10A NCAC 15 .0502 is amended with changes as published in NCR 29:21, pp. 2437-2445, as follows:

10A NCAC 15 .0502 DEFINITIONS

~~(a) As used in this Section,~~ In addition to terms found in Rule .0104 of this [~~Chapter,~~] Chapter and 10 CFR 34.3, the following definitions shall ~~apply:~~ apply to this [~~Section:~~] Section. 10 CFR 34.3 is incorporated by reference to include subsequent amendments and editions, and can be accessed at: http://www.nrc.gov/reading-rm/doc-collections/cfr/part034/part034-0003.html at no cost:

~~(1) "Annual refresher safety training"~~ [~~training," as defined in 10 CFR 34.3,~~] ~~means a review conducted or provided by the licensee or registrant for its employees on radiation safety aspects of industrial radiography. The review may include, as appropriate,~~ [~~include~~] ~~the results of internal inspections, new procedures or equipment, new or revised regulations, accidents~~ [~~or accidents~~] ~~or errors that have been observed,~~ [~~observed.~~] ~~and shall~~ [~~The review shall~~] ~~also provide opportunities for employees to ask safety questions.~~

~~(2) "Associated equipment" means equipment used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides or comes in contact with the sealed source or radiation machines [e.g. guide tube, control tube, control (guide) tube, removable source stop, "J" tube and collimator when it is used as an exposure head].~~

~~(3) "Cabinet radiography using radiation machines" means industrial radiography using radiation machines, which is conducted in an enclosed, interlocked cabinet, such that the radiation machine will not operate unless all openings are securely closed, and which cabinet is so shielded that every location on the exterior meets conditions for an unrestricted area as specified in Rule .1611 of this Chapter.~~

~~(4)~~ [~~(3)~~] ~~"Certifying entity" means an independent certifying organization meeting the requirements in Rule .0525 of this Section.~~

~~(5)~~ [~~(4)~~] (1) "Collimator" means a radiation shield that is placed on the end of the guide tube or directly onto a radiographic exposure device to limit the size, shape, and direction of the primary radiation when the sealed source is cranked into ~~position,~~ position to make a radiographic exposure.

~~(6)~~ [~~(5)~~] (2) ~~"Control device",~~ "Control device," commonly called a crank-out, means the control cable, the protective ~~sheath~~ sheath, and control drive mechanism used to move the sealed source from the shielded position in the radiographic device or camera to an unshielded position outside the device for the purpose of making a radiographic exposure.

~~(7)~~ [~~(6)~~] ~~"Control drive mechanism" means a device that enables the source assembly to be moved to and from the exposure device.~~

~~(8)~~ [~~(7)~~] ~~"Control tube" means a protective sheath for guiding the control cable. The control tube connects the control device mechanism to the radiographic exposure device.~~

~~(9)~~ [~~(8)~~] ~~"Exposure head",~~ [~~"Exposure head,"~~] ~~commonly called a source stop, means a device that locates the gamma radiography sealed source in the selected working position.~~

~~(10)~~ [~~(9)~~] (3) "Field examination" means a practical examination.

~~(11)~~ [~~(10)~~] ~~"Field station" means a facility where licensed material or registered equipment may be stored or used and from which licensed material or registered equipment is dispatched.~~

~~(12)~~ [~~(11)~~] ~~"Guide tube" (Projection sheath)~~ [~~"Guide tube," commonly called a projection sheath,~~] ~~means a flexible or rigid tube (i.e., "J" tube) for guiding the source assembly and the attached control cable from the exposure device to the exposure head. The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head.~~

~~(13)~~ [~~(12)~~] ~~"Hands-on experience" means experience in all of those areas considered to be directly involved in the radiography process~~.

~~(14)~~ [~~(13)~~] (4) "Independent certifying organization" means an independent organization that meets all of the requirements of Rule .0525 of this Section.

~~(15)~~ [~~(14)~~] ~~"Industrial radiography" means the examination of the structure of materials by nondestructive methods utilizing ionizing radiation to make radiographic images.~~

~~(16)~~ [~~(15)~~] ~~"Lay barge radiography" means industrial radiography performed on any water vessel used for laying pipe.~~

~~(17)~~ [~~(16)~~] ~~"Off-shore platform radiography" means industrial radiography conducted from a platform over a body of water.~~

~~(18)~~ [~~(17)~~] (5) "Periodic training" means ~~a periodic review conducted or provided~~ instruction provided at least every 12 months by the licensee or registrant for ~~its employees~~ operators and individuals subject to the requirements of Rule .1003 of this Chapter on radiation safety aspects of radiography. The~~ review~~ topics shall include the results of internal inspections, new procedures or equipment, accidents or errors that have been observed, and opportunities for employees to ask safety questions.

~~(19)~~ [~~(18)~~] ~~"Permanent radiographic installation" means an enclosed shielded room, cell, or vault not located at a temporary job site in which radiography is performed.~~

~~(20)~~ [~~(19)~~] (6) ~~"Projection sheath",~~ "Projection sheath" means a guide tube.

~~(21)~~ [~~(20)~~] ~~"Practical examination" means a demonstration through practical application of the safety rules and principles in industrial radiography including the use of all appropriate equipment and procedures.~~

~~(22)~~ [~~(21)~~] (7) "Radiation safety officer" means an individual named by the licensee or registrant who has knowledge of and responsibility for the overall radiation safety program on behalf of the licensee or registrant and who meets the requirements of Rule .0510(h) of this Section.

~~(23)~~ [~~(22)~~] ~~"Radiographer" means any individual who performs or who, in attendance at the site where sources of radiation are being used, personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of these Rules and all license or registration conditions.~~

~~(24)~~ [~~(23)~~] ~~"Radiographer certification" means written approval received from~~ ~~a~~ [~~an independent~~] ~~certifying organization stating that an individual has satisfactorily met certain established radiation safety, testing, and experience criteria.~~

~~(25)~~ [~~(24)~~] ~~"Radiographer's assistant" means any individual who, under the direct supervision of a radiographer, uses radiographic exposure devices, sources of radiation, related handling tools, or survey instruments in industrial radiography.~~

~~(26)~~ [~~(25)~~] ~~"Radiographic exposure device",~~ [~~"Radiographic exposure device,"~~] ~~commonly called a camera or projector, means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure.~~

~~(27)~~ [~~(26)~~] ~~"Radiographic operations" means all activities associated with the presence of radioactive~~ [~~or x-ray~~] ~~sources in a radiographic exposure device during use of the device or transport (except when being transported by a common or contract transport),~~ ~~to include~~ [~~including~~] ~~surveys to confirm the adequacy of boundaries, setting up equipment and any activity inside restricted area boundaries.~~

~~(28)~~ [~~(27)~~] ~~"S-tube" means a tube through which the radioactive source travels when inside a radiographic exposure device.~~

~~(29)~~ [~~(28)~~] ~~"Sealed source" means any radioactive material that is encased in a capsule designed to prevent leakage or escape of the radioactive material.~~

~~(30)~~ [~~(29)~~] ~~"Shielded position" means the location within the radiographic exposure device or source changer where the sealed source is secured and restricted from movement. This position incorporates maximum shielding for the sealed source.~~

~~(31)~~ [~~(30)~~] ~~"Source assembly" means an assembly that consists of the sealed source and a connector that attaches the source to the control cable. The source assembly also includes the stop ball if one is used to secure the sealed source in the shielded position. The connector attaches to the control cable.~~

~~(32)~~ [~~(31)~~] ~~"Source changer" means a device designed and used for replacement of sealed sources in radiographic exposure devices, including those also used for transporting and storage of sealed sources.~~

~~(33)~~ [~~(32)~~] ~~"Storage~~ ~~area"~~ [~~area," as defined in 10 CFR 34.3,~~] ~~means any location, facility or vehicle which is used to store or secure a radiographic exposure device, a storage~~ ~~container~~ [~~container,~~] ~~or a sealed source when it is not in use and which is locked or has a physical barrier to prevent accidental exposure, tampering with or unauthorized removal of the device, storage container or sealed source.~~

~~(34)~~ [~~(33)~~] ~~"Storage container" means a device in which sealed sources are secured and stored.~~

~~(35)~~ [~~(34)~~] ~~"Temporary jobsite" means a~~ ~~location,~~ [~~location where~~] ~~radiographic operations are conducted and where licensed material may be stored other than those location(s) of use authorized on the license.~~

~~(36)~~ [~~(35)~~] ~~"Underwater radiography" means industrial radiography performed when the radiographic exposure device or related equipment are beneath the surface of the water.~~

~~(b) Other definitions applicable to this Section may be found in Rule .0104 of this Chapter.~~

History Note: *Filed as a Temporary Amendment Eff. August 20, 1994, for a period of 180 days or until the permanent rule becomes effective, whichever is sooner;*
Authority G.S. 104E-7; 10 CFR 34.3;
Eff. February 1, 1980;
Amended Eff. April 1, 1999; May 1, 1995; January 1, 1994; June 1, 1989;
Transferred and Recodified from 15A NCAC 11 .0502 Eff. February 1, ~~2015.~~ 2015;
Amended Eff. October 1, 2015.

10A NCAC 15 .0801 is amended with changes as published in NCR 29:21, pp. 2437-2445, as follows:

SECTION .0800 REQUIREMENTS FOR ~~ANALYTICAL X-RAY EQUIPMENT~~ NON-HUMAN USE OF RADIATION GENERATING DEVICES

10A NCAC 15 .0801 PURPOSE AND SCOPE

~~This Section provides special requirements for analytical x-ray equipment which are in addition to, and not in substitution for, applicable requirements in the other sections of this Chapter.~~

(a) This Section provides special requirements for use of ionizing radiation generating devices (RGDs) operating above five thousand electron volts (5 keV), but below one million electron volts (1 MeV) that are in addition [~~to, and not in substitution for, applicable~~] to requirements in the other sections of this Chapter.

(b) This Section does not pertain to radiation safety requirements for x-ray equipment that is covered in other sections of this Chapter [~~(e.g.,~~] (e.g., x-rays in the healing arts in Section .0600 of this Chapter, and particle accelerators in Section .0900 of this [~~Chapter.)~~] Chapter).

History Note: *Authority G.S. 104E-7;*
Eff. February 1, 1980;
Transferred and Recodified from 15A NCAC 11 .0801 Eff. February 1, ~~2015.~~ 2015;
Amended Eff. October 1, 2015.

10A NCAC 15 .0802 is amended with changes as published in NCR 29:21, pp. 2437-2445, as follows:

10A NCAC 15 .0802 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 housings, port and shutter assemblies, collimators, sample holders, cameras, goniometers, detectors and shielding. Remote components include power supplies, transformers, amplifiers, readout devices, and control panels.~~

~~(c) "Fail-safe characteristics" means 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) "Normal operating procedures" mean operating procedures for conditions suitable for analytical purposes with shielding and barriers in place. These do not include maintenance but do include routine alignment procedures. Routine and emergency radiation safety considerations are part of these procedures.~~

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

~~(f) "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.~~

[~~(a)~~] In addition to terms found in Rule .0104 of this Chapter the following definitions shall apply to this Section:

(1) "Accredited bomb squad" means a law enforcement agency utilizing certified bomb technicians.

(2) "Analytical RGD equipment" means equipment that uses electronic means to generate ionizing radiation for the purpose of examining the microstructure of materials, i.e. x-ray diffraction and x-ray spectroscopy.

(3) "Analytical RGD system" means a group of local and remote components utilizing x-rays to determine the elemental composition or to examine the microstructure of materials.

(4) "Bomb detection RGDs" means RGDs used [~~solely~~] for the sole purpose of remotely detecting explosive devices.

(5) "Certified bomb technician" means a member of an accredited bomb squad who has [~~successfully~~] completed the FBI Hazardous Devices School. Information pertaining to this program can be found on the school website at http://www.fbi.gov/about-us/cirg/hazardous-devices.

(6) "Certifiable cabinet x-ray system" means an existing uncertified RGD that has been modified to meet the certification requirements specified in 21 CFR 1020.40 as incorporated by reference in Rule .0117 of this Chapter.

(7) "Certified cabinet x-ray system" means an RGD utilized in an enclosed, interlocked cabinet, such that the radiation machine will not operate unless all openings are securely closed. These systems shall be certified in accordance with 21 CFR 1010.2 as incorporated by reference in Rule .0117 of

this Chapter, as being manufactured and assembled pursuant to the provisions of 21 CFR 1020.40 as incorporated by reference in Rule .0117 of this Chapter.

(8) "Collimator" means a device or mechanism by which the x-ray beam is restricted in size.

(9) "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.

(10) "Electron Beam Device" means any device using electrons below 1MeV to heat, [~~join~~] join, or otherwise irradiate materials.

(11) "Enclosed beam RGD" means an RGD with all possible x-ray beam paths [~~fully~~] contained in a chamber, coupled chambers, or other beam-path-confinement devices to prevent any part of the body from intercepting the beam during normal operations. Normal access to the primary beam path, such as a sample chamber door, shall be interlocked with the high voltage of the x-ray tube or the shutter for the beam to be considered "enclosed." An open-beam device placed in an interlocked enclosure is considered an "enclosed beam" unless there are provisions for routine bypassing of the interlocks.

(12) "Fail-safe characteristics" means a design feature that causes the radiation beam to terminate, port shutters to close, or otherwise prevents emergence of the primary beam, upon the failure of a safety or warning device. For example, if an "X-ray On" light indicator or shutter indicator or interlock fails, the radiation beam shall terminate.

(13) "Hand-held x-ray system" means any device or equipment that is portable and used for similar purposes as [~~analytical x-ray equipment.~~] analytical RGD equipment.

(14) "Hybrid gauge" means an x-ray gauge device utilizing both x-ray and radioactive sources.

(15) "Industrial radiography" means RGDs used to make radiographic images to examine the structure of materials by nondestructive methods. These RGDs [~~are not~~] shall not be contained in a cabinet and are not permanent installations.

(16) "Ion implantation equipment, low-energy" means any closed device operating below 1MeV used to accelerate elemental ions and implant them in other materials.

(17) "Leakage radiation" means radiation emanating from the source assembly housing except for:

(A) the primary beam;

(B) scatter radiation emanating from other components (e.g., shutter or collimator); and

(C) radiation produced when the beam on switch or timer is not activated.

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

(19) "Mobile RGD" means RGD equipment mounted on a permanent base with wheels or casters for moving while assembled.

(20) “Normal operating procedures" means step-by-step instructions necessary to accomplish a task. These procedures shall include sample insertion and manipulation, equipment alignment, routine maintenance by the registrant, and data recording [~~procedures,~~] procedures that are related to radiation safety.

(21) “Open-beam RGD” means a device or system designed in such a way that the primary beam is not completely enclosed during normal operation and used for analysis, [~~gauging~~] gauging, or imaging in which an individual could accidentally place some part of their body in the primary beam or stray radiation path during normal operation.

(22) “Permanent radiographic installation" means an RGD utilized in an enclosed shielded room, cell, or vault that allows entry when the RGD is not energized.

(23) “Portable RGD” means RGD equipment designed to be carried.

(24) “Primary beam" means radiation [~~which~~] that passes through an aperture of the source assembly housing by a direct path from the radiation source.

(25) “Radiation generating device (RGD)” means any system, device, subsystem, or machine component that may generate by electronic means x-rays or particle radiation above 5 keV, but below 1 MeV, and not used for healing arts on humans or animals. Examples of RGDs are the following:

(A) [~~analytical x-ray machines;~~] analytical RGD equipment;

(B) certified and certifiable cabinet x-ray systems;

(C) gauging devices using x-ray sources;

(D) hybrid gauging devices;

(E) e-beam welders;

(F) baggage scanners;

(G) industrial radiography RGDs; and

(H) permanent radiographic installations.

(26) "Remote components" means parts of an RGD x-ray system that are not struck by x-rays such as power supplies, transformers, amplifiers, readout devices, and control panels.

(27) “Scattered radiation” means radiation, other than leakage radiation, that during passage through matter, has been deviated in direction or has been modified by a decrease in energy.

(28) “Shutter” means an adjustable device, generally made of lead or other high atomic number material, fixed to a source assembly housing to intercept, [~~block~~] block, or collimate the primary beam.

(29) “Source” means the point of origin of the radiation, such as the focal spot of an x-ray tube.

(30) “Stationary RGD” means RGD equipment that is installed or placed in a fixed location.

(31) “Stray radiation” means the sum of leakage and scatter radiation emanating from the source assembly or other components except for the primary beam, and radiation produced when the beam on switch or timer is not activated.

(32) “X-ray generator” means the part of an x-ray system [~~which~~] that provides the accelerating (high) voltage and current for the x-ray tube.

(33) "X-ray gauge" means an x-ray producing device designed and manufactured for the purpose of detecting, measuring, gauging, or controlling thickness, density, level, or interface location of manufactured products.

History Note: *Authority G.S. 104E-7;*
Eff. February 1, 1980;
Transferred and Recodified from 15A NCAC 11 .0802 Eff. February 1, ~~2015.~~ 2015;
Amended Eff. October 1, 2015.

10A NCAC 15 .0803 is amended with changes as published in NCR 29:21, pp. 2437-2445, as follows:

10A NCAC 15 .0803 EQUIPMENT REQUIREMENTS

~~(a) A safety device which prevents the entry of any portion of an individual's body into the primary x-ray beam path of which causes the beam to be shut off upon entry into its path shall be provided on all open-beam configurations. A registrant or licensee may apply to the agency for an exemption from the requirement of a safety device. This application shall include:~~

~~(1) a description of the various safety devices that have been evaluated;~~

~~(2) the reason safety 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) 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~~

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

~~Warning devices shall be labeled so that their purpose is easily identified. On equipment installed after the effective date of this Rule, warning devices shall have fail-safe characteristics.~~

~~(c) Unused ports on radiation source housings shall be secured in the closed position in a manner which will prevent casual opening.~~

~~(d) 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", on the source housing, if the radiation source is a radionuclide.~~

~~(e) On open-beam configurations installed after the effective date of this Rule each port on the radiation source housing shall be equipped with a shutter that cannot be opened unless a collimator or a coupling has been connected to the port.~~

~~(f) An easily visible warning light labeled with the words "X-RAY ON" or words having a similar intent, shall be located outside each entrance into the room containing an analytical x-ray tube and shall be illuminated only when the tube is energized; or in the case of a radioactive source, shall be illuminated only when the shutter is open. On equipment installed after the effective date of this Rule, warning lights shall have fail-safe characteristics.~~

~~(g) Each x-ray tube housing shall be so constructed that when all shutters are closed the leakage radiation measured at a distance of five centimeters from its surface is not capable of producing a dose in excess of 2.5 mrem in one hour.~~

~~(h) Each x-ray generator shall be supplied with a protection cabinet which limits leakage radiation measured at a distance of five centimeters from its surface such that it is not capable of producing a dose in excess of 0.04 mrem in one hour.~~

(a) Certified cabinet x-ray systems shall meet the requirements of 21 CFR 1020.40 as incorporated by reference in Rule .0117 (a)(3) of this Chapter.

(b) All certified and certifiable cabinet x-ray systems shall:

(1) be constructed so that, the radiation emitted from the system shall not exceed an exposure of 0.5 milliroentgen (mR) in one hour at any point five centimeters outside the external surface; and

(2) have a fail-safe interlock that prevents irradiation when the cabinet, [~~chamber~~] chamber, or coupled chambers are open.

(c) Open-beam analytical RGD systems shall be equipped with a safety device [~~which~~] that prevents the entry of any portion of an individual's body into the primary x-ray beam path that causes the beam to be shut off upon entry into its path.

(d) Open-beam analytical RGDs shall be provided with a visible and legible indication of:

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

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

(e) Warning devices on open-beam analytical RGDs shall be labeled so that their purpose is [~~easily~~] identified. On open-beam analytical RGDs installed after February 1, 1980, warning devices and lights shall have fail-safe characteristics.

(f) Unused ports on radiation source housings for open-beam RGDs shall be secured in the closed position in a manner that will prevent unintended opening.

(g) Each port on the radiation source housing on open-beam analytical [~~RGDs,~~] RGDs installed after February 1, 1980 and designed to accommodate interchangeable [~~components,~~] components shall be equipped with a shutter that cannot be opened unless a collimator or a component coupling is connected to the port.

(h) Portable open-beam analytical RGDs that [~~are~~] shall be manufactured to be used hand-held without safety devices are exempt from the requirements of Paragraph (c) of this Rule and shall be constructed according to International Standard IEC 62495 that is incorporated by reference and includes subsequent amendments. This standard can be downloaded for one hundred twenty-one dollars ($121.00) at the following website: http://webstore.ansi.org/FindStandards.aspx?SearchString=IEC+62495+Ed.+1.0+en%3a2011&SearchOption=0&PageNum=0&SearchTermsArray=null%7cIEC+62495+Ed.+1.0+en%3a2011%7cnull.

(i) A registrant may apply to the [~~agency~~] agency, as defined in Rule .0104 of this Chapter, for an exemption from the requirement of a safety device. This request shall include:

(1) a description of the safety devices;

(2) the reason safety 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.

(j) Analytical RGDs shall be provided with a visible and legible label(s) bearing the radiation symbol and the words:

(1) "CAUTION - HIGH INTENSITY X-RAY BEAM," or words having a similar meaning, near the exit port to identify the location of the beam; and

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

(k) Warning lights labeled with the words "X-RAYS ON," or other words having similar meaning, shall be located:

(1) near any switch [~~which~~] that activates the high voltage to energize an x-ray tube; or

(2) in a conspicuous location near the radiation source housing and radiation beam(s) and visible from all instrument access areas.

(l) Warning lights shall activate when the x-ray tube is energized.

(m) Each x-ray tube housing shall be:

(1) constructed that when all shutters are closed the leakage radiation measured at a distance of five centimeters from its surface is not capable of producing an exposure in excess of 2.5 millirem (mrem)/ (25 microsieverts µSv) in one hour; and [~~if the tube housing is the primary shielding for the x-ray tube~~]

(2) if the tube housing is the primary shielding for the x-ray tube, does not produce x-rays when the housing is opened or disassembled.

(n) Each x-ray generator shall be supplied with a protection cabinet which limits leakage radiation measured at a distance of five centimeters from its surface such that it is not capable of producing an exposure in excess of 0.25 mrem/2.5µSv in one hour.

(o) [~~Industrial radiography RGDs and permanent radiographic installations~~] Permanent radiographic installations and industrial radiography RGDs shall comply with the requirements of Rule .0807 of this Section.

History Note: *Authority G.S. 104E-7;*
Eff. February 1, 1980;
Transferred and Recodified from 15A NCAC 11 .0803 Eff. February 1, ~~2015.~~ 2015;
Amended Eff. October 1, 2015.

10A NCAC 15 .0804 is amended with changes as published in NCR 29:21, pp. 2437-2445, as follows:

10A NCAC 15 .0804 AREA REQUIREMENTS

(a) The local components of ~~an analytical x-ray system~~ RGDs shall be ~~so located~~ located and arranged ~~and shall include~~ to include sufficient shielding or access control ~~that~~ to ensure no radiation levels exist in any area surrounding the local ~~component group which~~ components that could result in a dose to an individual present ~~therein~~ in excess of the dose limits given in Rule ~~.1611~~ .1611(a) of this Chapter. ~~For systems utilizing x-ray tubes, these levels shall be met at any specified tube rating~~. ~~A registrant or licensee may apply to the agency for an exemption from this requirement pursuant to Rule .0106(a) of this Chapter.~~

(b) ~~Surveys~~ Survey Requirements

(1) Radiation surveys, ~~as required by Rule .1613~~ as set forth in Rule .1613(a) and (b) of this Chapter, of all ~~analytical x-ray systems~~ RGDs sufficient to show compliance with Paragraph (a) of this Rule, shall be performed:

(A) ~~upon installation of the equipment;~~ within 30 days after initial operation of the device;

(B) prior to use following any change in the initial [arrangement,] [~~arrangement~~] including the number or type of local components in the system; and

(C) prior to use following any maintenance requiring the disassembly or removal of a local component in the system ~~which~~ that could affect the radiation exposure to ~~personnel;~~ personnel.

~~(D) radiation monitoring shall be performed during maintenance.~~

(2) ~~A licensee or~~ A registrant may apply to the agency for approval of procedures differing from those in Subparagraph (b)(1) of this Rule, provided that the ~~licensee or~~ registrant demonstrates satisfactory compliance with Paragraph (a) of this Rule.

(3) Surveys [~~must~~] shall be performed with a radiation survey instrument capable of the following:

(A) measuring the radiation energies of the system surveyed;

(B) confirming that the radiation limits of this Section are met; and

(C) calibrated according to the manufacture's recommended frequency or at least annually when a frequency is not recommended.

(c) Each area of use or room containing ~~analytical x-ray equipment~~ RGDs shall be conspicuously posted with ~~a sign or signs~~ caution signs in accordance with the requirements of Rule .1623 of this Chapter, bearing the radiation caution symbol and the words "CAUTION - X-RAY ~~EQUIPMENT",~~ EQUIPMENT," or words having a similar ~~intent.~~ meaning.

History Note: *Authority G.S. ~~104E-7;~~ 104E-7(a)(2);*
Eff. February 1, 1980;
Amended Eff. January 1, 1994;
Transferred and Recodified from 15A NCAC 11 .0804 Eff. February 1, ~~2015.~~ 2015;

Amended Eff. October 1, 2015.

10A NCAC 15 .0805 is amended with changes as published in NCR 29:21, pp. 2437-2445, as follows:

10A NCAC 15 .0805 OPERATING REQUIREMENTS

(a) RGDs shall be operated by individuals that have completed the training requirements of Rule .0806 of this Section.

~~(a)~~ (b) Normal operating procedures shall be written and available to all ~~analytical x-ray equipment workers.~~ RGD operators and support staff. ~~No person shall be permitted to operate analytical x-ray equipment in any manner other than that specified in the procedures unless the person has obtained written approval of the person responsible for radiation safety.~~

(c) No [~~person~~] individual shall be permitted to operate RGDs in any manner other than that specified in the operating procedures unless the person has obtained written approval of the [~~person~~] individual responsible for radiation safety, or Radiation Safety Officer (RSO) as defined in Rule .0104 of this Chapter.

~~(b)~~ (d) No ~~person~~ individual shall bypass a safety device unless the person has obtained the approval of the person responsible for radiation ~~safety.~~ safety or RSO. ~~Such approval shall be for a specified period of time.~~ This process shall be incorporated into the radiation protection [~~program,~~] program by the RSO, as set forth in Rule .1613(a), and the operating procedures as set forth in Rule .0603(a)(1)(B). The written [~~approval~~] approval, as granted by the RSO, shall include an expiration date. When a safety device has been bypassed, a ~~readily discernible~~ legible sign bearing the words "SAFETY DEVICE NOT ~~WORKING",~~ WORKING," or words having a similar ~~intent,~~ meaning shall be placed on the radiation source housing and the control panel during the ~~period such bypassing is in effect.~~ bypassing period.

(e) Prior to an individual modifying the:

(1) x-ray tube system, resulting in the removal of tube housings, covers, or shielding materials;

(2) shutters;

(3) collimators; or

(4) beam stops;

the individual shall determine the tube is off and will remain off until safe conditions have been restored.

(f) Safety devices including interlocks, shutters, and warning lights shall be tested for proper operation on all RGDs in operation once annually. Records of the testing shall be retained by the registrant for three years.

(g) Individuals shall not hold a sample or object being irradiated.

History Note: *Authority G.S. 104E-7; 104E-12;*
Eff. February 1, 1980;
Transferred and Recodified from 15A NCAC 11 .0805 Eff. February 1, ~~2015.~~ 2015;
Amended Eff. October 1, 2015.

10A NCAC 15 .0806 is amended with changes as published in NCR 29:21, pp. 2437-2445, as follows:

10A NCAC 15 .0806 PERSONNEL REQUIREMENTS

(a) ~~Instructions of personnel~~ Personnel operating or maintaining RGDs shall comply with the following:

(1) No person shall be permitted to operate or maintain ~~analytical x-ray equipment~~ RGDs unless the person has received ~~instruction in :~~ instruction in the operating and emergency procedures for the RGD and instruction that is in accordance with Rule .1003 of this Chapter.

~~(A) identification of possible radiation hazards and biological effects associated with the use of the equipment;~~

~~(B) 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 these cases;~~

~~(C) proper operating procedures for the equipment;~~

~~(D) appropriate use and limitations of dosimetric devices;~~

~~(E) proper procedures for reporting an actual or suspected exposure.~~

(2) Each ~~licensee or~~ registrant operating or maintaining RGDs shall maintain, for inspection by the agency, records of training ~~which demonstrate~~ that demonstrate the requirements of this Rule have been ~~met.~~ satisfied.

~~(b) Personnel monitoring or wrist dosimetric devices shall be provided to, and shall be used by:~~

(b) The registrant shall provide ring or wrist personnel monitoring equipment to:

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

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

History Note: *Authority G.S. 104E-7; 104E-11; 104E-12;*
Eff. February 1, 1980;
Transferred and Recodified from 15A NCAC 11 .0806 Eff. February 1, ~~2015.~~ 2015;
Amended Eff. October 1, 2015.

10A NCAC 15 .0807 is adopted as published in NCR 29:21, pp. 2437-2445, as follows:

10A NCAC 15 .0807 PERMANENT RADIOGRAPHIC INSTALLATIONS AND INDUSTRIAL RADIOGRAPHY RGDS

(a) Permanent radiographic installations and industrial radiography RGDs are exempt from the requirements of the rules of this Section except Rule .0802 and Rule .0804(a), (b)(1)(A), (b)(1)(C), (b)(2), and (b)(3).

(b) Permanent radiographic installations and industrial radiography RGDs shall comply with the following rules of this Chapter:

(1) .0501;
(2) .0502;
(3) .0506;
(4) .0509-.0520;
(5) .0522;
(6) .0523(a)(1);
(7) .0523(a)(3);
(8) .0523(a)(6) -.0523(a)(15);
(9) .0523(b)(1) -.0523(b)(4);
(10) .0523(b)(6) -.0523(b)(7);
(11) .0523(b)(9) -.0523(b)(12);
(12) .0523(c); and
(13) .0525.

History Note: *Authority G.S. 104E-7;*
Eff. October 1, 2015.