DEPARTMENT OF HEALTH

Minnesota Rules, Chapter 4732 X-ray Revision

DRAFT SECURITY SCREENING X-RAY SYSTEMS DEFINITIONS, 1.0

4732.####. SECURITY SCREENING X-RAY SYSTEMS DEFINITIONS.

Subpart 1. **Ambient dose equivalent, H*(d).** "Ambient dose equivalent" means the dose equivalent at a point in a radiation field produced by the corresponding expanded and aligned field in the ICRU sphere in 1998 at a depth d on the radius opposing the direction of the aligned field. Dose equivalent is the product of the absorbed dose D at a point in tissue (i.e., the mean energy imparted per unit mass) and the quality factor Q at that point. The unit of dose equivalent, H, and of ambient dose equivalent, H*(d), is the joule per kilogram (J kg -1), with the special name Sievert (Sv, 1 Sv = 100 rem).

Subp. 2. **Beam stop.** "Beam stop" means a radiation shield meant to intercept the direct beam of radiation.

Subp. 3. **Inspection zone**. "Inspection zone" means the general area established by the registrant for the purpose of limiting or controlling access to the area where the scanning is performed. This includes any ingress, egress, gate, portal, traffic path, and areas where access is restricted due to the presence of radiation. The ambient dose equivalent, H*(10), outside of the inspection zone must not exceed 20 µSv (2 mrem) in any one hour.

Subp. 4. **Security screening radiation area.** "Security screening radiation area" means an area, accessible to individuals, where radiation levels may result in an individual receiving a dose equivalent in excess of 0.05 mSv (5 mrem) in 1 hour at 30 cm from a beam exit surface.

The ambient dose equivalent at 10 mm, H*(10), must be used for determining the potential dose to individuals.

Subp. 5. **Reference effective dose, E_{ref}.** " Reference effective dose, E_{ref}" means a quantity based on measurable parameters used for setting dose limits. The reference effective dose is determined from measurements of the half-value layer (HVL) and air kerma (or exposure) using one of the following equations:

A. $E_{ref} = K_a \times C$ where E_{ref} is the reference effective dose in Sv, K_a is the measured air kerma in Gy, and C in Sv/Gy is given by C = 0.125 × HVL in mm of Al or C = 1.14, whichever is smaller; or

B. $E_{ref} = X \times C_R$, when using traditional units the equivalent equation, where E_{ref} is the reference effective dose in rem, X is the measured exposure in R, and C_R in rem/R is given by C_R = 0.110 × HVL in mm of Al or C_R = 1.00, whichever is smaller.

Subp. 6. **Safety interlock.** "Safety interlock" means a device that is intended to automatically prevent or interrupt the radiation hazard whenever safety is compromised by access to the interior of the x-ray system, unauthorized access to a security screening radiation area, or by an operational malfunction.

Subp. 7. **Scan.** "Scan" means the security screening operation necessary to produce one image from one radiation source. One radiation source simultaneously producing multiple images also constitutes one scan. Two sources simultaneously producing two images constitute two scans. In some cases, several scans may be required for a single screening of the subject.

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Subp. 8. **Screening.** "Screening" means the sum of radiation exposures or scans necessary to image objects concealed within or on all sides of the human body as intended by the security screening x-ray system.

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Subp. 9. **Security screening x-ray system.** "Security screening x-ray system" means radiation-producing equipment designed and used for screening a subject and used by the correctional or detention facility to image and to identify contraband items concealed within or on all sides of a human body. A screening typically consists of:

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(1) four scans, one from each side for backscatter systems; or

(2) one scan for transmission systems.

Subp. 10. **Shutter.** "Shutter" means a device that is affixed to any radiation source housing to block the useful beam with a suitable thickness of shielding material.

Environmental Health Division, Indoor Environments & Radiation Section
Minnesota Department of Health
PO Box 64975
St. Paul, MN 55134-0975
x-rayrules@state.mn.us
www.health.state.mn.us

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