Kansas Administrative Regulations

Department of Health and Environment

Article 35.—Radiation

28-35-301b. Additional requirements for open-beam configurations.

(a) Safety devices.

(1) Each registrant shall maintain written justification for the use of an open-beam configuration instead of a closed-beam X-ray system for review by the department until the open-beam configuration is no longer in use.

(2) Unless infeasible, each registrant shall use a safety device that prevents the entry of any portion of the operator's body into the path of the primary beam or that causes the primary beam to be shut off upon entry into its path.

(3) For portable open-beam configurations that may be used as handheld X-ray equipment without safety devices, the requirements of this subsection may be met by complying with the requirements specified in K.A.R. 28-35-301c before use.

(b) X-ray status "on-off" indicator. Open-beam configurations shall be provided with a readily discernible and active indication of the following:

(1) X-ray tube status "on-off" indicator located near the radiation source housing. The warning lights required by K.A.R. 28-35-297 shall meet this requirement if the warning lights are readily discernible and viewable by anyone near the primary beam. The X-ray tube status "on-off" indicator shall display "on" in case of failure; and

(2) shutter "open-closed" status indicator located at the control panel and near each beam port on the radiation source housing, if the primary beam is controlled with a shutter. The shutter "open-closed" status indicator shall be clearly labeled whether the shutter is open or closed. The status light at the control panel may meet the requirement for the status light at the beam port if the status light at the control panel is readily discernible and viewable by anyone near the primary beam. The shutter "open-closed" status indicator shall display "open" in case of failure.

(c) Labeling. Each open-beam configuration shall be labeled at or near the X-ray exit beam port to identify the location of the beam with the words "CAUTION—X-RAY

BEAM," "CAUTION—HIGH INTENSITY X-RAY BEAM," or similar words approved by the department.

(d) Beam ports. Each unused beam port on any radiation source housing shall be secured in the closed position in a manner that will prevent accidental opening.

(e) Shutters. On open-beam configurations that are designed to accommodate interchangeable components, each beam port on the radiation source housing shall be equipped with a shutter that cannot be opened unless a collimator or a component coupling has been connected to the beam port.

(f) Radiation emission limits. The local components of an open-beam configuration shall include sufficient shielding or access control so that no radiation emissions exist other than the primary beam in any area surrounding the local component group that could result in a dose to an individual present in excess of the dose limits specified in K.A.R. 28-35-214a. These emission requirements shall be met at any specified tube rating.

(g) Primary beam interception. If the primary beam is not intercepted by the detector device under all conditions of operation, protective measures shall be provided, including auxiliary shielding or administrative procedures, to avoid exposure to any individual from the primary beam.

(h) Operator attendance. The operator shall be present at all times when the X-ray equipment is in operation except when the area is locked or the X-ray equipment is secured to protect against unauthorized or accidental entry.

(i) Control of access.

(1) If the X-ray system is not in a restricted area and the X-ray system is not capable of creating a radiation area or high-radiation area, the operator shall be able to control access to the primary beam at all times during operation.

(2) If the X-ray system is not in a restricted area and the X-ray system is capable of creating a radiation area or a high-radiation area, the operator shall meet the following requirements in addition to the requirement in paragraph (i)(1):

(A) Each radiation area shall be conspicuously identified. The radiation source shall be within a conspicuous perimeter that identifies the radiation area in which the

dose equivalent (H_T) rate exceeds 0.05 millisieverts (five millirem) per hour. The radiation area described by the conspicuous perimeter shall be posted with signs bearing the following: “CAUTION—RADIATION AREA”. The operator shall ensure that no individual is inside or enters the radiation area during operation of the X-ray system.

(B) Each high-radiation area shall be conspicuously identified. The radiation source shall be within a conspicuous perimeter that identifies the high-radiation area in which the dose equivalent (H_T) rate exceeds one millisievert (100 millirem) per hour. The high-radiation area described by the conspicuous perimeter shall be posted with a sign or signs bearing the following: “CAUTION—HIGH-RADIATION AREA”. The operator shall ensure that no individual is inside or enters the high-radiation area during operation of the X-ray system.

(C) The operator shall perform a visual check of the controlled area to ensure that the controlled area is free of all unauthorized personnel immediately before activating or exposing the radiation source.

(D) Surveillance of the area receiving exposure from the primary beam shall be maintained during operation either by visual or by other reliable means to ensure that no individual enters the area receiving exposure from the primary beam.

(E) With the exception of handheld X-ray equipment, when approaching the radiation source following the conclusion of an exposure, the operator shall use a suitable, calibrated, and operable radiation detection instrument to verify that the radiation source is in its fully shielded condition or that the X-ray tube has been de-energized.

(F) A personal alarming ratemeter may be worn to approach the work area if the device is appropriately designed and calibrated for the type of X-ray emitted, including pulse X-rays or continuous X-rays, set at an appropriate level to detect the presence of the source and has been source-checked before use. The radiation in the work area shall be reasonably uniform so that the ratemeter responds to radiation exposure to any part of the body. The ratemeter shall not be used to measure radiation levels or to indicate the presence of the source for potential nonuniform exposure that could occur during X-ray system maintenance or work near the target.

(G) Measurement of radiation levels for a survey required by K.A.R. 28-35-298(b) shall be conducted using a calibrated survey meter appropriate for the energies to be measured. A survey meter shall also be used if there is potential for nonuniform exposure to personnel, including during X-ray system maintenance or work near the target.

(H) During an initial exposure, the radiation levels shall be measured around the perimeter of the controlled area or restricted area. The perimeter shall be adjusted accordingly to meet the access control requirement for radiation areas or high-radiation areas.

(I) A survey around the perimeter shall be made for each new operating condition and the perimeter shall be adjusted accordingly. The perimeter of an area of use exposed by an X-ray system shall be surveyed periodically if radiation levels are variable.

(j) Instruction and training. In addition to the requirements in K.A.R. 28-35-300(a), no individual shall be permitted to operate or maintain an open-beam configuration unless the individual has received specific and detailed instruction and demonstrated competence in the following:

(1) Knowledge of sources and magnitude of common radiation exposure;

(2) knowledge of units of radiation measurement;

(3) radiation protection concepts of time, distance, shielding, and ALARA;

(4) procedures and rights of a declared pregnant woman;

(5) regulatory requirements and area postings;

(6) worker, embryo or fetus, and public dose limits;

(7) proper use of survey instruments and dosimetry; and

(8) the policies and procedures required by subsection (a).

(Authorized by and implementing K.S.A. 48-1607; effective Oct. 23, 2026.)

***** Authenticated Kansas Administrative Regulation *****