

25 TEXAS ADMINISTRATIVE CODE

§289.228

Radiation Safety Requirements for Industrial Radiation Machines

Texas Regulations for Control of Radiation

(revisions effective May 1, 2008 are show as **shaded** text)

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§289.228. **Radiation Safety Requirements for Industrial Radiation Machines.**

(a) Purpose. This section establishes requirements for the use of industrial radiation machines not otherwise covered by this chapter. For purposes of this section, industrial radiation machines include, but are not limited to, portable/handheld fluorescence x-ray (open beam), fluoroscopy hand held intensified, fluoroscopy x-ray, industrial accelerator, spectrography x-ray, flash x-ray, flash x-ray for bomb detection, educational facility (x-ray for non-human or not live animal use), diffraction x-ray, uncertified cabinet x-ray, and minimal threat radiation machines.

(b) Scope.

(1) The requirements of this section are in addition to and not in substitution for other applicable requirements of this chapter.

(2) In addition to the requirements of this section, all registrants, unless otherwise specified, are subject to the requirements of §289.203 of this title (relating to Notices, Instructions, and Reports to Workers; Inspections), §289.204 of this title (relating to Fees for Certificates of Registration, Radioactive Material Licenses, Emergency Planning and Implementation, and Other Regulatory Services), §289.205 of this title (relating to Hearing and Enforcement Procedures), §289.226 of this title (relating to Registration of Radiation Machine Use and Services), and §289.231 of this title (relating to General Provisions and Standards for Protection Against Machine-Produced Radiation).

(3) Radiation safety requirements and registration procedures for industrial radiography are specified in §289.255 of this title (relating to Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography).

(c) Definitions. The following words and terms, when used in this section, shall have the following meanings, unless the context clearly indicates otherwise.

(1) Fail-safe characteristics--Design features that cause beam port shutters to close, or otherwise prevent emergence of the primary beam, upon the failure of a safety or warning device.

(2) Local components--Parts of an x-ray system that 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.

(3) Minimal threat radiation machines--Minimal threat radiation machines include, but are not limited to, fluorescence x-ray (closed beam), gauges x-ray, certified cabinet x-ray, package x-ray, electron beam welding, particle size analyzer, ion-implant, and cathodoluminescence. In addition, minimal threat radiation machines are those radiation machines capable of generating or emitting fields of radiation that, during the operation of which:

(A) no deliberate exposure of an individual occurs;

(B) the radiation is not emitted in an open beam configuration; and

(C) no known physical injury to an individual has occurred.

(4) Open-beam configuration--A radiation machine in which an individual could accidentally place some part of his/her body in the primary beam path during normal operation.

(5) Primary beam--Ionizing radiation that passes through an aperture of the source housing by a direct path from the x-ray tube located in the radiation source housing.

(6) Safety device--A device that prevents the entry of any portion of an individual's body into the primary x-ray beam path or that causes the beam to be shut off upon entry into its path.

(7) X-ray system--A group of components utilizing x rays to determine the elemental composition or to examine the microstructure of materials.

(d) Exemptions.

(1) Uses of minimal threat radiation machines as specified in §289.231(1l)(3) of this title, are exempt from the requirements of subsections (e)(2)(B) and (C), (f)(3), and (g)(1) of this section.

(2) Uses of certified and certifiable cabinet x-ray systems are exempt from the requirements of subsection (f)(1) and (2) of this section. This exemption will apply only to those radiation machines that do not allow a person or body part to be exposed to the radiation beam.

(3) Uses of portable/handheld fluorescence x-ray (open beam) devices that are manufactured without safety devices are exempt from the requirements of subsection (e)(1)(A) of this section.

(e) Equipment requirements.

(1) Safety devices.

(A) A safety device shall be provided on all open-beam configurations.

(B) A registrant may apply to the agency for an exemption from the requirement of a safety device in accordance with §289.231 of this title. Any such request shall include:

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

(ii) the reason each of these devices cannot be used; and

(iii) 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.

(2) Warning devices.

(A) Open-beam configurations shall be provided with a visible indication of:

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

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

(B) The x-ray control shall provide visual indication whenever x rays are produced.

(C) Warning devices shall be labeled so that their purpose is easily identified and shall have fail-safe characteristics.

(3) Ports. Unused ports on radiation machine source housings shall be secured in the closed position in a manner that will prevent inadvertent opening.

(4) Labeling. Each registrant shall ensure that each radiation machine is labeled in a conspicuous manner to caution individuals that radiation is produced when it is energized. This label shall be affixed in a clearly visible location on the face of the control unit. If the radiation machine is not visible from the control unit, the radiation machine shall have a visible indication that it is energized.

(5) Shutters. On open-beam configurations, 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.

(6) Radiation source housing. Each x-ray tube housing shall be equipped with an interlock that shuts off the tube if it is removed from the radiation source housing or if the housing is disassembled.

(7) Generator cabinet. Each x-ray generator shall be supplied with a protective cabinet that limits leakage radiation measured at a distance of 5 centimeters from its surface such that it is not capable of producing a dose in excess of 0.5 millirem (5.0 microsieverts (μSv)) in any one hour.

(8) Certified and certifiable cabinet x-ray systems. Certified and certifiable cabinet x-ray systems, including those designed to allow admittance of individuals, shall:

(A) be maintained in compliance with Title 21, Code of Federal Regulations (CFR), §1020.40 and no modification shall be made to the system unless prior agency approval has been granted in accordance with §289.231(d) of this title; and

(B) comply with the following requirements.

(i) No registrant shall permit any individual to operate a cabinet x-ray system until the individual has received a copy of and instruction in the operating procedures for the unit.

(ii) Tests for proper operation of interlocks shall be conducted and recorded at intervals not to exceed 12 months.

(iii) The registrant shall perform an evaluation to determinate compliance with §289.231(o)(1)-(3) of this title and Title 21, CFR, §1020.40 at intervals not to exceed one year. The registrant shall ensure that radiation emitted 5 centimeters from the external surface of the cabinet x-ray system does not exceed 0.5 millirem (5.0 μSv) in any one hour.

(iv) Documentation of the requirements in clauses (i)-(iii) of this subparagraph shall be maintained by the registrant for 10 years for inspection by the agency.

(9) Package x-ray systems.

(A) The registrant shall perform an annual evaluation to ensure radiation emitted 5 centimeters from the external surface of the package x-ray system does not exceed 0.5 millirem (5.0 μSv) in any one hour.

(B) Tests for proper operation of interlocks shall be conducted and recorded at intervals not to exceed 12 months.

(C) Documentation of the requirements in subparagraphs (A) and (B) of this paragraph shall be maintained by the registrant for 10 years for inspection by the agency.

(f) Area requirements.

(1) Radiation levels. The local components of an 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 that could result in a dose to an individual present in the area in excess of the dose limits specified in §289.231 of this title.

(2) Surveys.

(A) Radiation surveys, as required by §289.231 of this title, of all radiation machines and x-ray systems sufficient to show compliance with paragraph (1) of this subsection shall be performed:

(i) upon installation of the equipment;

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

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

(iv) 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;

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

(vi) whenever individual monitoring devices show a significant increase over the previous monitoring period or the readings are approaching the radiation dose limits.

(B) Radiation survey measurements shall not be required if a registrant can demonstrate, to the satisfaction of the agency, compliance with paragraph (1) of this subsection in some other manner.

(3) Posting. Each area or room containing radiation machines 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.

(g) Operating requirements.

(1) Procedures. Operating and safety procedures shall be written and made available to all radiation machine operators. No person shall be permitted to operate radiation machines in any manner other than that specified in the procedures unless that person has obtained written approval of the radiation safety officer.

(2) Bypassing. No person shall bypass a safety device unless that person has obtained the approval of the radiation safety officer. When a safety device has been bypassed, a visible sign bearing the words "SAFETY DEVICE NOT WORKING," or words having a similar intent, shall be placed on the radiation source housing.

(3) Repair or modification of radiation machines. Except as specified in paragraph (2) of this subsection, no operation involving removal of covers, shielding materials, or tube housings, or modifications to shutters, collimators, or beam stops shall be performed without ensuring that the tube is off and will remain off until safe conditions have been restored. The main switch, rather than interlocks, shall be used for routine shutdown in preparation for repairs.

(h) Personnel requirements.

(1) Instructions. No person shall be permitted to operate or maintain radiation machines unless such person has received instruction in and demonstrated competence in the following:

(A) identification of radiation hazards associated with the use of the radiation machine;

(B) radiation warning and safety devices incorporated into the radiation machine, or the reasons they have not been installed on certain pieces of equipment and the extra precautions required in such cases;

(C) operating and safety procedures for the radiation machine; **and**

(D) proper procedures for reporting an actual or suspected exposure in excess of the limits specified in §289.231 of this title.

(2) Instructions for bomb detection radiation machines. All personnel operating bomb detection radiation machines shall be trained in the set-up and operation of the radiation machine and in establishing a restricted area.

(3) Individual monitoring. In addition to the requirements of §289.231(n)(1)(A) of this title, finger dosimetric devices shall be provided to and shall be used by:

(A) radiation machine workers using systems having an open-beam configuration and not equipped with a safety device; and

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

(4) Records and documentation. Documentation of the requirements in paragraphs (1) - (3) of this subsection shall be maintained by the registrant for 10 years for inspection by the agency. In addition to complying with the requirements of this paragraph, records of individual monitoring results shall be maintained by the registrant in accordance with §289.231(dd) of this title.