IOWA DEPARTMENT OF PUBLIC HEALTH
BUREAU OF RADIOLOGICAL HEALTH
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DES MOINES, IOWA 50319

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IDPH INFORMATION NOTICE 2013-01 Recent radiography events resulting in exposure exceeding regulatory limits

## ADDRESSEES

All industrial radiography licensees

## PURPOSE

The IDPH is issuing this information notice (IN) to alert addressees to recent nationwide events that resulted in radiography workers receiving occupational doses in excess of the dose limits specified in Iowa Administrative Code 641-40.15(136C)

## DESCRIPTION OF CIRCUMSTANCES

Over the past year, the Nuclear Regulatory Commission has received four radiography event reports of radiography workers having received occupational whole body doses in excess of the five (5) rem limit or the fifty (50) rem to the skin of any extremity. The events are summarized below. All events involved a QSA Global radiography camera, model 880 Delta. The events are not mentioned in any particular order.

The first event occurred in Pasadena, Texas on March 24, 2012, and involved a source disconnect of a 65 curie Iridium-192 (Ir-192) source. A radiographer trainer (RT) had been working on a scaffold. Thinking the source had been properly retracted; the RT disconnected the source guide tube from the camera and, with the guide tube around his neck, climbed down the scaffold ladder. When the RT reached the platform, he removed the guide tube from around his neck. He then noted that the radiographer trainee was having problems disconnecting the crank assembly from the camera and that the camera locking mechanism was still unlocked. Radiation surveys of the camera and guide tube revealed radiation levels indicating that the source was still within the guide tube. Both the RT's and the trainee's alarming rate meters sounded at some point during the survey. The RT picked up the guide tube with long tongs and the source fell onto the deck. After establishing the 2mR/hour boundary, an authorized individual was contacted and performed source retrieval.

The RT's film badge was sent for immediate processing, and the results revealed a deep-dose equivalent (DDE) whole body dose of 812 mrem. However, as the result of a re-enactment, the licensee calculated the dose at 29.32 rem. Blood tests were normal and no symptoms of local radiation injury were identified. The manufacturer examined the equipment and made the following determinations: (1) the drive cable was rusted, corroded, stiff, and lacked lubrication, leading to severing directly behind the 550 connector, (2) the male connector passed the no-go test, but was heavily worn, and (3) the control assembly components revealed significant signs of rusting and the housing was taped together to allow continued use. The manufacturer's overall

conclusion was that the cable failed due to a combination of wear, corrosion, and lack of lubrication.

In the second event, which occurred on February 17, 2012, a radiographer was working in a shooting bay at a fixed facility using a camera that contained a 37 curie Ir-192 source. While carrying a dose-rate meter, the radiographer entered the shooting bay to set up for the next operation but was not paying attention to the dose-rate meter. The radiographer completed set-up, left the shooting bay, attempted to crank the source out, but then discovered that the source was already cranked into the collimator. The radiographer retracted the source and contacted the radiation safety officer (RSO). As the result of two reenactments of the event, the licensee determined that the radiographer received a TEDE of 81 rem based on a total exposure time of two minutes and 30 seconds. The RSO stated that the radiographer did not have to relocate the collimator and did not believe an extremity overexposure occurred. The licensee was able to use the radiographer's cell phone records to determine the approximate length of exposure time, because the radiographer had been talking on the phone while setting up for the radiograph. The distance for the radiographer's TEDE was determined to be 12 inches. The radiographer provided three blood samples for evaluation and results were normal. A contributing factor was the inadvertent disabling of the area alarm, because one individual who shut off a breaker had erroneously believed that the breaker only supplied power to a ventilation fan, when in fact, it also supplied power to the area alarm. The radiographer was removed from all work involving potential radiation exposure.

In the third event, which involved a 63 curie Ir-192 radiography source, two radiographers were performing operations on a pipeline project at a temporary job site in north central Pennsylvania on October 28, 2011. After cranking in the source, the radiography crew approached the pipe to set up for their next shot. While placing the film on a weld, a radiographer noticed that the locking mechanism on the camera had not popped up. Both radiographers confirmed that their survey meters read zero. However, one radiographer's rate alarm was chirping, although not very loudly. The other radiographer's rate alarm was silent. Problems had been identified with both radiographers' rate alarms prior to beginning work, but operations were still conducted. The radiographers went to the crank assembly and were able to make approximately one turn to fully retract the source. Both radiographers' electronic dosimeters read off-scale. Their personnel dosimeters were sent for emergency processing and results revealed whole body exposures of 5.133 and 1.447 rem.

In the fourth event, which occurred on October 12, 2011, a radiographer climbed a ladder to remove the source guide tube from the camera, which was suspended by a rope. While the radiographer was disconnecting the guide tube, another employee observed that the radiographer's survey meter indicated that the 49.3 curie Ir-192 source was not in the shielded position. The radiographer climbed down the ladder and cranked the source back into the camera. Although the radiographer's processed badge revealed a 4.192 rem dose, the radiographer was unable to ascertain where the source had been in the guide tube during the incident. Therefore, based on reenactments, the licensee calculated the dose to the radiographer's hands to actually be 58.15 rem.

## DISCUSSION

In most of these events, a functioning survey and/or rate meter was available, but was not properly utilized in a preventative capacity. Also, some type of inattention to detail was a factor

in all of these events. IDPH would like to remind licensees that the safety requirements associated with the use of radiography cameras are in place because of the potentially high dose hazard associated with radiography. For example, a typical radiography source contains 100 curies of Ir-192. This would produce a dose rate of about 450 rem/hr at 1 foot from the unshielded source. Exposure at a foot from such a source will result in exceeding IDPH's annual whole body-dose limit in about 40 seconds. Actual handling of the guide tube with the source still in it could result in dose rates to the hand, on the order of 1,000 rads per minute, leading to very serious injury to the skin and underlying tissues.

Because of the potentially high doses associated with radiography, licensees should always have calibrated, functioning survey meters that are used when approaching the radiography camera or guide tube after an exposure. Likewise, calibrated, functioning personal rate alarms should always be utilized. IDPH understands that survey instruments and alarming rate meters can fail to work for a variety of reason, or the meter may appear to be working, but may respond slowly to initially indicate a lower incorrect dose-rate reading. Because of this, and because of the serious dangers involved in using radiography sources, both instruments are required to be used during radiography. They serve different functions, but they also act as backups to each other.

In addition to using survey meters and alarming rate meters, radiographers are reminded to follow proper safety procedures when using radiography equipment. These include: procedures for properly posting and roping off work area; controlling access to the radiography area during radiography; ensuring that the source is properly secured when it is retracted into the camera; the correct use of survey meters to allow the meter sufficient time to fully respond; periodically checking the camera to make sure that there is no apparent damage, and that moving parts do not show undue wear; and similar actions that ensure that the equipment is in good mechanical condition and that it is operated properly.

Finally, IDPH noted that in three of the four events discussed, reenactments were necessary to estimate a more accurate dose although dosimetry was worn. In fact, in the first event, the dosimetry severely underestimated the radiographer's dose.

IDPH is highlighting these occurrences as a reminder to workers of the limits of personal dosimetry, even when properly working and worn. In instances when overexposure is possible and the dose on the dosimetry is questionable, licensees are encouraged to assess the situation to see if a re-enactment of the event would be prudent.

## CONTACT

This IN requires no specific action or written response. If you have any questions about the information in this notice, please contact this office.

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