Developing Time (Minutes)		Developer Temperature °C / °F	Developing Time (Minutes)
26.7 / 80	2.0		20.6 / 69	4.5
26.1 / 79	2.0		20.0 / 68	5.0
25.6 / 78	2.5		19.4 / 67	5.5
25.0 / 77	2.5		18.9 / 66	5.5
24.4 / 76	3.0		18.3 / 65	6.0
23.9 / 75	3.0		17.8 / 64	6.5
23.3 / 74	3.5		17.2 / 63	7.0
22.8 / 73	3.5		16.7 / 62	8.0
22.2 / 72	4.0		16.1 / 61	8.5
21.7 / 71	4.0		15.6 / 60	9.5
21.1 / 70	4.5			

**(iv)** Devices shall be utilized which will indicate the actual temperature of the developer solution and signal the passage of a preset time.

**(b)** Automatic processors and other closed processing systems:

**(i)** Automatic processors shall be operated and maintained following manufacturer specifications.

**(ii)** Films shall be developed in accordance with the time-temperature relationships recommended by the film manufacturer; in the absence of such recommendations, the film shall be developed using the following chart:

Developer Temperature		Minimum Immersion Time <sup>a/</sup>
°C	°F	Seconds
35.5	96	19
35	95	20
34.5	94	21

34	93	22
33.5	92	23
33	91	24
32	90	25
31.5	89	26
31	88	27
30.5	87	28
30	86	29
29.5	85	30
<i>a/ Immersion time only, no crossover time included.</i>		

**(iii)** Processing deviations from the requirements of Paragraph 2 of Subsection B of 20.3.6.602 NMAC shall be documented by the registrant in such manner that the requirements are shown to be met or exceeded (e.g., extended processing, and special rapid chemistry).

**(3)** Additional requirements for facilities using x-ray film.

**(a)** Pass boxes, if provided, shall be so constructed as to exclude light from the darkroom when cassettes are placed in or removed from the boxes, and shall incorporate adequate shielding from stray radiation to prevent exposure of undeveloped film.

**(b)** Darkrooms typically used by more than one individual shall be provided a method to prevent accidental entry while undeveloped films are being handled or processed.

**(c)** Film shall be stored in a cool, dry place and shall be protected from exposure to stray radiation. Film in open packages shall be stored in a light tight container.

**(d)** Film cassettes and intensifying screens shall be inspected periodically and shall be cleaned and replaced as necessary.

**(e)** Outdated x-ray film shall not be used for diagnostic radiographs.

**(f)** The film and intensifying screen shall be spectrally compatible.

**(g)** Facilities shall maintain a light-tight darkroom, use proper safelighting and safeguards, and evaluate darkroom integrity and daylight loading systems for film fog every six months and after a change that may impact film fog.

**(h)** Facilities other than dental, podiatry, and veterinary shall:

**(i)** have a continuous and documented sensitometric quality control program, including quality control tests for speed, contrast and fog, which shall be performed according to specifications of the manufacturer, a QMP [QE], or a nationally recognized organization;

**(ii)** maintain a light-tight darkroom and use proper safelighting and safeguards such that any film type in use exposed in a cassette to x-radiation sufficient to produce an optical density from 1 to 2 when processed shall not suffer an increase in optical density greater than 0.1 when exposed in the darkroom for 2 minutes with all safelights on. If used, daylight film handling boxes shall preclude fogging of the film; and

**(iii)** limit the base plus fog of unexposed film to an optical density less than 0.25 when developed by the routine procedure used by the facility.

**(4)** Facilities Using Computed Radiography (CR) or Direct Digital Radiography (DDR).

**(a)** When exposure indicators are available, the facility shall establish and document an acceptable range for the exposure values for examinations routinely performed at the facility. The indicated exposure values for each image shall be compared to the established range. Consistent deviations from established ranges shall be investigated, corrective actions taken as necessary, and results documented.

**(b)** Facilities shall establish and follow an image quality control program in accord with the recommendations of a QMP [QE], the system manufacturer, or a nationally recognized organization.

(c) Facilities other than dental, podiatric and veterinary, shall quarterly complete phantom image evaluation using a phantom approved by a QMP [QE], system manufacturer, or the department. The analysis at a minimum shall include: artifacts, spatial resolution, contrast/noise, workstation monitors, and exposure indicator constancy.

(d) In addition CR facilities shall perform erasure of all CR cassettes, at least on a weekly basis.

[B-]C. Plan review:

(1) Prior to construction, the floor plans and equipment arrangement of all installations (new or modifications of existing installations) utilizing x-rays for diagnostic or therapeutic purposes, shall be submitted to the department for review and approval. The required information is denoted in 20.3.2.213 NMAC and 20.3.2.214 NMAC [(now 20.3.6.610 NMAC and 20.3.6.611 NMAC)].

(2) The department may require the applicant to utilize the services of a qualified expert to determine the shielding requirement prior to the plan review and approval.

(3) 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 20.3.4.405 NMAC to 20.3.4.414 NMAC [(now 20.3.4.405 to 20.3.4.412 NMAC)].

(4) For all medical facilities in hospitals or clinics, interlocks shall be required on all doors leading into diagnostic x-ray rooms when the doors cannot be seen by the operator at the control station.

[C. Chemicals, film processing and darkroom will be complied with in accordance with Subpart 6, Section 612 (now 20.3.6.612 NMAC):]

D. Digital radiographic systems shall be evaluated by a QMP [QE] within 30 calendar days of clinical use, after repair or maintenance by or under the direction of a QMP [QE] at intervals not to exceed 12 months unless otherwise determined by the department. The evaluation shall follow those recognized by the department.

E. Exemptions.

(1) Dental facilities. Dental facilities performing only intra-oral, panoramic, cephalometric or volumetric dental imaging are exempt from the following provisions: Paragraph (10) of Subsection A of 20.3.6.602 NMAC (information available to referring physician), Subparagraph (e) of Paragraph (1) of Subsection B of 20.3.6.602 NMAC (repeat analysis) and subsection D of 20.3.6.602. (evaluation)

(2) Podiatry facilities. Podiatry facilities are exempt from the following provisions of this Section: Paragraph (11) of Subsection A of 20.3.6.602 NMAC (information available to referring physician) and Subparagraph (e) of Paragraph (1) of Subsection B of 20.3.6.602 NMAC (repeat analysis).

(3) Veterinary facilities. Veterinary facilities are exempt from the following provisions of this Section: Paragraph (6) of Subsection A of 20.3.6.602 NMAC (X-Ray Chart), Paragraph (10) of Subsection A of 20.3.6.602 NMAC (information available to referring physician), Paragraph (11) of Subsection A of 20.3.6.602 NMAC (use of reference levels), Paragraph 16 of Subsection A of 20.3.6.602 NMAC (dose reduction), Paragraph 17 of Subsection A of 20.3.6.602 NMAC (patient identification), Subparagraph d Paragraph (20) of Subsection A of 20.3.6.602 NMAC (routine holding of patient), Paragraph 26 of Subsection A of 20.3.6.602 NMAC (X-Ray Log), Paragraph (27) of Subsection A of 20.3.6.602 NMAC (healing arts screening), Paragraph (1) of Subsection B of 20.3.6.602 NMAC (quality assurance), subparagraph h of paragraph (3) Subsection B of 20.3.602 NMAC (use of sensitometric equipment) and Subsection D of 20.3.6.602NMAC (evaluation).

[[5/3/95; Recompiled 11/27/04] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.603 GENERAL REQUIREMENTS FOR ALL DIAGNOSTIC X-RAY SYSTEMS:** ~~In addition to other requirements of this subpart (now part), all diagnostic x ray systems shall meet the following requirements:~~

~~A. Warning label: The control panel containing the main power switch shall bear the warning statement, legible and accessible to view: “WARNING: This X ray Unit May Be Dangerous To Patient and Operator Unless Safe Exposure Factors and Operating Instructions Are Observed”.~~

~~B. Battery charge indicator: On battery powered generators, visual means shall be provided on the control panel to indicate whether the battery is in a state of charge adequate for proper operation.~~

~~C. Leakage radiation from the diagnostic source assembly: The leakage radiation from the diagnostic source assembly measured at a distance of 1 m in any direction from the source shall not exceed 100 mR (1 mSv) in 1 hour when the x ray tube is operated at its leakage technique factor. Compliance shall be determined by measurements averaged over an area of 100 sq cm (39.37 inches) with no linear dimension greater than 20 cm (7.87 inches).~~

~~D. Radiation from components other than the diagnostic source assembly: The radiation emitted by a component other than the diagnostic source assembly shall not exceed 2 mR (2 mSv) in 1 hour at 5 cm from any~~

accessible surface of the component when it is operated in an assembled x-ray system under any conditions for which it was designed. Compliance shall be determined by measurements averaged over an area of 100-sq-cm (39.37 inches) with no linear dimension greater than 20-cm (7.87 inches).

E. Beam quality:

(1) Half value layer:

(a) The half value layer (HVL) of the useful beam for a given x-ray tube potential shall not be less than the values shown in Table 603.1. If it is necessary to determine such half-value layer at an x-ray tube potential which is not listed in Table 603.1, linear interpolation or extrapolation may be made.

Table 603.1

Design operating range (Kilovolts peak)	Measured potential (Kilovolts peak)	Half value layer (Millimeters of aluminum)
Below 50	30	0.3
	40	0.4
	49	0.5
50 to 70	50	1.2
	60	1.3
	70	1.5
Above 70	71	2.1
	80	2.3
	90	2.5
	100	2.7
	110	3.0
	120	3.2
	130	3.5
	140	3.8
	150	4.1

(b) The above HVL criteria will be considered to have been met if it can be demonstrated that the aluminum equivalent of the total filtration in the primary beam is not less than that shown in Table 603.2.

TABLE 603.2

FILTRATION REQUIRED vs. OPERATING VOLTAGE	
Operating voltage (kVp)	Total filtration (inherent plus added) (millimeters aluminum equivalent)
Below 50	0.5 mm
50 - 70	1.5 mm
Above 70	2.5 mm

(c) Beryllium window tubes shall have a minimum of 0.5-mm aluminum equivalent filtration permanently mounted in the useful beam.

(d) For capacitor energy storage equipment, compliance shall be determined with the maximum quantity of charge per exposure.

(e) The required minimal aluminum equivalent filtration shall include the filtration contributed by all materials which are always present between the focal spot of the tube and the patient (e.g., a tabletop when the tube is mounted "under the table" and inherent filtration of the tube).

(2) Filtration control: For x-ray systems manufactured after August 1, 1974, which have variable kVP and variable filtration for the useful beam, a device shall link the kVP selector with the filter(s), and

will prevent an exposure, unless the minimum required amount of filtration (see Table 603.1 or Table 603.2 above) is in the useful beam for the given kVP which has been selected.

**F.** Multiple tubes: Where two or more radiographic tubes are controlled by one exposure switch, the tube or tubes which have been selected shall be clearly indicated prior to initiation of the exposure. This indication shall be both on the x ray control and at or near the tube housing assembly which has been selected.

**G.** Mechanical support of tube head: The tube housing assembly supports shall be adjusted such that the tube housing assembly will remain stable during an exposure, unless the tube housing movement is a designed function of the x ray system.

**H.** Technique indicators:

(1) The technique factors to be used during an exposure shall be indicated before the exposure begins, except when automatic exposure controls are used, in which case the technique factors which are set prior to the exposure shall be indicated.

(2) On equipment having fixed technique factors, the requirement, Section 603.H.1 (now Paragraph (1) of Subsection H of 20.3.6.603 NMAC), may be met by permanent markings. Indication of technique factors shall be visible from the operator's position, except in the case of spot films by the fluoroscopist. The regulations of the U.S. food and drug administration set forth in 21 CFR 1020.30 and 21 CFR 1020.31 are hereby incorporated by reference.

[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.604 FLUOROSCOPIC X-RAY SYSTEMS:** [All fluoroscopic x ray systems shall meet the following requirements: The provisions of this Part apply to equipment for fluoroscopic imaging or for recording images from the fluoroscopic image receptor. (21CFR1020.32)]

**A.** Limitation of useful beam:

(1) The fluoroscopic tube shall not produce x rays, unless the primary protective barrier is in position to intercept the entire useful beam at all times.

(2) The entire cross section of the useful beam shall be intercepted by the primary protective barrier of the fluoroscopic image assembly at any SID.

(3) Limitation to the imaging surface:

(a) Non image intensified fluoroscopy and spot filming: The x ray field produced by non image intensified fluoroscopic equipment shall not extend beyond the entire visible area of the image receptor. This requirement applies to field size during both fluoroscopic procedures and spot filming procedures.

(b) Image intensified fluoroscopy and spot filming:

(i) During fluoroscopic or spot filming procedures, neither the length nor the width of the x ray field in the plane of the image receptor shall exceed the visible area of the image receptor by more than 3 percent of the SID. The sum of the excess length and the excess width shall be no greater than 4 percent of the SID.

(ii) Compliance shall be determined with the beam axis perpendicular to the image receptor. For rectangular x ray fields used with circular image reception, the error in alignment shall be determined along the length and width dimensions of the x ray field, which pass through the center of the visible area of the image receptor.

**B.** Activation of the fluoroscopic tube: X ray production in the fluoroscopic mode shall be controlled by a device which requires continuous pressure by the fluoroscopist for the entire time of any exposure. When recording serial fluoroscopic images, the fluoroscopist shall be able to terminate the x ray exposure(s) at any time, but means may be provided to permit completion of any single exposure of the series in process.

**C.** Entrance exposure rate allowable limits:

(1) The exposure rate measured at the point where the center of the useful beam enters the patient shall not exceed 10 R per minute, (2.58 mC/kg), except during recording of fluoroscopic images or when provided with optional high level control.

(2) When provided with optional high level control, the equipment shall not be operable at any combination of tube potential and current, which will result in an exposure rate in excess of 5 rem (1.29 mC/kg) per minute at the point where the center of the useful beam enters the patient, unless the high level control is activated. A continuous signal audible to the fluoroscopist shall indicate that the high level control is being employed.

(3) Measuring compliance of entrance exposure rate limits: Compliance with Section 604.C (now Subsection C of 20.3.6.604 NMAC) shall be determined by:

\_\_\_\_\_ (a) removing movable grids and compression devices from the useful beam during the measurements;

\_\_\_\_\_ (b) if the source is below the table, express exposure rate, 1 cm above the tabletop or cradle;

\_\_\_\_\_ (c) express exposure rate, if the source is above the table, 30 cm above the tabletop with the end of the beam limiting device or spacer positioned as closely as possible to the point of measurement; and

\_\_\_\_\_ (d) in a C-arm type of fluoroscope, the exposure rate shall be measured, 30 cm (11.81 inches) from the input surface of the fluoroscopic imaging assembly.

\_\_\_\_\_ (4) Periodic measurement of entrance exposure rate limits:

\_\_\_\_\_ (a) Periodic measurements of the exposure rate shall be made by a qualified expert. An adequate period for such measurements shall be annually or after any maintenance of the system which might affect the exposure rate.

\_\_\_\_\_ (b) Results of these measurements shall be posted where any fluoroscopist may have ready access to such results while using that fluoroscope and in the record required in Section 602.A.2.e (now Subparagraph (e) of Paragraph (2) of Subsection A of 20.3.6.602 NMAC). Results of the measurements shall include the maximum possible rem/per minute, (1.29 mC/kg), as well as the physical factors used to determine all data; the name of the person performing the measurements; and the date the measurements were performed.

\_\_\_\_\_ (c) Use of monitoring devices (e.g., commercially available film badges, thermoluminescent dosimeters, or low energy dosimeters) may be used to perform the test, provided the measurements are made as noted in Section 604.C.4.d (now Subparagraph (d) of Paragraph (4) of Subsection C of 20.3.6.604 NMAC).

\_\_\_\_\_ (d) Conditions of measurement:

\_\_\_\_\_ (i) the measurement shall be made under the conditions that satisfy the requirements of Section 604.C.3 (now Paragraph (3) of Subsection C of 20.3.6.604 NMAC);

\_\_\_\_\_ (ii) the kVp shall be the peak Kv that the x ray system is capable of producing;

\_\_\_\_\_ (iii) the high level control, if present, shall not be activated;

\_\_\_\_\_ (iv) the x ray systems that do not incorporate automatic exposure control (automatic brightness control, etc.) shall have sufficient material (e.g., lead or lead equivalence) placed in the useful beam to produce the maximum milliamperage of the x ray system; and

\_\_\_\_\_ (v) x ray systems that incorporate automatic exposure control shall utilize the maximum milliamperage of the x ray system; materials (e.g., an attenuation block) may be placed in the useful beam to protect the imaging system.

\_\_\_\_\_ D. Barrier transmitted radiation rate limits:

\_\_\_\_\_ (1) The exposure rate due to transmission through the primary protective barrier with the attenuation block in the useful beam combined with radiation from the image intensifier, if provided, shall not exceed 2 mR (0.516 mC/kg) per hour at 10 cm (3.93 inches) from any surface of the fluoroscopic imaging assembly beyond the plane of the image receptor for each roentgen per minute of entrance exposure rate.

\_\_\_\_\_ (2) Measuring compliance of barrier transmission:

\_\_\_\_\_ (a) The exposure rate due to transmission through the primary protective barrier, combined with radiation from the image intensifier, shall be determined by measurements averaged over an area of 100 sq cm with no linear dimension greater than 20 cm (7.87 inches).

\_\_\_\_\_ (b) If the source is below the tabletop, the measurement shall be made with the input surface of the fluoroscopic imaging assembly, positioned 30 cm (11.81 inches) above the tabletop.

\_\_\_\_\_ (c) If the source is above the tabletop and the SID is variable, the measurement shall be made with the end of the beam limiting device or spacer as close to the tabletop as it can be placed, provided that it shall not be closer than 30 cm (11.81 inches).

\_\_\_\_\_ (d) Movable grids and compression devices shall be removed from the useful beam during the measurement.

\_\_\_\_\_ (e) The attenuation block shall be positioned in the useful beam 10 cm (3.93 inches) from the point of measurement of entrance exposure rate and between this point and the input surface of the fluoroscopic imaging assembly.

\_\_\_\_\_ E. Indication of potential and current: During fluoroscopy and cinefluorography, x ray tube potential and current shall be continuously indicated.

\_\_\_\_\_ F. Source skin distance: The source to skin distance shall not be less than:

\_\_\_\_\_ (1) 38 cm (14.96 inches) on stationary fluoroscopes installed after March 10, 1989;

\_\_\_\_\_ (2) \_\_\_\_\_ 35.5 cm (13.98 inches) on stationary fluoroscopes which are in operation prior to March 10, 1989;

\_\_\_\_\_ (3) \_\_\_\_\_ 30 cm (11.81 inches) on all mobile fluoroscopes; and

\_\_\_\_\_ (4) \_\_\_\_\_ 20 cm (7.87 inches) for image intensified fluoroscopes used for specific surgical application; the users operating manual must provide precautionary measures to be adhered to during the use of this device.

\_\_\_\_\_ **G.** \_\_\_\_\_ Fluoroscopic timer:

\_\_\_\_\_ (1) \_\_\_\_\_ Means shall be provided to preset the cumulative on time of the fluoroscopic tube. The maximum cumulative time of the timing device shall not exceed 5 minutes without resetting.

\_\_\_\_\_ (2) \_\_\_\_\_ A signal audible to the fluoroscopist shall indicate the completion of any preset cumulative on-time. Such signal shall continue to sound while x-rays are produced until the timing device is reset.

\_\_\_\_\_ **H.** \_\_\_\_\_ Mobile fluoroscopes: In addition to the other requirements of Section 604 (now 20.3.6.604 NMAC), mobile fluoroscopes shall provide intensified imaging.

\_\_\_\_\_ **I.** \_\_\_\_\_ Control of scattered radiation:

\_\_\_\_\_ (1) \_\_\_\_\_ Fluoroscopic table designs, when combined with procedures utilized, shall be such that no unprotected part of any staff or ancillary person's body shall be exposed to unattenuated scattered radiation which originates from under the table. The attenuation required shall be not less than 0.25 mm lead equivalent.

\_\_\_\_\_ (2) \_\_\_\_\_ Equipment configuration, when combined with procedures, shall be such that no portion of any staff or ancillary person's body, except the extremities, shall be exposed to the unattenuated scattered radiation emanating from above the tabletop unless that individual:

\_\_\_\_\_ (a) \_\_\_\_\_ is at least 120 cm (47.24 inches) from the center of the useful beam; or

\_\_\_\_\_ (b) \_\_\_\_\_ the radiation has passed through not less than 0.25 mm lead equivalent material (e.g., drapes, bucky slot cover, sliding or folding panel, or self supporting curtains) in addition to any lead equivalency provided by the protective apron referred to in Section 602 A.1.e.(2) (now Item (ii) of Subparagraph (e) of Paragraph (1) of Subsection A of 20.3.6.602 NMAC); and

\_\_\_\_\_ (c) \_\_\_\_\_ exceptions to Section 604.I.2 (now Paragraph (2) of Subsection I of 20.3.6.604 NMAC) may be made in some special procedures where a sterile field will not permit the use of the normal protective barriers; where the use of the pre fitted sterilized cover for the barriers is practical, the department shall not permit such exception.] The regulations of the U.S. food and drug administration set forth in 21 CFR 1020.30 and 21 CFR 1020.32 are hereby incorporated by reference.

[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

### **20.3.6.605 [RADIOGRAPHIC SYSTEMS, OTHER THAN FLUOROSCOPIC, DENTAL, INTRAORAL OR VETERINARIAN, OR COMPUTED TOMOGRAPHY X-RAY SYSTEMS:**

\_\_\_\_\_ **A.** \_\_\_\_\_ Beam limitation: The useful beam shall be limited to the area of clinical interest.

\_\_\_\_\_ (1) \_\_\_\_\_ General purpose stationary and mobile x-ray systems:

\_\_\_\_\_ (a) \_\_\_\_\_ Variable field limitation: There shall be provided a means for stepless adjustment of the size of the x-ray field. The minimum field size at a SID of 100 cm shall be equal to or less than 5 cm (1.96 inches) by 5 cm (1.96 inches).

\_\_\_\_\_ (b) \_\_\_\_\_ Visual definition: Means shall be provided for visually defining the perimeter of the x-ray field. The total misalignment of the edges of the x-ray field along either the length or width of the visually defined field shall not exceed 2 percent of the distance from the source to the center of the visually defined field when the surface upon which it appears is perpendicular to the axis of the x-ray beam.

\_\_\_\_\_ (2) \_\_\_\_\_ Additional requirements for stationary general purpose x-ray systems: In addition to the requirements in Section 605.A.1 (now Paragraph (1) of Subsection A of 20.3.6.605 NMAC) above, all stationary x-ray systems shall:

\_\_\_\_\_ (a) \_\_\_\_\_ provide means to indicate when the axis of the x-ray beam is perpendicular to the plane of the image receptor, to align the center of the x-ray field with respect to the center of the image receptor to within 2 percent of the SID, and to indicate the SID to within 2 percent;

\_\_\_\_\_ (b) \_\_\_\_\_ be equipped with a beam limiting device that numerically indicates the field size in the plane of the image receptor to which it is adjusted; and

\_\_\_\_\_ (c) \_\_\_\_\_ indicate field size dimensions and SID's in inches or cm, and shall be such that aperture adjustments result in x-ray field dimensions in the plane of the image receptor which correspond to those of the image receptor to within 2 percent of the SID when the beam axis is perpendicular to the plane of the image receptor.

~~\_\_\_\_\_ (3) X ray systems designed for one image receptor size: Radiographic equipment designed for only one image receptor size at a fixed SID shall be provided with means to limit the field at the plane of the image receptor to dimensions no greater than those of the image receptor, and to align the center of the x ray field with the center of the image receptor to within 2 percent of the SID.~~

~~\_\_\_\_\_ (4) Special purpose x ray systems:~~

~~\_\_\_\_\_ (a) shall be provided with means to limit the x ray field in the plane of the image receptor so that such field does not exceed each dimension of the image receptor by more than 2 percent of the SID when the axis of the x ray beam is perpendicular to the plane of the image receptor;~~

~~\_\_\_\_\_ (b) shall be provided with means to align the center of the x ray field with the center of the image receptor to within 2 percent of the SID;~~

~~\_\_\_\_\_ (c) the above Sections 605.A.4.a and 605.A.4.b (now Subparagraphs (a) and (b) of Paragraph (4) of Subsection A of 20.3.6.605 NMAC) may be met with a system that meets the requirements for a general purpose x ray system as specified in Section 605.A.1 (now Paragraph (1) of Subsection A of 20.3.6.605 NMAC) above or, when alignment means are also provided, may be met with either:~~

~~\_\_\_\_\_ (i) an assortment of removable, fixed-aperture, beam-limiting devices sufficient to meet the requirements for each combination of image receptor size and SID for which the unit is designed (each such device shall have clear and permanent markings to indicate the image receptor size and SID for which it is designed); or~~

~~\_\_\_\_\_ (ii) a beam limiting device having multiple fixed apertures sufficient to meet the requirements for each combination of image receptor size and SID for which the unit is designed; permanent, clearly legible markings shall indicate the image receptor size and SID for which each aperture is designed and shall indicate which aperture is in position for use.~~

~~\_\_\_\_\_ **B.** Radiation exposure control devices:~~

~~\_\_\_\_\_ (1) Timers: Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition:~~

~~\_\_\_\_\_ (a) termination of exposure shall cause automatic resetting of the timer to its initial setting or to zero; and~~

~~\_\_\_\_\_ (b) it shall not be possible to make an exposure when the timer is set to a zero or off position if either position is provided.~~

~~\_\_\_\_\_ (2) X ray control (exposure switch):~~

~~\_\_\_\_\_ (a) A control shall be incorporated into each x ray system such that an exposure can be terminated at any time, except for:~~

~~\_\_\_\_\_ (i) exposure of one half second or less; or~~

~~\_\_\_\_\_ (ii) during serial radiography, when means shall be provided to permit completion of any single exposure of the series in process.~~

~~\_\_\_\_\_ (b) Each x ray control shall:~~

~~\_\_\_\_\_ (i) for stationary x ray systems, be permanently mounted in a protected area so that the operator is required to remain in that protected area during the entire exposure;~~

~~\_\_\_\_\_ (ii) mobile and portable x ray systems which are: 1) used for greater than one week in one location (one room or suite) shall meet the requirements of Section 605.B.2.b.(1) (now Item (i) of Subparagraph (b) of Paragraph (2) of Subsection B of 20.3.6.605 NMAC) above; 2) used for more than 1 hour and less than 1 week at one location (one room or suite) shall meet the requirement of Section 605.B.2.b.(2)(a) (now Item (ii) of Subparagraph (b) of Paragraph (2) of Subsection B of 20.3.6.605 NMAC), or be provided with 1.98 m (6.5 feet) high protective barrier which is placed at least 1.83 m (6 feet) from the tube housing assembly, and at least 1.83 m (6 feet) from the patient; or 3) used to make an exposure(s) of only one patient at the use location shall meet the requirement of Section 605.B.2.b.(2)(a) (now Item (ii) of Subparagraph (b) of Paragraph (2) of Subsection B of 20.3.6.605 NMAC), or Section 605.B.2.b.(2)(b) (now Item(ii) of Subparagraph (b) of Paragraph (2) of Subsection B of 20.3.6.605 NMAC); or be provided with a method of control which will permit the operator to be at least 3.66 m (12 feet) from the tube head assembly during an exposure;~~

~~\_\_\_\_\_ (iii) the x ray control shall provide visual indication observable at or from the operator's protected position whenever x rays are produced; in addition, a signal audible to the operator shall indicate that the exposure has terminated.~~

~~\_\_\_\_\_ (3) Automatic exposure controls (phototimer): When an automatic exposure control is provided:~~

- \_\_\_\_\_ (a) \_\_\_\_\_ indication shall be made on the control panel when this mode of operation is selected;
- \_\_\_\_\_ (b) \_\_\_\_\_ when the x ray tube potential is equal to or greater than 50 kVp, the minimum exposure time for field emission equipment rated for pulsed operation shall be equal to or less than a time interval equivalent to two pulses;
- \_\_\_\_\_ (c) \_\_\_\_\_ the minimum exposure time for all equipment, other than specified in Section 605.B.3.b (now Subparagraph (b) of Paragraph (3) of Subsection B of 20.3.6.605 NMAC), shall be equal to or less than 1/60 second or a time interval required to deliver 5 mAs, whichever is greater;
- \_\_\_\_\_ (d) \_\_\_\_\_ either the product of peak x ray tube potential, current and exposure time shall be limited to not more than 60 kW per exposure, or the product of x ray tube current and exposure time shall be limited to not more than 600 mAs per exposure, except when the x-ray tube potential is less than 50 kVp, in which case the product of x ray tube current and exposure time shall be limited to not more than 2000 mAs per exposure; and
- \_\_\_\_\_ (e) \_\_\_\_\_ a visible signal shall indicate when an exposure has been terminated at the limits described in Section 605.B.3.d (now Subparagraph (d) of Paragraph (3) of Subsection B of 20.3.6.605 NMAC), and manual resetting shall be required before further automatically timed exposures can be made.
- \_\_\_\_\_ (4) \_\_\_\_\_ Reproducibility: With a timer setting of 0.5 seconds or less, the average exposure period (T) shall be greater than or equal to 5 times the maximum exposure period ( $T_{max}$ ) minus the minimum exposure period ( $T_{min}$ ) when 4 timer tests are performed:  $T \geq 5(T_{max} - T_{min})$ .
- \_\_\_\_\_ C. \_\_\_\_\_ Source to source or receptor distance limitation: All radiographic systems shall be provided with a durable, securely fastened means to limit the source to skin distance to not less than 30 cm (11.81 inches). This can be met when the collimator or cone provides the required limits.
- \_\_\_\_\_ D. \_\_\_\_\_ Exposure reproducibility: The exposure produced shall be reproducible to within the following criteria: When all technique factors are held constant, the coefficient of variation shall not exceed 0.10. This shall be deemed to have been met if when four exposures at identical technique factors are made that the value of the average exposure (E) is greater than or equal to five times the maximum exposure ( $E_{max}$ ), minus the minimum exposure ( $E_{min}$ ):
- $$E > 5(E_{max} - E_{min})$$
- \_\_\_\_\_ E. \_\_\_\_\_ Standby radiation from capacitor energy storage equipment: Radiation emitted from the x ray tube when the exposure switch or timer is not activated shall not exceed a rate of 2 mR (20 mSv) per hour at 5 cm (1.96 inches) from any accessible surface of the diagnostic source assembly, with the beam limiting device fully open.] **COMPUTED TOMOGRAPHY (CT) EQUIPMENT:** The regulations of the U.S. food and drug administration set forth in 21 CFR 1020.30 and 21 CFR 1020.33 are hereby incorporated by reference. [5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.606 [INTRAORAL DENTAL RADIOGRAPHIC SYSTEMS:** In addition to the provisions of Sections 602 and 603 (now 20.3.6.602 NMAC and 20.3.6.603 NMAC), the requirements of this section apply to x-ray equipment and associated facilities used for dental radiography. Criteria for extraoral dental radiographic systems are covered in Section 605.

- \_\_\_\_\_ A. \_\_\_\_\_ Source to skin distance: X-ray systems designed for use with an intraoral image receptor shall be provided with means to limit source to skin distance to not less than:
- \_\_\_\_\_ (1) \_\_\_\_\_ 18 cm (7.09 inches) if operable above 50 kVp; or
- \_\_\_\_\_ (2) \_\_\_\_\_ 10 cm (3.93 inches) if not operable above 50 kVp.
- \_\_\_\_\_ B. \_\_\_\_\_ Field limitation:
- \_\_\_\_\_ (1) \_\_\_\_\_ Radiographic systems designed for use with an intraoral image receptor shall be provided with means to limit the x ray beam such that:
- \_\_\_\_\_ (a) \_\_\_\_\_ if the minimum source to skin distance (SSD) is 18 cm (7.09 inches) or more, the x ray field, at the minimum SSD, shall be containable in a circle having a diameter of no more than 7 cm (2.76 inches); and
- \_\_\_\_\_ (b) \_\_\_\_\_ if the minimum SSD is less than 18 cm, (7.09 inches) the x ray field, at the minimum SSD, shall be containable in a circle having a diameter of no more than 6 cm (2.36 inches).
- \_\_\_\_\_ C. \_\_\_\_\_ Timers: Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition:
- \_\_\_\_\_ (1) \_\_\_\_\_ termination of exposure shall cause automatic resetting of the timer to its initial setting or to zero;

~~(2) it shall not be possible to make an exposure when the timer is to a zero or off position if either position is provided;~~

~~(3) Reproducibility: With a timer setting of 0.5 seconds or less, the average exposure period (T) shall be greater than or equal to 5 times the maximum exposure period ( $T_{max}$ ) minus the minimum exposure period ( $T_{min}$ ) when 4 timer tests are performed:  $T > 5 (T_{max} - T_{min})$ .~~

~~**D. X ray control (use of dead man timers):**~~

~~(1) A control shall be incorporated into each x ray system such that an exposure can be terminated at any time, except for exposures of one half second or less;~~

~~(2) Each x ray control shall be located in such a way as to meet the following criteria:~~

~~(a) for stationary x ray systems, it shall be required that the control switch be permanently mounted in a protected area (e.g., corridor outside the room) so that the operator is required to remain in that protected area during the entire exposure;~~

~~(b) for mobile and portable x ray systems which are:~~

~~(i) used for greater than 1 week in one location (one room or suite) shall meet the requirements of Section 606.D.2.a (now Subparagraph (a) of Paragraph (2) of Subsection D of 20.3.6.606 NMAC);~~

~~(ii) used for more than 1 hour and less than 1 week at one location (one room or suite) shall meet the requirements of Section 606.D.2.b.(1) (now Item (i) of Subparagraph (b) of Paragraph (2) of Subsection D of 20.3.6.606 NMAC), or be provided with 1.98 m (6.5 feet) high protective barrier which is placed at least 1.83 m (6 feet) from the tube housing assembly and at least 1.83 m (6 feet) from the patient;~~

~~(iii) used to make an exposure(s) of only one patient at the use location shall meet the requirement of Sections 606.D.2.b.(1) or 606.D.2.b.(2) (now Items (i) or (ii) of Subparagraph (b) of Paragraph (2) of Subsection D of 20.3.6.606 NMAC), or be provided with a method of control which will permit the operator to be at least 3.63 m (12 feet) from the tube head assembly during an exposure.~~

~~(3) The x ray control shall provide visual indication observable at or from the operator's protected position whenever x rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.~~

~~(4) From the operator's position, the patient must be capable of being viewed directly or via mirrors.~~

~~**E. Exposure reproducibility:** The exposure produced shall be reproducible to within the following criteria: when all technique factors are held constant, the coefficient of variation shall not exceed 0.10. This shall be deemed to have been met if, when four exposures at identical technique factors are made, that the value of the average exposure (E) is greater than or equal to five times the maximum exposure ( $E_{max}$ ) minus the minimum exposure ( $E_{min}$ ):  $E > 5 (E_{max} - E_{min})$ .~~

~~**F. Operating controls:**~~

~~(1) Patient and film holding devices shall be used when the techniques permit. The safety rules, required by Section 602.A.1.d (now Subparagraph (d) of Paragraph (1) of Subsection of 20.3.6.602 NMAC), shall list individual projections where holding devices cannot be utilized.~~

~~(2) Neither the tube housing nor the position indicating device shall be hand-held during an exposure.~~

~~(3) The x ray system shall be arranged and operated in such a manner that the useful beam at the patient's skin does not exceed the dimensions specified in Sections 606.B.1.a or 606.B.1.b (now Subparagraphs (a) or (b) of Paragraph (1) of Subsection B of 20.3.6.606 NMAC).~~

~~(4) Dental fluoroscopy shall be prohibited.] CABINET X-RAY SYSTEMS: The regulations of the U.S. federal drug administration set forth in 21 CFR 1020.30 and 21 CFR 1020.40 are hereby incorporated by reference.~~

~~[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]~~

**20.3.6.607 THERAPEUTIC X-RAY INSTALLATIONS:**

**A. Equipment:**

- (1) The protective tube housing shall be of therapeutic type.
- (2) Permanent diaphragms or cones for collimating the useful beam shall afford the same degree of protection as the tube housing. Adjustable or removable beam-defining diaphragms or cones shall transmit not more than five percent of the useful beam at the maximum kilovoltage and with maximum treatment filter.

(3) Filters shall be secured in place to prevent them from dropping out during treatment. The filter slot shall be so constructed that the radiation escaping through it does not exceed 1 R (0.258 mC/kg) per hour at 1 m (3.28 feet), or, if the radiation from the slot is accessible to the patient, 30 R (7.74 mC/kg) per hour at 5 cm (1.96 inches) from the external opening. Each removable filter shall be marked with its thickness and material.

(4) A filter indication system shall be used on all therapy machines using changeable filters. It shall be designed so as to permit easy recognition of any added filter in place. It shall indicate, from the control panel, the presence or absence of any filter.

(5) The x-ray tube shall be so mounted that it cannot turn or slide with respect to the housing aperture.

(6) Means shall be provided to immobilize the tube housing during stationary portal treatment.

(7) A device (e.g., an automatic timer exposure meter or dose meter) shall be provided to terminate the exposure after a preset time interval or preset exposure of dose limit. Means shall be provided for the operator to terminate the exposure at any time.

(8) Equipment utilizing shutters to control the useful beam shall have a shutter position indicator on the control panel.

(9) The control panel shall include a device (usually an ammeter) which will give positive indication of the production of x-rays whenever the x-ray tube is energized.

**B. Structural shielding:**

(1) All walls, floors and ceilings that can be struck by the useful beam shall be provided with primary barriers to the height of the ceiling. Low-voltage superficial therapy units only require a height of 2.1 m (6.88 feet).

(2) All walls, floors and ceilings that, because of restrictions in the orientation of the useful beam cannot be struck by the useful beam, shall be provided with secondary barriers to a minimum height of 2.1 m (6.88 feet).

(3) With equipment operating at voltages above 50 kVp, the required barriers shall be an integral part of the building.

(4) With equipment operating above 150 kVp, the control panel shall be within a protective booth equipped with an interlocked door, or located outside the treatment room.

(5) Interlocks shall be provided for x-ray therapy equipment capable of operating above 150 kVp so that, when any door of the treatment room is opened, either the machine will shut off automatically, or the radiation level within the room will be reduced to an average of not more than 2 mR (20 mSv) per hour and a maximum of 10 mR (100 mSv) per hour at a distance of 1 m (3.28 feet) in any direction from the target. After such shutoff or reduction in output, it shall be possible to restore the machine to full operation only from the control panel.

(6) Windows, mirror systems or closed-circuit television viewing screen shall be provided to permit continuous observation of the patient during irradiation, and shall be so located that the operator may see the patient and the control panel from the same position.

(7) Provision shall be made for oral communication with the patient from the control room.

(8) Treatment rooms to which access is possible through more than one entrance shall be provided with flashing warning lights in a readily observable position near the outside of all access doors, which will indicate when the useful beam is "on".

**C. Operating procedure:**

(1) All new facilities, and existing facilities not previously surveyed, shall have a protection survey made by or under the direction of a qualified expert. This also shall be done after any change in the facility which might produce a radiation hazard. The expert shall report his findings, in writing, to the person in charge of the facility and a copy of this report shall be transmitted to the department.

(2) The facility shall be operated in compliance with any limitations indicated by the protection survey.

(3) When a patient must be held in position for radiation therapy, mechanical supporting or restraining devices shall be used whenever feasible. If the patient must be held by an individual, that individual shall be adequately protected, and shall be positioned so that no part of the body will be struck by the useful beam, and that the body is as far as possible from the edge of the useful beam. The exposure of any individual used for this purpose shall be monitored.

(4) The output of each therapeutic x-ray machine shall be calibrated by, or under the direction of, a qualified expert. The calibration shall be repeated after any change in or replacement of components

of the x-ray generating equipment which could cause a change in x-ray output. Check calibrations shall be made at least once a year thereafter. Records of calibration shall be maintained by the registrant.  
[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**20.3.6.608 SPECIAL REQUIREMENTS FOR X-RAY THERAPY EQUIPMENT OPERATED AT POTENTIALS OF 60 kVp AND BELOW:**

- A.** Equipment: All provisions of Section 607.A (now Subsection A of 20.3.6.607 NMAC) apply, except that the leakage radiation 5 cm (1.96 inches) from the surface to the tube housing shall not exceed 0.1 R/hr.
- B.** Operating procedures:
- (1) Automatic timers shall be provided which will permit accurate presetting and termination of exposures as short as one second.
  - (2) In the therapeutic application of apparatus constructed with beryllium or other low-filtration windows, the registrant shall ensure that the unfiltered useful beam is blocked at all times, except when actually being used.
  - (3) Machines having an output of more than 1,000 R (100 Bq) per minute at any accessible place shall not be left unattended without the power being shut off at the main disconnect switch, in addition to the control panel switch.
  - (4) The tube-head shall not be hand-held during x-ray therapy.

[[5/3/95; Recompiled 11/27/01]]

**20.3.6.608 [RESERVED]**

**20.3.6.609 VETERINARY MEDICINE RADIOGRAPHIC INSTALLATIONS:**

- A.** Equipment:
- (1) The protective tube housing shall be of diagnostic type.
  - (2) Diaphragms or cones shall be provided for collimating the useful beam to the area of clinical interest, and shall provide the same degree of protection as is required of the housing.
  - (3) The total filtration permanently in the useful beam shall not be less than 0.5 mm aluminum equivalent for machines operating up to 50 kVp, 1.5 mm aluminum for machines operating between 50-70 kVp, and 2.5 mm aluminum equivalent for machines operating above 70 kVp.
  - (4) A device shall be provided to terminate the exposure after a preset time or exposure.
  - (5) A dead-man type of exposure switch shall be provided, together with an electrical cord of sufficient length, so that the operator can stand out of the useful beam and at least 1.8 m from the animal during all x-ray exposures.
- B.** Structural shielding: All wall, ceiling and floor areas shall be equivalent to or provided with applicable protective barriers as required in Sections 602.B.1 and 602.B.2 (now Paragraphs (1) and (2) of Subsection B of 20.3.6.602 NMAC).
- C.** Operating procedures:
- (1) The operator shall stand well away from the useful beam and the animal during radiographic exposures.
  - (2) No individual, other than the operator, shall be in the x-ray room while exposures are being made, unless such individual's assistance is required.
  - (3) When an animal must be held in position during radiography, mechanical supporting or restraining devices should be used. If the animal must be held by an individual, that individual shall be protected with appropriate shielding devices, such as protective gloves and apron, and he shall so positioned that no part of his body will be struck by the useful beam. The exposure of any individual used for this purpose shall be monitored.

[[5/3/95; Recompiled 11/27/01] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026]

**~~20.3.6.610 APPENDIX A. INFORMATION ON RADIATION SHIELDING REQUIRED FOR PLAN REVIEWS:~~**

- ~~**A.** In order for the department to provide evaluation, technical advice and official approval on shielding requirements for a radiation installation, the following information is needed:~~
- ~~(1) normal location of the radiation producing equipment's radiation port; port's travel and traverse limits; general direction(s) of the radiation beam; locations of all windows; locations of the operator's booth; location of the equipment's control console; distance from x ray tube to nearest primary barrier;~~

\_\_\_\_\_ (2) \_\_\_\_\_ structural composition and thickness of all walls, doors, partitions, floor(s) and ceiling(s) of room(s) concerned;

\_\_\_\_\_ (3) \_\_\_\_\_ height, floor to floor, of room(s) concerned;

\_\_\_\_\_ (4) \_\_\_\_\_ type of occupancy of all adjacent areas, inclusive of space above and below the room(s) concerned; for exterior walls, distance to the closest existing occupied area(s);

\_\_\_\_\_ (5) \_\_\_\_\_ kVp (kilovolt peak potential) and maximum mA (milliamperage) for each radiation machine; and

\_\_\_\_\_ (6) \_\_\_\_\_ type of examination(s) or treatment(s) performed with equipment (e.g., dental, orthodontal, chest, gastrointestinal, fluoroscopic, podiatry, fixed therapy, rotational therapy, etc.).

\_\_\_\_\_ **B.** \_\_\_\_\_ Information on anticipated workload used in shielding calculations must be provided. This must include for each radiation machine number of exposures/week and average duration of each exposure.

\_\_\_\_\_ **C.** \_\_\_\_\_ If services of a qualified radiation expert have been utilized, a copy of his report shall be submitted with plans. This report must show all basic assumptions (i.e., workload, occupancy and use factors, distance, etc.) used to determine the shielding requirements.]

[5/3/95; Recompiled 11/27/01]

### **[20.3.6.611 APPENDIX B: MINIMUM DESIGN REQUIREMENTS FOR AN X RAY MACHINE OPERATOR'S BOOTH:**

\_\_\_\_\_ **A.** \_\_\_\_\_ Space requirements:

\_\_\_\_\_ (1) \_\_\_\_\_ The operator shall be allotted not less than 0.7 square m (7.5 square feet) of unobstructed floor space in the booth.

\_\_\_\_\_ (2) \_\_\_\_\_ The minimum space as indicated above may be any geometric configuration with no dimension of less than 61 cm (2 feet).

\_\_\_\_\_ (3) \_\_\_\_\_ The space shall be allotted excluding any encumbrance by the console, such as overhang or 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 cassette not reach the operator's station in the booth.

\_\_\_\_\_ (5) \_\_\_\_\_ The booth walls shall be at least 2.1 m (7 feet) high, and shall be permanently fixed to the floor or other structure as may be necessary.

\_\_\_\_\_ (6) \_\_\_\_\_ When a door or movable panel is used as an integral part of the booth structure, it must have a permissive device which will prevent an exposure when the door or panel is not closed (this type of booth structure is not recommended).

\_\_\_\_\_ **B.** \_\_\_\_\_ Switch placement:

\_\_\_\_\_ (1) \_\_\_\_\_ The operator's switch for the radiographic machine shall be fixed within the booth.

\_\_\_\_\_ (2) \_\_\_\_\_ The switch shall be at least 1 m (40 inches) from any edge of the booth wall which is proximal to the examining table.

\_\_\_\_\_ (3) \_\_\_\_\_ The switch shall allow the operator to use the majority of the available viewing windows.

\_\_\_\_\_ **C.** \_\_\_\_\_ Viewing system requirements:

\_\_\_\_\_ (1) \_\_\_\_\_ Each booth shall have a least one viewing device which will:

\_\_\_\_\_ (a) \_\_\_\_\_ be so placed that the operator can view the patient during any exposure; and

\_\_\_\_\_ (b) \_\_\_\_\_ the device shall be so placed that he can have full view of any occupant of the room and should be so placed that he can view any entry into the room; and if any door, which allows access to the room, cannot be seen from the booth, then that door must have a permissive device controlling the exposure which will prevent the exposure if the door is not closed.

\_\_\_\_\_ (2) \_\_\_\_\_ When the viewing system is a window:

\_\_\_\_\_ (a) \_\_\_\_\_ it shall have a visible area of at least 930 square cm (1.5 square feet);

\_\_\_\_\_ (b) \_\_\_\_\_ the distance between the proximal edge of the window and the open edge of the booth shall not be less than 45.7 cm (18 inches); and

\_\_\_\_\_ (c) \_\_\_\_\_ the glass shall have the same lead equivalence as that required in the booths' wall in which it is to be mounted.

\_\_\_\_\_ (3) \_\_\_\_\_ When the viewing system is by mirrors, the mirror(s) shall be so located as to accomplish the general requirements as in above.

\_\_\_\_\_ (4) \_\_\_\_\_ When the viewing system is by electronic means (e.g., TV, etc.):

\_\_\_\_\_ (a) \_\_\_\_\_ the camera shall be so located as to accomplish the general requirements of Section 611.C.1 (now Paragraph (1) of Subsection C of 20.3.6.611 NMAC) above; and

\_\_\_\_\_ (b) \_\_\_\_\_ there shall be an alternative viewing system as a backup for electronic failure.]

**20.3.6.610-20.3.6.611** [RESERVED]

**20.3.6.612 APPENDIX [C](A): X-RAY FILM DEVELOPING: Time temperature chart:**

Thermometer readings (Degrees)		Minimum developing times (Minutes)
C	F	
27	80	2.0
	79	2.5
	78	2.5
	77	3.0
24	76	3.0
	75	3.0
	74	3.5
	73	3.5
22	72	4.0
	71	4.0
	70	4.5
20	69	4.5
	68	5.0
	67	5.5
	66	5.5
	65	6.0
18	64	6.5
	63	7.0
	62	8.0
	61	8.5
16	60	9.5

**A.** Processing of film: All films shall be processed in such a fashion as to achieve adequate sensitometric performance. This criterion shall be adjudged to have been met if either of the following items can be met:

- (1) film manufacturers' published recommendations as regards time and temperature are followed; or
- (2) each film shall be developed in accord with the time temperature chart.

**B.** Manual processing of film:

(1) Where film is developed manually, a system shall be available which consists of at least one three-sectional tank made of mechanically rigid, corrosion-resistant material (each section of which shall be constructed so as to retain its solution separation from the other two) and has the overall temperature-controlling capability of maintaining each solution such that the temperature of each solution will always fall within the range of 16 degrees C to 27 degrees C (60 degrees - 80 degrees F).

- (2) Devices shall be available which will:
  - (a) give the actual temperature of the developer; and
  - (b) give an audible or visible signal, after a preset time (in minutes of duration).

(3) Chemical-film processing control:

(a) Chemicals shall be mixed in accord with the chemical manufacturer's recommendations.

(b) Developer replenisher shall be periodically added to the developer tank based on the area of the films which have been developed (e.g., 1 liter per 3100 in<sup>2</sup> of film or in accord with the recommendations of the chemical manufacturer). Solution may be removed from the tank to permit the addition of an adequate volume of replenisher.

(c) All processing chemicals shall be completely replaced at least every 3 months.

(d) At the time of the complete processing chemical change, a film shall be exposed to a density of approximately one, with one-half of the film being protected from the exposure. After full development, it will be maintained in the darkroom or vicinity, and at the beginning of each work day at least one test film or film strip (exposed under techniques identical with those used for the original test film) shall be compared with the original test film to evaluate the adequacy of developing results and base fog level.

C. Automatic processors and other closed processing systems:

(1) Preventive maintenance shall be performed on the unit, except for extended periods of nonuse, on a frequency basis which is not less than that schedule recommended by the manufacturer. In the event that no schedule is available from the manufacturer, a maintenance schedule shall be established which will preserve good film quality.

(2) After a full cleansing of the processor, a film shall be exposed to a density of approximately one, with one-half of the film protected from exposure. It will be developed and then kept near the unit and daily at least one test film (exposed under techniques identical with those used for the original test film) shall be compared with the original test film to evaluate the adequacy of the unit's developing capability and base fog level.

D. Darkrooms:

(1) Darkrooms shall be constructed so that film being processed, handled or stored will be exposed only to light which has passed through a safelight filter.

(2) The radiance and spectral emission of the safelight (bulb and filter combination) shall be such that film shall not be "fogged" above the base level when exposed for 1 minute at a distance of about 120 cm from the lamp(s). Film manufacturer's recommendations for a safelight and its placement shall be adjudged to meet this criterion.

[~~5/3/95; Recompiled 11/27/01~~] 20.3.2.1 NMAC – Rp 20.3.2.1 NMAC, xx/xx/2026

**20.3.6.613 - 20.3.6.699** [RESERVED]

#### **HISTORY OF 20.3.6 NMAC:**

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EIB RPR-1, Radiation Protection Regulations filed on 4/21/80;

EIB RPR-1, Amendment 1, Radiation Protection Regulations filed on 10/13/81;

EIB RPR-1, Amendment 2, Radiation Protection Regulations filed on 12/15/82; and

EIB RPR-1, Radiation Protection Regulations filed on 3/10/89.

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Other History:

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