

3701:1-68-04 Industrial analytical radiation-generating equipment.

In addition to the applicable rules in Chapter 3701:1-38 and Chapter 3701:1-68 of the Administrative Code, handlers of industrial analytical radiation-generating equipment shall comply with the following:

- (A) Industrial analytical radiation-generating equipment shall meet the following equipment standards:
- (1) Open beam configurations shall have a device or an automatic shut-off feature that prevents any part of a person's body from being exposed to the primary x-ray beam path.
 - (2) Open-beam configurations and all other equipment installed after February 10, 2006, shall be provided with a readily visible warning light labeled with the words "X-RAY ON" or symbols having a similar intent, and be located near the x-ray source and its controls and be illuminated when the x-ray source is energized. In addition, open beam configurations shall be provided with a readily discernible indication of:
 - (a) X-ray source power "on-off" status located near the radiation source housing, if the primary beam is controlled in this manner; or
 - (b) Shutter "open-closed" status located near each radiation port on the source housing, if the primary beam is controlled in this manner.
 - (3) Except for gauging units, open-beam systems installed after February 10, 2006, shall have warning devices, or a system of warning devices, such as redundant lights with fail-safe characteristics.
 - (4) All analytical radiation-generating equipment shall conspicuously display a clearly legible label or labels bearing the radiation symbol and the words "CAUTION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED" or appropriate words having a similar intent, near any switch or control that directly energizes the unit. Analytical radiation-generating equipment with open-beam configurations shall have an additional warning label on or near the x-ray housing with the radiation symbol with the words "CAUTION - HIGH INTENSITY X-RAY BEAM" or appropriate words having a similar intent.
 - (5) Each radiation source housing shall be equipped with an interlock that shuts off the radiation beam before the source is removed from the radiation source housing or before the housing is disassembled. For each radiation source installed prior to the effective date of this rule and not equipped with an interlock, administrative controls shall be instituted to include that the power shall be disconnected before any disassembly.
 - (6) Unused radiation ports on radiation source housings shall be secured in the closed position, or mechanically blocked.
 - (7) All industrial analytical radiation-generating equipment other than open beam shall be supplied with a protective 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 2.5 microsievert (0.25 millirem) in one hour.

- (B) Handlers of industrial analytical radiation-generating equipment shall comply with the following radiation safety requirements:
- (1) The facility's individual responsible for radiation protection (IRRP) shall document and implement operating procedures relative to radiation safety. The IRRP shall be qualified in accordance with paragraph (B)(13) of rule 3701:1-68-01 of the Administrative Code and paragraph (C)(4) of this rule. The IRRP shall assure and document that all operators of industrial analytical radiation-generating equipment have received appropriate training. No individual shall be permitted to operate industrial analytical radiation-generating equipment in any manner other than that specified in the procedures unless such individual has obtained written approval of the IRRP.
 - (2) Any temporary alteration to safety devices, such as by-passing interlocks or removing shielding shall be:
 - (a) Documented and maintained for inspection for a minimum of three years. This record shall contain such information as date the alteration was made, type of alteration, length of time alteration remained in place, and signature of the individual who made the alteration and the individual who restored the safety device to the original condition; and
 - (b) Approved, and signed in advance for a specified period of time by the individual responsible for radiation protection, and posted near the radiation-generating source housing with the signatures of approval.
 - (3) Except as specified in paragraph (B)(2) of this rule, no operation involving removal of covers, shielding materials or radiation source housings or modifications to shutters, collimators, or beam stops shall be performed without ascertaining that the radiation source is off and will remain off until safe conditions have been restored. The radiation source power switch, in conjunction with appropriate interlocks, shall be used for routine shutdown in preparation for repairs.
 - (4) Industrial analytical radiation-generating equipment shall not be used to intentionally irradiate human beings.
- (C) In addition to the requirements in rule 3701:1-68-02 of the Administrative Code, handlers of industrial analytical radiation-generating equipment shall comply with the following quality assurance requirements:
- (1) The local components of an industrial analytical radiation-generating system shall be located, arranged, and 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 Chapter 3701:1-38 of the Administrative Code. These levels shall be met at any specified radiation source rating.
 - (2) Radiation surveys of all industrial analytical radiation-generating systems shall be performed in compliance with the rules of Chapter 3701:1-38 of the Administrative Code:
 - (a) Upon installation of the radiation-generating equipment;
 - (b) Following any change in the initial arrangement, number, or type of local

components in the system;

- (c) Following any maintenance requiring the disassembly or removal of a local component in the system;
 - (d) 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;
 - (e) Any time a visual inspection of the local components in the system reveals an abnormal condition; and
 - (f) Whenever personnel monitoring reports show an unexplained increase over the previous monitoring period or the readings are approaching the limits specified in rules adopted pursuant to Chapter 3701:1-38 of the Administrative Code.
- (3) Proper operation of all radiation safety devices, such as interlocks, lights and labels, shall be checked at least every six months by individuals qualified according to paragraph (C)(4) of this rule. Documentation shall be maintained and available for inspection for a minimum of three years and shall include any corrective actions taken.
- (4) No individual shall be permitted to operate or maintain industrial analytical radiation-generating equipment unless that individual has received training and demonstrated competence regarding the following:
- (a) Identification of radiation hazards associated with the use of the equipment;
 - (b) Significance of the various radiation warning, safety devices, and interlocks 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;
 - (c) Standard operating procedures for the equipment;
 - (d) Recognition of symptoms of an acute localized exposure;
 - (e) Proper procedures for reporting an actual or suspected exposure in accordance with in rule 3701:1-38-21 of the Administrative Code.
- The individual responsible for radiation protection shall verify and document compliance with this paragraph and maintain and make the documentation available for inspection for a minimum of three years.
- (5) Finger or wrist radiation monitoring devices shall be provided to and shall be used by:
- (a) Industrial analytical radiation-generating equipment workers using systems having an open-beam configuration without provisions for engineering controls as provided in paragraph (A)(1) of this rule; and
 - (b) Personnel maintaining industrial analytical radiation-generating equipment if the maintenance procedures require the presence of an external radiation beam when any local component in the industrial analytical

radiation-generating system is disassembled or removed.

- (D) Handlers of electron microscopes and photoelectron spectrometers shall be exempt from the requirements of paragraphs (C)(2)(b) to (C)(2)(f), paragraph (C)(3), paragraphs (C)(4)(a) to (C)(4)(b), and paragraphs (C)(4)(d) to (C)(4)(e) of this rule.
- (E) Handlers of gauging units shall be exempt from the requirements of paragraphs (C)(2)(c) to (C)(2)(e) of this rule.
- (F) Handlers of hand-held open beam analyzer systems shall:
 - (1) Be exempt from the requirements of paragraphs (A)(1) and (A)(3) of this rule;
 - (2) Require the IRRP to document and implement safe operating procedures to include, but not be limited to:
 - (a) Using specific administrative controls to prevent unauthorized access or use of the system;
 - (b) Assuring that the system remains in direct control of the authorized operator;
 - (c) Prohibiting individuals from holding a sample in their hand during irradiation;
 - (d) Operating of software, trigger locks and proximity sensors;
 - (e) Using analyzer stands when the sample fits or when the part does not completely cover the beam port;
 - (f) Taking precautions during irradiation to prevent exposure of the operator or other individuals;
 - (g) Establishing and maintaining a restricted area of at least three feet opposite the side of the sample being exposed;
 - (h) Having alternative engineering and administrative safety controls that effectively prevent personnel exposure to the primary beam; and
 - (i) Requiring operators to wear assigned ring badges on the hand closest to the beam port; and
 - (3) Assure that the IRRP documents and implements radiation safety training to each operator before operating the equipment, and annually thereafter, audits the operators to assure competency in all safety procedures and standard operating procedures.
- (G) The director may, upon application thereof or upon his or her own initiative, grant a variance to the requirements of this rule as he or she determines is authorized by law, provided that the registrant shows to the satisfaction of the director that there is good cause for the variance, and that the variance will not result in any undue hazard or effect on the public health and safety or environment. The terms, conditions, and expiration of the variance shall be set forth in writing by the director. Failure to comply with the terms of the variance may result in immediate revocation of the variance.

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