

This rule was filed as 20 NMAC 3.1 Subpart 11.

**TITLE 20 ENVIRONMENTAL PROTECTION**  
**CHAPTER 3 RADIATION PROTECTION**  
**PART 11 CABINET X-RAY SYSTEMS**

20.3.11.1 ISSUING AGENCY: [RESERVED]

20.3.11.2 SCOPE: This Subpart [20.3.11 NMAC] establishes requirements for use of cabinet x-ray systems, including x-ray systems used for inspection of carry-on baggage at airline terminals and similar facilities. The provisions of this Subpart [20.3.11 NMAC] are not applicable to systems which are designed exclusively for microscopic examination of material, e.g., x-ray defraction, spectroscopic, and electron microscope equipment, or to systems for intentional exposure of humans to x-rays.

[5-3-95; 20.3.11.2 NMAC--Rn, 20 NMAC 3.1.11.1100, Recompiled 11/27/01]

20.3.11.3 STATUTORY AUTHORITY: [RESERVED]

20.3.11.4 DURATION: [RESERVED].

20.3.11.5 EFFECTIVE DATE: [RESERVED]

20.3.11.6 OBJECTIVE: [RESERVED]

20.3.11.7 DEFINITIONS:

A. "Access panel" means any barrier or panel which is designed to be removed or opened for maintenance or service purposes, requires tools to open, and permits access to the interior of the cabinets.

B. "Aperture" means any opening in the outside surface of the cabinet, other than a port, which remains open during generation of x-radiation.

C. "Cabinet x-ray system" means an x-ray system with the x-ray tube installed in an enclosure (hereinafter termed "Cabinet") which, independently of existing architectural structures except the floor on which it may be placed, is intended to contain at least that portion of a material thing irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of x-radiation. Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities. An x-ray tube used within a shielded part of a building, or x-ray equipment that may temporarily or occasionally incorporate portable shielding is not considered a cabinet x-ray system.

D. "Door" means any barrier which is designed to be removable or opened for routine operation purposes, does not generally require tools to open, and permits access to the interior of the cabinet. For the purposes of Section 1103.D.1 [Paragraph (1), Subsection D of 20.3.11.1103 NMAC], inflexible hardware rigidly affixed to the door shall be considered part of the door.

E. "Exposure" means the quotient of dQ divided 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 by photons in a volume element of air having mass dm are completely stopped in air.

F. "External surface" means the outside surface of the cabinet x-ray system, including the high-voltage generator, doors, access panels, latches, control knobs, and other permanently mounted hardware and including the plane across any aperture or port.

G. "Floor" means the underside external surface of the cabinet.

H. "Ground Fault" means an accidental electrical grounding of an electrical conductor.

I. "Port" means any opening in the outside surface of the cabinet which is designed to remain open, during generation of x-rays, for the purpose of conveying material to be irradiated into and out of the cabinet, or for partial insertion of an object whose dimensions do not permit complete insertion into the cabinet.

J. "Primary beam" means the x-radiation emitted directly from the target and passing through the window of the x-ray tube.

K. "Safety interlock" means a device which is intended to prevent the generation of x-radiation when access by any part of the human body to the interior of the cabinet x-ray system through a door or access panel is possible.

L. "X-ray system" means an assemblage of components for the controlled generation of x-rays.

M. "X-ray tube" means any electron tube which is designed for the conversion of electrical energy into x-ray energy.

[5-3-95; 20.3.11.7 NMAC--Rn, 20 NMAC 3.1.11.1101, Recompiled 11/27/01]

20.3.11.8--20.3.11.1101 [RESERVED]

20.3.11.1102 GENERAL SAFETY PROVISION:

A. Use.

(1) The registrant shall assure that all x-ray equipment under his control is operated only by individuals adequately instructed in safe operating procedures and competent in safe use of the equipment.

(2) The registrant shall provide safety rules 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 apparatus, and require that the operator demonstrate familiarity with these regulations.

(3) The registrant shall provide personnel monitoring in accordance with Section 417 [20.3.4.417 NMAC] of these regulations.

(4) The registrant shall report to the Department, in writing, a list of those individuals whose exposure equals or exceeds 1.250 rem per quarter, and reasons for the exposure.

B. Prohibited Use: No registrant shall operate or permit the operation of x-ray equipment unless the equipment and installation meet the applicable requirements of these regulations.

[5-3-95; 20.3.11.1102 NMAC--Rn, 20 NMAC 3.1.11.1102, Recompiled 11/27/01]

20.3.11.1103 REQUIREMENTS:

A. Emission Limit.:

(1) Radiation emitted from the cabinet x-ray system shall not exceed an exposure of 0.5 mrem (5  $\mu$ Sv) per hour at any point 5 cm outside the external surface.

(2) Compliance with the exposure limit in Section 1103.A.1 [Paragraph (1), Subsection A of 20.3.11.1103 NMAC], shall be determined by measurements averaged over a cross-sectional area of ten square centimeters with no linear dimension greater than 5 centimeters, with the cabinet x-ray system operated at those combinations of x-ray tube potential, current, beam orientation, and conditions of scatter radiation which produce the maximum x-ray exposure at the external surface, and with the door and access panel fully closed as well as fixed at any other position which will allow the generation of x-radiation.

B. Floors: A cabinet x-ray system shall have a permanent floor. Any support surface to which a cabinet x-ray system is permanently affixed may be deemed the floor of the system.

C. Ports and Apertures: The insertion of any part of the human body through any port or aperture into the primary beam shall not be possible.

D. Safety Interlocks:

(1) Each door of a cabinet x-ray system shall have a minimum of two safety interlocks. One, but not both, of the required interlocks shall be such that door opening results in physical disconnection of the energy supply circuit to the high-voltage generator and such disconnection shall not be dependent upon any moving part other than the door.

(2) Each access panel shall have at least one safety interlock.

(3) Following interruption of x-ray generation by the functioning of any safety interlock, use of a control provided in accordance with Section 1103.F.2 [Paragraph (2), Subsection F of 20.3.11.1103 NMAC], shall be necessary for resumption of x-ray generation.

(4) Failure of any single component of the cabinet x-ray system shall not cause failure of more than one required safety interlock.

E. Ground Fault: A ground fault shall not result in the generation of x-rays.

F. Controls and Indicators for all Cabinet X-ray Systems: For all systems to which this section is applicable there shall be provided:

(1) A key-actuated control to ensure that x-ray generation is not possible with the key removed;

(2) A control or controls to initiate and terminate the generation of x-rays other than by functioning of safety interlock or the main power control;

(3) Two independent means which indicate when and only when x-rays are being generated, unless the x-ray generation period is less than one-half second, in which case the indicators shall be activated for one-half second, and which are discernible from any point at which initiation of x-ray generation is possible. Failure of a

single component of the cabinet x-ray system shall not cause failure of both indicators to perform their intended function. One, but not both, of the indicators, required by this Section [Subsection] may be a milliammeter labeled to indicate x-ray tube current. All other indicators shall be legibly labeled "X-RAY ON "; and

(4) Additional means other than milliammeters which indicate when and only when x-rays are being generated, unless the x-ray generation period is less than one-half second, as needed to ensure that at least one indicator is visible from each door, access panel, and port, and is legibly labeled "X-RAY ON".

G. Additional Requirements for Cabinet X-ray Systems Designed to Admit Humans: For cabinet x-ray systems designed to admit humans there shall also be provided:

(1) A control within the cabinet for preventing and terminating x-ray generation, which cannot be reset, overridden or by-passed from the outside of the cabinet;

(2) No means by which x-ray generation can be initiated from within the cabinet;

(3) Audible and visible warning signals within the cabinet which are actuated for at least 10 seconds immediately prior to the first initiation of x-ray generation after closing any door designed to admit humans. Failure of any single component of the cabinet x-ray system shall not cause failure of both the audible and visible warning signals;

(4) A visible warning signal within the cabinet which remains actuated when and only when x-rays are being generated, unless the x-ray generation period is less than one-half second, in which case the indicators shall be activated for one-half second;

(5) Signs indicating the meaning of the warning signals provided by Section 1103.G.3 [Paragraph (3), Subsection G of Section 20.3.11.1103 NMAC], and Subpart 4 [20.3.4 NMAC], and containing instructions for the use of the control provided by Section 1103.G.1 [Paragraph (1), Subsection G of 20.3.11.1103 NMAC]. These signs shall be legible, accessible to view, and illuminated when the main power control is in the "on" position; and

(6) A physical radiation survey shall be conducted to determine that the radiation machine is "off" prior to each entry into the shielded room. Such surveys shall be made with a radiation measuring instrument which is capable of measuring radiation of the energies and at the exposure rates to be encountered, which is in good working order, and which has been properly calibrated within the preceding three months or following the last instrument servicing, whichever is later.

H. Warning Labels:

(1) There shall be permanently affixed or inscribed on the cabinet x-ray system at the location of any controls that can be used to initiate x-ray generation, a clearly legible and visible label bearing the statement: CAUTION: X-RAYS PRODUCED WHEN ENERGIZED;

(2) There shall be permanently affixed or inscribed on the cabinet x-ray system adjacent to each port a clearly legible and visible label bearing the statement: CAUTION, X-RAY HAZARD: DO NOT INSERT ANY PART OF THE BODY WHEN SYSTEM IS ENERGIZED -- X-RAY HAZARD.

I. Instructions.

(1) Manufacturers of cabinet x-ray systems shall provide for purchasers, and to others upon request, at a cost not to exceed the cost of preparation and distribution, manuals and instructions that shall include at least the following technical and safety information: Potential, current, and duty cycle ratings of the x-ray generation equipment; adequate instructions concerning any radiological safety procedures and precautions which may be necessary because of unique features of the system; and a schedule of maintenance necessary to keep the system in compliance with this Subpart [Part].

(2) Manufacturers of cabinet x-ray systems which are intended to be assembled or installed by the purchaser shall provide instructions for assembly, installation, adjustment and testing of the cabinet x-ray system adequate to assure that the system is in compliance with applicable provisions of this part when assembled, installed, adjusted and tested as directed.

J. Additional Requirements for X-ray Baggage Inspection Systems: X-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and at similar facilities, shall be provided with the following means to ensure operator presence at the control area in a position which permits surveillance of the ports and doors during generation of x-radiation:

(1) During an exposure or preset succession of exposures of one-half second or greater duration, the means provided shall enable the operator to terminate the exposure or preset succession of exposures at any time, and

(2) During an exposure or preset succession of exposures of less than one-half second duration, the means provided may allow completion of the exposure in progress but shall enable the operator to prevent additional exposures.

[5-3-95; 20.3.11.1103 NMAC--Rn, 20 NMAC 3.1.11.1103, Recompiled 11/27/01]

20.3.11.1104--20.3.11.1199 [RESERVED]

HISTORY of 20.3.11 NMAC:

Pre-NMAC History: The material in this Part was derived from that previously filed as follows: EIB 73-2, Regulations for Governing the Health and Environmental Aspects of Radiation filed on 7-9-73; EIB 73-2, Amendment 1, Regulations for Governing the Health and Environmental Aspects of Radiation filed on 4-17-78; 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.

History of Repealed Material: [Reserved]

Other History: EIB RPR 1, Radiation Protection Regulations, filed 03-10-1989 renumbered and reformatted to 20 NMAC 3.1, Radiation Materials And Radiation Machines, filed 04-03-1995. 20 NMAC 3.1, Radiation Materials And Radiation Machines, filed 06-17-1999 internally renumbered and reformatted replaced 20 NMAC 3.1, filed 04-03-1995. The material in this Part was derived from that previously filed as: 20 NMAC 3.1.Subpart 11, Cabinet X-Ray Systems, filed 06-17-99 recompiled as 20.3.11 NMAC, effective 11/27/01.