

**3701:1-68-03 Industrial radiography and irradiation devices.**

In addition to the applicable rules in Chapter 3701:1-38 and Chapter 3701:1-68 of the Administrative Code, handlers of industrial radiography and irradiation devices shall comply with the following:

- (A) Radiation-generating equipment used for industrial radiography or irradiation shall meet the following equipment standards:
  - (1) A lock designed to prevent unauthorized or accidental production of ionizing radiation shall be provided.
  - (2) Permanent installations having a high radiation area shall be equipped with the following:
    - (a) Failsafe interlock at each entrance used for personnel access to the high radiation area;
    - (b) A visible signal that is activated when radiation is produced; and
    - (c) An audible signal that is activated when an attempt is made to enter the high radiation area while radiation is being produced.
  - (3) A readily visible warning light, labeled with the words "X-RAY ON" or words or symbols having a similar intent, shall be located on or near the source of radiation and its controls and shall be illuminated when the radiation source is energized;
  - (4) All industrial radiography and irradiation devices shall be labeled with a readily discernible sign or signs bearing the radiation symbol and the words:
    - (a) "CAUTION - HIGH INTENSITY X-RAY BEAM", or appropriate words having a similar intent, on or near the housing of the source of radiation; and
    - (b) "CAUTION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED", or appropriate words having a similar intent, near any switch or control that directly energizes the unit.
- (B) In addition to paragraph (A) of this rule, handlers shall comply with the following radiation safety requirements:
  - (1) A physical inventory of all industrial radiography and irradiation devices shall be conducted each calendar quarter. Records of the inventories shall be maintained between inspections and shall include:
    - (a) The number and type;
    - (b) The location;
    - (c) The date of the inventory;
    - (d) The name of the individual making the inventory; and
    - (e) The manufacturer, model number, and the serial number.

- (2) Industrial radiography equipment and irradiation devices shall be kept locked at all times, to prevent tampering or removal by unauthorized personnel, except when under the direct surveillance of a industrial radiographer or industrial radiographer assistant, or as may be otherwise authorized pursuant to this rule.
- (3) Sufficient calibrated and operable radiation survey instruments shall be maintained to make physical radiation surveys as required by this rule and rule 3701:1-38-14 of the Administrative Code.
  - (a) Instrumentation required by this rule shall have a range such that 0.02 millisievert (two millirem) per hour through 0.01 sievert (one rem) per hour can be measured.
  - (b) Radiation survey instruments shall be calibrated:
    - (i) For the type of radiation to be monitored;
    - (ii) At intervals not to exceed six months and after each instrument servicing other than battery replacement;
    - (iii) Such that accuracy within plus or minus twenty per cent can be demonstrated;
    - (iv) At two points located approximately one third and two thirds of full-scale on each scale for linear scale instruments;
    - (v) At midrange of each decade, and at two points of at least one decade for logarithmic scale instruments; and
    - (vi) At appropriate points for digital instruments.
- (4) The following items shall be supplied to each location where industrial radiography or irradiation operations are performed:
  - (a) At least one operable, calibrated survey instrument;
  - (b) A current whole body personnel dosimeter assigned to each radiation worker;
  - (c) An operable, calibrated direct reading dosimeter with a range of zero to two millisieverts (two hundred millirem), or an appropriate electronic dosimeter, for each radiation worker; and
  - (d) Appropriate barriers, such as ropes, tapes, and signs.
- (5) A utilization log shall be maintained between inspections showing the following information for each piece of industrial radiography equipment used:
  - (a) At temporary job sites:
    - (i) Manufacturer, model number, and serial number;
    - (ii) Locations and dates of use;
    - (iii) Results of radiation surveys as required by this rule and rule 3701:1-38-14 of the Administrative Code;

- (iv) Dates that each piece of industrial radiography equipment is removed from storage and returned to storage;
  - (v) Operating kilovoltage, tube current, and exposure time for each radiographic exposure; and
  - (vi) Identity and signature of the industrial radiographer to whom the equipment was assigned.
- (b) At permanent radiographic installations:
- (i) Manufacturer, model number, and serial number;
  - (ii) Dates each industrial radiography device is energized;
  - (iii) Results of radiation surveys as required by this rule and rule 3701:1-38-14 of the Administrative Code;
  - (iv) Dates that each piece of industrial radiography equipment is removed from storage and returned to storage;
  - (v) Operating kilovoltage, tube current, and exposure time for each radiographic exposure; and
  - (vi) Identity and signature of the industrial radiographer.
- (6) Operating and emergency procedures shall include instructions in at least the following:
- (a) Handling and use of industrial radiography or irradiation equipment to be employed such that no individual is likely to be exposed to radiation doses in excess of the limits established in rules 3701:1-38-12 and 3701:1-38-13 of the Administrative Code;
  - (b) Methods and occasions for conducting radiation surveys;
  - (c) Methods for controlling access to radiation areas;
  - (d) Methods and occasions for locking and securing industrial radiography and irradiation devices;
  - (e) Personnel monitoring and the use of personnel monitoring equipment, including all steps that must be taken immediately by monitored personnel in the event a dosimeter is found to be off scale or beyond its range.
  - (f) If appropriate, security and control of industrial radiography equipment during transportation to field locations;
  - (g) Minimizing additional exposure of individuals in the event of an accident;
  - (h) The procedure for notifying proper personnel in the event of an accident;
  - (i) Maintenance of records; and
  - (j) The inspection and maintenance of industrial radiography and irradiation devices.

- (7) If the provisions set forth in this rule or any other applicable equipment requirements of Chapter 3701:1-68 of the Administrative Code are not met, the industrial radiography and irradiation devices shall not be operated.
- (8) Industrial radiography and irradiation devices shall not be used to intentionally irradiate human beings for any purpose.
- (9) At least two qualified individuals shall be present at temporary job sites when industrial radiography equipment is being used. At least one of the individuals shall be the industrial radiographer to whom the industrial radiography equipment is assigned and the other individual shall be either an industrial radiographer or an industrial radiographer assistant.
- (10) No individual other than an industrial radiographer or an industrial radiographer assistant who is under the personal supervision of an industrial radiographer shall manipulate controls or operate equipment used in radiographic operations. The personal supervision must include:
  - (a) The industrial radiographer's physical presence at the site where the industrial radiography equipment is being used;
  - (b) The availability of the industrial radiographer to give immediate assistance if required; and
  - (c) The industrial radiographer's direct observation of the industrial radiographer assistant's performance of the operations referred to in this rule.
- (11) The handler shall not permit any individual to act as an industrial radiographer or as an industrial radiographer assistant unless, at all times during radiographic operations, each such individual wears an appropriate direct reading dosimeter and a personnel dosimeter. Pocket dosimeters shall have a range from zero to two millisieverts (two hundred millirem) and analog dosimeters shall be recharged at the start of each shift. Electronic dosimeters shall be battery-tested at the beginning of each shift. Each personnel dosimeter shall be assigned to and worn by only one individual and the handler shall assure that:
  - (a) Direct reading dosimeters are read and exposures are recorded at the beginning and end of each shift. These records shall be maintained between inspections;
  - (b) Direct reading dosimeters are checked for correct response to radiation at periods not to exceed twelve months. Acceptable dosimeters shall read within plus or minus twenty per cent of the true radiation exposure. Records of this check shall be maintained between inspections;
  - (c) If an individual's pocket dosimeter is found to be off-scale, or the electronic personnel dosimeter reads greater than two millisieverts (two hundred mrem), the individual's personnel dosimeter must be sent for processing within twenty-four hours. In addition, the individual may not resume work associated with the use of sources of radiation until a determination of the individual's radiation exposure has been made. This determination must be made by the individual responsible for radiation protection (IRRP) or the IRRP's designee. The results of this determination must be documented and maintained until the department terminates the registration.

- (d) Dosimetry reports received from the accredited National Voluntary Laboratory Accreditation Program (NVLAP) personnel dosimeter processor are kept for review during inspection in accordance with rule 3701:1-38-20 of the Administrative Code;
  - (e) If a personnel dosimeter is lost or damaged, the worker shall cease work immediately until a replacement personnel dosimeter is provided and the exposure is calculated for the time period from issuance to loss or damage of the personnel dosimeter. This calculation must be made by the IRRP or the IRRP's designee. The results of the calculated exposure and the time period for which the personnel dosimeter was lost or damaged must be included in the records maintained until the department terminates the registration;
  - (f) Personnel dosimeters shall be exchanged monthly unless the IRRP has performed an evaluation that indicates a longer frequency is adequate. Under no circumstances shall the frequency exceed three months. Documentation of the evaluation shall be maintained for inspection.
  - (g) After replacement, each personnel dosimeter must be returned to the supplier for processing within fourteen calendar days of the end of the monitoring period, or as soon as practicable. In circumstances that make it impossible to return each personnel dosimeter in fourteen calendar days, such circumstances must be documented and available for review by the department.
- (12) No radiographic operation shall be conducted unless calibrated and operable radiation survey instrumentation is available and used at each site where radiographic exposures are made.
- (13) A physical radiation survey shall be made after each radiographic exposure to verify that the radiation-generating device is not still producing radiation.
- (14) Records shall be kept of the surveys in accordance with paragraph (C) of rule 3701:1-38-20 of the Administrative Code.
- (15) During each radiographic operation, the industrial radiographer or industrial radiographer assistant shall maintain surveillance of the operation to protect against unauthorized entry into a high radiation area, except:
- (a) When the high radiation area is equipped with a control device or alarm system as described in paragraph (A)(2) of this rule; or
  - (b) When the high radiation area is locked to protect against unauthorized or accidental entry.
- (16) When performing radiographic operations at a location other than a permanent radiographic installation having the control devices specified in paragraph (B)(15) of this rule, the industrial radiographer shall be responsible for:
- (a) Posting signs bearing the radiation symbol and the words "CAUTION HIGH RADIATION AREA" at the perimeter of the calculated high radiation area;
  - (b) Restricting access and posting signs bearing the radiation symbol and the words "CAUTION RADIATION AREA" at the perimeter of the restricted area;

and

- (c) Maintaining constant visual surveillance of the restricted area boundary to prevent access by unauthorized personnel.
- (17) Radiographic operations shall not be performed if any of the items in paragraph (B)(4) of this rule are not available at the jobsite or are inoperable.
- (C) In addition to the requirements listed in rule 3701:1-68-02 of the Administrative Code, handlers shall comply with the following quality assurance requirements:
- (1) Radiation survey instrumentation described in paragraph (B)(3) of this rule shall be checked at the beginning of each day of use and at the beginning of each work shift using check sources or other appropriate means to ensure it is operating accurately.
  - (2) Industrial radiography and irradiation devices shall be checked prior to each day or shift of use to identify any obvious defects. If any check conducted reveals damage to components critical to radiation safety, the device shall be locked out and tagged until repairs have been made.
  - (3) Entrance control devices and alarm systems described in paragraph (A)(2) of this rule, shall be tested at the beginning of each day of equipment use for proper operation. If an entrance control device or an alarm system is operating improperly, it shall be immediately labeled as defective and repaired or replaced within seven calendar days. The facility may continue operations during this seven-day period, provided the handler implements the continuous surveillance requirements of this rule. Records of these tests shall be maintained between inspections from the date of the event.
  - (4) Industrial radiography and irradiation devices shall be evaluated every three months, not to exceed fourteen weeks, to assure proper functioning of components important to safety unless the radiation-generating equipment has been locked out and tagged "DO NOT USE" and is under the administrative control of the IRRP. All appropriate parts shall be maintained in accordance with the manufacturer's specifications. Records of evaluations shall be maintained between inspections.
  - (5) The following documents and records shall be available for inspection at each temporary jobsite where industrial radiography is being performed:
    - (a) Appropriate certificate of registration;
    - (b) Operating and emergency procedures;
    - (c) Copies of applicable rules adopted pursuant to Chapter 3748. of the Revised Code;
    - (d) Records of surveys required pursuant to this rule and rule 3701:1-38-14 of the Administrative Code for the period of operation at the site;
    - (e) Daily dosimeter records for the period of operation at the site; and
    - (f) The latest instrument calibration records for specific devices in use at the site. Acceptable records include tags or labels which are affixed to the

device or survey meter.

- (D) The IRRP for industrial radiography shall ensure that radiation safety activities are being performed in accordance with approved procedures and regulatory requirements in the daily operation of the registrant's program.
- (1) The minimum qualifications, training, and experience for IRRPs for industrial radiography are as follows:
    - (a) Completion of the training and testing requirements of paragraph (E) of this rule;
    - (b) Two thousand hours of hands-on experience as a qualified radiographer in industrial radiographic operations; and
    - (c) Formal training in the establishment and maintenance of a radiation protection program.
  - (2) The department will consider alternatives to paragraph (D)(1) of this rule when the IRRP for industrial radiography has appropriate training and/or experience in the field of ionizing radiation, and in addition, has adequate formal training with respect to the establishment and maintenance of a radiation safety protection program.
  - (3) The specific duties and authorities of the IRRP for industrial radiography include, but are not limited to:
    - (a) Establishing and overseeing all operating, emergency, and ALARA procedures as required by Chapter 3701:1-38 of the Administrative Code, and reviewing them regularly to ensure that the procedures in use conform to current regulatory requirements, and to the registration conditions.
    - (b) Overseeing and approving all phases of the training program for radiographic personnel, ensuring that appropriate and effective radiation protection practices are taught;
    - (c) Ensuring that required radiation surveys are performed and documented in accordance with the regulations, including any corrective measures when levels of radiation exceed established limits;
    - (d) Ensuring that personnel monitoring devices are calibrated and used properly by occupationally-exposed personnel, that records are kept of the monitoring results, and that timely notifications are made as required by paragraph (C) of rule 3701:1-38-21 of the Administrative Code; and
    - (e) Ensuring that operations are conducted safely and to assume control for instituting corrective actions including stopping of operations when necessary.
- (E) No individual shall act as an industrial radiographer or industrial radiographer assistant unless such individual has received copies of, been instructed in, and has demonstrated understanding and competency in the subjects identified in this paragraph. Training provided to qualify as industrial radiographers and industrial radiographer assistants shall be presented on a formal basis. This training shall include following subjects:

- (1) Fundamentals of radiation safety;
    - (a) Characteristics of radiation;
    - (b) Units of radiation dose;
    - (c) Significance of radiation dose;
      - (i) Radiation protection standards;
      - (ii) Biological effects of radiation; and
      - (iii) Case histories of radiography accidents;
    - (d) Levels of radiation from sources of radiation; and
    - (e) Methods of controlling radiation dose;
      - (i) Working time;
      - (ii) Working distance; and
      - (iii) Shielding.
  - (2) Radiation detection instrumentation to be used;
    - (a) Use of radiation survey instruments;
      - (i) Operation;
      - (ii) Calibration; and
      - (iii) Limitations;
    - (b) Survey techniques; and
    - (c) Use of personnel monitoring equipment;
  - (3) Applicable requirements of federal and state regulations;
  - (4) Registrant's written operating and emergency procedures; and
  - (5) Radiographic equipment to be used;
    - (a) Operation and control of x-ray equipment;
    - (b) Handling equipment; and
    - (c) Collimators.
- (F) Handlers shall assure that personnel performing industrial radiography meet the following requirements.
- (1) Industrial radiographers shall be certified through an independent program approved by the United States nuclear regulatory commission, the "Conference of Radiation Control Program Directors Inc.," or equivalent certification approved by the director in accordance with the requirements in the appendix to

this rule.

- (2) Each industrial radiographer at a job site shall have on his or her person a valid certification identification card issued by the independent program reference in paragraph (F)(1) of this rule.
  - (3) Prior to any individual acting as an industrial radiographer, he or she shall demonstrate two months of prior on-the-job experience.
  - (4) Prior to an individual acting as an industrial radiographer assistant, he or she shall demonstrate competence in the training subjects identified in paragraph (E) of this rule.
- (G) Handlers shall assure that the following requirements are met regarding the individuals operating the industrial radiography equipment:
- (1) Each industrial radiographer and industrial radiographer assistant shall be audited at intervals not to exceed six months by the registrant's IRRP to ensure that the registrant's operating procedures are followed;
  - (2) The handler shall provide refresher safety training for each industrial radiographer and industrial radiographer assistant at intervals not to exceed twelve months. The training shall include, as a minimum, any results of internal inspections, new procedures or equipment, new or revised regulations, and accidents or errors that have been observed. The review shall also provide opportunities for employees to ask safety questions.
  - (3) Records of internal audits shall be maintained between inspections from the date of the audit; and
  - (4) Records of each industrial radiographer and industrial radiographer assistant training, including certificates of successful completion, oral, written, and practical examinations, and refresher training shall be maintained until termination of an individual's employment or the next inspection, whichever period is longer.
- (H) Handlers utilizing a cabinet x-ray system shall ensure the following:
- (1) A cabinet x-ray system that is large enough to walk into, shall:
    - (a) Comply with all applicable requirements of this rule; and
    - (b) Be evaluated with at least one operable calibrated survey instrument at intervals not to exceed twelve months. Records of these evaluations shall be maintained between inspections.
  - (2) A cabinet x-ray system that is not large enough to walk into and designed to exclude all personnel, including extremities, from the interior of the cabinet during the generation of radiation, is exempt from the requirements of paragraphs (A) to (H)(1) of this rule, except that:
    - (a) No handler shall permit any individual to operate a cabinet x-ray system until such individual has received a copy of, and instruction in, the operating procedures for the equipment and has demonstrated competence in its use. Records which demonstrate compliance with this paragraph shall be

maintained between inspections; and

- (b) Tests for proper operation of high radiation area control devices, interlocks, warning lights, and labels specified in paragraphs (A)(2) to (A)(4) of this rule, where applicable, shall be conducted, recorded, and maintained in accordance with paragraph (C)(4) of this rule.
- (3) The handler shall perform an evaluation, at intervals not to exceed twelve months, to determine compliance with rules adopted pursuant to Chapter 3748. of the Revised Code. Records of these evaluations shall be maintained between inspections.
- (4) A certified enclosed system shall be maintained in compliance with requirement in 21 C.F.R. 1020.40 (as published in the April 1, 2007 Code of Federal Regulations) and the handler shall maintain documentation of compliance between inspections.
- (5) Radiation emitted from the cabinet x-ray system shall not exceed a dose equivalent of five microsieverts (0.5 millirem) in one hour at any point five centimeters outside the external surface.
- (I) 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.
- (J) Handlers of industrial radiation-generating equipment used for bomb detection purposes shall be exempt from paragraphs (B)(1), (B)(3), (B)(4)(b), (B)(4)(c), (B)(6)(e), (B)(9) to (B)(13), (B)(15), (B)(16), (C)(1) to (C)(3), (C)(5)(e), (D)(1)(b), (D)(1)(c), and (F) of this rule. In addition to these exemptions, the interval for calibrating radiation survey instruments as listed in paragraph (B)(3)(b)(ii) of this rule, and the frequency for the evaluation of operable radiation-generating equipment as listed in paragraph (C)(4) of this rule may be changed to annually.

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