Division of Health
Bureau of Environmental Health
1000 SW Jackson, Suite 330
Topeka, KS 66612-1365

Phone: 785-296-1560
Fax: 785-296-0984
BEH@kdheks.gov
www.kdheks.gov/radiation

Robert Moser, MD, Secretary

Department of Health & Environment

Sam Brownback, Governor

November 16, 2012

KANSAS INFORMATION NOTICE 12-01

TITLE Thermo Scientific Sentinel RadEye G portable dose and dose rate meter

Addressees

Industrial Radiography Licensees

Purpose

The Kansas Department of Health and Environment Radiation Control Program (KDHE) is issuing this Information Notice to provide the State of Kansas position on the use of the Thermo Scientific Sentinel RadEye G portable dose and dose rate meter.

Description of Circumstances

The Thermo Scientific Sentinel RadEye G portable dose and dose rate meter is a pocket sized electronic device to measure photon exposure rate of gamma and x-ray radiation. The RadEye G has alarm settings which alarms at a total integrated exposure as an integrating electronic dosimeter and also as an alarming rate meter. The rate meter function of the RadEye G provides the ability to detect and locate sources of radiation for survey measurements or for general area monitoring.

Discussion

Kansas licensees are requesting permission to use the RadEye G simultaneously as an integrating electronic dosimeter, an alarming rate meter and survey meter when performing industrial radiography operations.

The staff of KDHE performed an evaluation of the RadEye G operational characteristics, the licensee request to use of the RadEye G simultaneously as an integrating electronic dosimeter, an alarming rate meter and survey meter when performing industrial radiography operations and Kansas regulation K.A.R. 28-35-274 to determine if the instrument may be used in simultaneous multiple modes of operation.

KDHE concluded the RadEye G may not be used simultaneously as an integrating electronic dosimeter, an alarming rate meter and survey meter when performing industrial radiography operations for the following reasons:

1. K.A.R. 28-35-284 Personnel monitoring, requires a radiographer or a radiographer's assistant at all times during radiographic operations, wear on the trunk of the body a personnel-monitoring device (PMD) as specified in K.A.R. 28-35-217a, a direct reading dosimeter, and an alarming rate meter. Removal of the RadEye G from the trunk of the body to perform a radiation survey measurement will cause the electronic dosimeter mode of the instrument to not be performing its required function is a violation of K.A.R. 28-35-217a. K.A.R. 28-35-217b(c) requires precautions are taken to prevent a deceptive exposure of an individual monitoring device. Performing a radiation survey measurement with the RadEye G will cause the electronic dosimeter mode of the instrument to receive a deceptive exposure in violation of K.A.R. 28-35-217b(c).
2. K.A.R. 28-35-284(f)(3) requires each alarming rate meter to have a special means to change the preset alarm function. The manufacturer operating instructions for the RadEye G describe the ease of changing alarm settings without any special equipment or software. This feature of the RadEye G would eliminate the instrument for use as an alarming rate meter.
3. K.A.R. 28-35-284 requires the calibration frequency for electronic dosimeters and alarming rate meters to not exceed 12 months and K.A.R. 28-35-278 requires the calibration frequency for survey meters used in industrial radiography operations to not exceed 6 months. Having different calibration frequencies for individual modalities of the same instrument may present a challenge to the licensee to maintain multiple calibration dates for each instrument and could result in the instrument being used for a modality that is not in calibration.

Conclusion

KDHE has concluded the RadEye G may be used as an electronic dosimeter and is a suitable substitute for the pocket ion chamber dosimeter permitted by K.A.R. 28-35-284(a)(1). The RadEye G does not meet the requirements of an alarming rate meter as specified in K.A.R. 28-35-284(f), however, it may be used independently as a general area radiation monitor or survey meter with audible alarm capability.

This Information Notice does not contain a change in regulatory requirements or change a previously stated position. No specific action or written response is required. If you have questions regarding this information notice, please contact the Kansas Department of Health and Environment, Radiation Control Section at 785-296-1560.

Kansas Regulatory Citations:

K.A.R. 28-35-217b(c) The licensee or registrant shall ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.

K.A.R. 28-35-278. **Radiation survey instruments.**
(a) Each licensee or registrant shall maintain calibrated and operable radiation survey instruments to make physical radiation surveys as required by this part. The instrumentation required by this subsection shall have a range capable of measuring two milliroentgens per hour through one roentgen per hour.
(b) Each radiation survey instrument shall be calibrated as follows:
(1) At energies appropriate for use;
(2) at intervals not to exceed six months and after each instrument servicing;

K.A.R. 28-35-284. **Personnel monitoring.** (a) The licensee or registrant shall not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each individual wears on the trunk of the body a personnel-monitoring device (PMD) as specified in K.A.R. 28-35-217a, a direct reading dosimeter, and an alarming ratemeter…
(1) Each pocket ion-chamber dosimeter shall have a range from zero to 200 mrem and shall be recharged at the start of each work shift. Electronic personal dosimeters may be used in place of only pocket ion-chamber dosimeters.
(f) Each licensee or registrant shall ensure that each alarming ratemeter meets the following requirements:
(1) Is checked to ensure that the alarm functions properly before using at the start of each shift;
(2) is set to give an alarm signal at a preset dose rate of 500 mrem per hour, with an accuracy of plus or minus 20 percent of the true radiation dose rate;
(3) requires a special means to change the preset alarm function; and
(4) is calibrated at least each 12 months for the accurate measurement of radiation..

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
612 EAST LAMAR BOULEVARD, SUITE 400
ARLINGTON, TEXAS 76011-4125

May 11, 2011

Team Industrial Services, Inc.
ATTN: David P. Tebo
Corporate Radiation Safety Officer
200 Hermann Drive
Alvin, Texas 77511

SUBJECT: SENTINEL RAD-EYE G

The U.S. Nuclear Regulatory Commission (NRC) has performed a preliminary review of your letter and enclosures dated February 14, 2011, in which Team Industrial Services requested an amendment to the NRC license to authorize a Sentinel Rad-Eye G instrument for use simultaneously as an electronic dosimeter, alarm ratemeter, and survey meter when conducting industrial radiography operations. The NRC staff evaluated the information provided for the Sentinel Rad-Eye G instrument; compared the requirement of 10 CFR Part 34, "Licenses for Industrial Radiography and Radiation Safety Requirements for Industrial Radiographic Operations", for the proposed use; and reviewed the guidance provided in NUREG 1556, Volume 2, "Consolidated Guidance About Material Licenses: Program Specific Guidance About Industrial Radiography Licenses." Our review has determined that there is not sufficient information for the NRC to authorize the Sentinel Rad-Eye G instrument for multiple modalities. Because the amendment request is incomplete and does not provide sufficient information for the NRC to make and assessment, your amendment request dated February 14, 2011, has been voided without prejudice and will be re-instated when sufficient information is received that will allow the NRC staff to make an evaluation. Should Team Industrial Services elect to re-submit its amendment request, it will need to specifically address the following:

1. 10 CFR 34.47(a) requires a radiographer or a radiographer's assistant to wear at all times, on the trunk of the body, a direct reading dosimeter, an operating alarm ratemeter, and a personnel dosimeter, that is processed and evaluated by an accredited National Volunteer Laboratory Accreditation Program (NVLAP) processor.

   Demonstrate how a radiographer or radiographer's assistant would use the Sentinel Rad-Eye G instrument in all three modalities simultaneously when the regulations require that personnel monitoring be worn at all times on the trunk of the body. It is not clear how the radiographer or radiographer's assistant would satisfy this requirement if the individual takes the instrument off the trunk of the body to perform a radiation survey (in the survey meter modality), while at the same time using the instrument as an electronic dosimeter. It appears that the electronic personal dosimeter part of the instrument would no longer be performing its regulatory required function when radiation survey measurements are being made when using the survey instrument modality of the Sentinel Rad-Eye G instrument.

2. 10 CFR 34.47(g)(3), requires each alarm ratemeter to have special means to change the preset alarm function. This feature is necessary to prevent the change of the preset 500 millirem limit by the user of the instrument while working in the field.

   Demonstrate how the Sentinel Rad-Eye G instrument, in the alarm ratemeter modality, has a special means to impede the user from changing the 500 millirem limit. It appears from the manufacturer's information that the alarm function can be changed without difficulty. This feature by itself would prevent the Sentinel Rad-Eye G instrument from being used as an alarming ratemeter.

3. 10 CFR Part 34 specifies different calibration frequencies for electronic personal dosimeter, alarm ratemeter, and survey meter. For example, electronic personal dosimeters and alarm ratemeters need to be calibrated at periods not to exceed 12 months as required by 10 CFR 34.47(c) and 10 CFR 34.47(g)(4), respectively; and survey meters need to be calibrated at intervals not to exceed six months as required by 10 CFR 34.25(b)(1).

   Demonstrate how the Sentinel Rad-Eye G instrument will meet the calibration frequencies required by 10 CFR 34.47(c), 10 CFR 34.47(g)(4), and 10 CFR 34.25(b)(1). Different calibration frequencies for the same instrument can present a challenge for the radiographer and radiographer's assistant when recording calibration dates for all three modalities (survey instrument, electronic personal dosimeter, and alarm ratemeter), and could result in using an instrument that is out of calibration for a specific modality.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Thank you for your cooperation.

Sincerely,

/RA/

Roberto J. Torres, Senior Health Physicist
Nuclear Materials Safety Branch B

Docket: 030-35252
License: 42-32219-01
Control: 574437

Answer to Question #9038 Submitted to "Ask the Experts"

Category: ***Instrumentation and Measurements — Instrument Calibration (IC)***

The following question was answered by an expert in the appropriate field:

Q I want to know if EPDs (electronic personal dosimeters) require calibration or not.

A The short answer to your question is, “Yes, electronic personal dosimeters do require calibration.” These devices may be initially calibrated by the manufacturer, but electronic components can degrade, electronic settings may change, and various physical effects can occur that may alter the performance of the dosimeters.

Many electronic dosimeters use a number of self test procedures built into the devices to ensure that general operational requirements are being met, but such internal checks do not usually satisfy all the requirement for calibration. Some facilities use a self-contained irradiation system to carry out performance checks and/or limited calibration procedures to demonstrate consistency of response. An example of one such irradiation device is shown at Thermo Scientific. Such systems are often well suited to doing checks of devices to determine whether they are responding as expected, but they may not obviate the need for doing more complete calibrations with dosimeters mounted on appropriate phantoms.

We shall assume that the manufacturer has done sufficient testing to demonstrate that the dosimeters of interest meet required performance criteria for the measurement of dose from radiations of specific types and energies. Through appropriate calibration procedures, the manufacturer will determine calibration factors for a given dosimeter and will write these into firmware or software that operate to convert EPD responses to the proper doses or dose rates. The readers supplied by manufacturers may or may not have built-in capability for readjusting these calibration factors as necessary, and the manufacturer’s recommendations should generally be followed.

For routine use applications, most electronic dosimeters will likely require some level of calibration at least once per year. This frequency is also generally consistent with many regulatory agencies’ recommendations for instrument calibration. For the most common photon-sensitive devices, the procedure may involve evaluating responses to at least two different energy photon sources, sources such as ^{137}Cs and ^{241}Am being common. If the responses are within acceptable limits the dosimeters may be assumed to have remained in calibration. If responses are unacceptable, adjustments of the dosimeter calibration factors or other modifications may be necessary. This may require returning the dosimeters to the manufacturer for recalibration.

Specific calibration requirements vary among different user facilities and among different dosimeter types. You should work in conjunction with your calibration staff and the dosimeter manufacturer, taking account of specific requirements and recommendations of appropriate regulating agencies, to implement a satisfactory calibration program for the EPDs.

George Chabot, PhD, CHP