

This rule was filed as 20 NMAC 3.1 Subpart 8.

TITLE 20 ENVIRONMENTAL PROTECTION
CHAPTER 3 RADIATION PROTECTION
PART 8 RADIATION SAFETY REQUIREMENTS FOR ANALYTICAL X-RAY EQUIPMENT

20.3.8.1 ISSUING AGENCY: Environmental Improvement Board.
[Recompiled 11/27/01]

20.3.8.2 SCOPE: This Subpart [20.3.8 NMAC] provides special requirements for analytical x-ray equipment. The requirements of this Subpart [20.3.8 NMAC] are in addition to, and not in substitution for, applicable requirements in other Subparts [Parts] of these regulations.
[5-3-95; 20.3.8.2 NMAC--Rn, 20 NMAC 3.1.8.800, Recompiled 11/27/01]

20.3.8.3 STATUTORY AUTHORITY: [RESERVED]

20.3.8.4 DURATION: [RESERVED]

20.3.8.5 EFFECTIVE DATE [RESERVED]

20.3.8.6 OBJECTIVE: [RESERVED]

20.3.8.7 DEFINITIONS:

A. "Analytical x-ray equipment" means equipment used for x-ray diffraction or fluorescence analysis.
B. "Analytical x-ray system" means a group of local and remote components utilizing x-rays to determine the elemental composition or to examine the microstructure of materials. Local components include those that are struck by x-rays such as radiation source housing, port and shutter assemblies, collimator, sample holders, cameras, goniometers, detectors and shielding. Remote components include power supplies, transformers, amplifiers, readout devices, and control panels.

C. "Fail-safe characteristics" mean a design feature which causes beam port shutters to close, or otherwise prevents emergence of the primary beam, upon the failure of a safety or warning device.

D. "Local components" mean part of an analytical x-ray system and include areas that are struck by x-rays such as radiation source housings, port and shutter assemblies, collimator, sample holders, cameras, goniometers, detectors and shielding but do not include power supplies, transformers, amplifiers, readout devices, and control panels.

E. "Normal operating procedures" mean step-by-step instructions necessary to accomplish the analysis. These procedures shall include sample insertion and manipulation, equipment alignment, routine maintenance by the registrant, and data-recording procedures which are related to radiation safety.

F. "Open-beam configuration" means analytical x-ray system in which an individual could accidentally place part of his body in the primary beam path during normal operation.

G. "Primary beam" means ionizing radiation which passes through an aperture of the source housing by a direct path from the x-ray tube or a radioactive source located in the radiation source housing.

[5-3-95; 20.3.8.7 NMAC--Rn, 20 NMAC 3.1.8.801, Recompiled 11/27/01]

20.3.8.8 to 20.3.8.801 [RESERVED]

20.3.8.802 EQUIPMENT REQUIREMENTS:

A. Safety Device: A device which prevents the entry of any portion of an individual's body into the primary x-ray beam or which causes the beam to be shut off upon entry into its path shall be provided on all open-beam configurations. An applicant may apply to the Department for an exemption from the requirements of a safety device. Such application shall include:

- (1) A description of the various safety devices that have been evaluated;
- (2) The reason each of these devices cannot be used; and
- (3) A description of the alternative methods that will be employed to minimize the possibility of an accidental exposure, including procedures to assure that operators and others in the area will be informed of the absence of safety devices.

B. Warning Devices: Warning devices shall be labeled so that their purpose is identified. On equipment installed after March 10, 1989, these warning devices shall have fail-safe characteristics. Open-beam configurations shall be provided with a readily discernible indication of:

(1) X-ray tube status (ON-OFF) located near the radiation source housing, if the primary beam is controlled in this manner; and/or

(2) Shutter status (OPEN-CLOSED) located near each port on the radiation source housing, if the primary beam is controlled in this manner.

C. Ports: Unused ports on radiation source housings shall be secured in the closed position in a manner which will prevent casual opening.

D. Labeling: All analytical x-ray equipment shall be labeled with a readily discernible sign or signs bearing the radiation symbol and the words:

(1) "CAUTION--HIGH INTENSITY X-RAY BEAM", or words having a similar intent on the x-ray source housing; and

(2) "CAUTION--RADIATION: THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED" or words having a similar intent, near any switch that energizes an x-ray tube if the radiation source is an x-ray tube; or

(3) "CAUTION--RADIOACTIVE MATERIAL", or words having a similar intent, on the source housing if the radiation source is a radionuclide.

E. Shutters: On open-beam configurations installed after March 10, 1989, each port on the radiation source housing shall be equipped with a shutter that cannot be opened unless a collimator or coupling has been connected to the port.

F. Warning Lights: A fail-safe, visible warning light labeled with the words "X-RAY ON", or words having a similar intent, shall be located:

(1) near any switch that energizes an x-ray tube and shall be illuminated only when the tube is energized; or

(2) in the case of a radioactive source, near any switch that opens a housing shutter, and shall be illuminated only when the shutter is open.

G. Radiation Source Housing: Each x-ray tube housing shall be so constructed that with all shutters closed the leakage radiation measured at a distance of 5 cm from its surface is not capable of producing a dose in excess of 2.5 mrem (25 μ Sv) in one hour at any specified tube rating. (If radioactive sources are used, corresponding dose limits shall not exceed 2.5 mrem (25 μ Sv) per hour.)

H. Generator Cabinet: Each x-ray generator shall be supplied with a protective cabinet which limits leakage radiation measured at a distance of 5 cm from its surface such that it is not capable of producing a dose in excess of 0.25 mrem (2.5 μ Sv) in one hour.

[5-3-95; 20.3.8.802 NMAC--Rn, 20 NMAC 3.1.8.802, Recompiled 11/27/01]

20.3.8.803 AREA REQUIREMENTS:

A. Radiation Levels: The local components of an analytical x-ray system shall be located and arranged and shall include sufficient shielding or access control such that no radiation levels exist in any area surrounding the local component group which could result in a dose to an individual present therein in excess of the dose limits given in Section 405 [20.3.4.405 NMAC] to Section 412 [20.3.4.412 NMAC]. For systems utilizing x-ray tubes, these levels shall be met at any specified tube rating.

B. Surveys: Radiation surveys, as required by Section 405 [20.3.4.405 NMAC] and Section 416 [20.3.4.416 NMAC] of these regulations, of all analytical x-ray systems sufficient to show compliance with Section 802.A [Subsection A of 20.3.8.802 NMAC] shall be performed:

(1) upon installation of the equipment and at intervals not to exceed 12 months thereafter;

(2) following any change in the initial arrangement, number, or type of local components in the system;

(3) following any maintenance requiring the disassembly or removal of a local component in the system;

(4) during the performance of maintenance and alignment procedures if the procedures require the presence of a primary x-ray beam when any local component in the system is disassembled or removed; and

(5) any time a visual inspection of the local components in the system reveals an abnormal condition; and

(6) whenever personnel monitoring devices show a significant increase over the previous monitoring period or the readings are approaching the radiation dose limits in Subpart 4 [20.3.4 NMAC].

C. Posting: Each area or room containing analytical x-ray equipment shall be conspicuously posted with a sign or signs bearing the radiation symbol and the words "CAUTION-- X-RAY EQUIPMENT." or words having a similar intent.

[5-3-95; 20.3.8.803 NMAC--Rn, 20 NMAC 3.1.8.803, Recompiled]

20.3.8.804 OPERATING REQUIREMENTS:

A. Procedures: Normal operating procedures shall be written and available to all analytical x-ray equipment workers. No person shall be permitted to operate analytical x-ray equipment in any manner other than that specified in the procedures unless such person has obtained written approval of the radiation safety officer.

B. Bypassing: No person shall bypass a safety device unless such person has obtained the approval of the radiation safety officer. When a safety device or interlock has been bypassed, a readily discernible sign bearing the words "SAFETY DEVICE NOT WORKING," or words having a similar intent, shall be placed on the radiation source housing.

[5-3-95; 20.3.8.804 NMAC--Rn, 20 NMAC 3.1.8.804, Recompiled 11/27/01]

20.3.8.805 PERSONNEL REQUIREMENTS:

A. Instructions: No person shall be permitted to operate or maintain analytical x-ray equipment unless such person has received instruction in and demonstrated competence as to:

(1) identification of radiation hazards associated with the use of the equipment;
(2) significance of the various radiation warning and safety devices incorporated into the equipment, or the reasons they have not been installed on certain pieces of equipment and the extra precautions required in such cases;

- (3) proper operating procedures for the equipment;
(4) recognition of symptoms of an acute localized exposure; and
(5) proper procedures for reporting an actual or suspected exposure.

B. Personnel Monitoring: Finger or wrist dosimeter devices shall be provided to and shall be used by:

(1) analytical x-ray equipment workers using systems having an open-beam configuration and not equipped with a safety device; and

(2) personnel maintaining analytical x-ray equipment if the maintenance procedures require the presence of a primary x-ray beam when any local component in the analytical x-ray system is disassembled or removed.

C. Reported dose values shall not be used for the purpose of determining compliance with Section 405 [20.3.4.405 NMAC] to Section 412 [20.3.4.412 NMAC] unless evaluated by a qualified expert.

[5-3-95; 20.3.8.808 NMAC--Rn, 20 NMAC 3.1.8.805, Recompiled 11/27/01]

20.3.8.809 to 20.3.8.899 [RESERVED]

HISTORY of 20.3.8 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 8, Radiation Safety Requirements for Analytical X-Ray Equipment, filed 06-17-99 recompiled as 20.3.8 NMAC, effective 11/27/01.