

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, D.C. 20555

January 14, 1993

NRC INFORMATION NOTICE NO. 93-05: LOCKING OF RADIOGRAPHY EXPOSURE
DEVICES

Addressees:

All Nuclear Regulatory Commission industrial radiography licensees

Purpose

This information notice is intended to: (a) alert licensees that the locking mechanisms on certain industrial radiography exposure devices can be locked with the sealed source in the exposed position; and (b) emphasize the importance of ensuring that the source is secure in a shielded position before moving the device. We expect that licensees will review this notice, distribute it to responsible staff, and consider actions, if appropriate, to verify that the source is properly secured at the conclusion of radiographic operations. However, suggestions contained in this notice do not constitute any new NRC requirements, and no written response is required.

Description of Circumstances

Case 1: A radiographer was overexposed in an incident involving a disconnected source when he failed to conduct a survey after each exposure. After investigating the incident, it was discovered that the radiographer had approached the device without a survey instrument, locked the device, disassembled the source guide tube, and left the drive controls connected before moving the device from one location to another. The radiographer had incorrectly assumed that in locking the exposure device, he had secured the source in a shielded position. In fact, the sealed source remained in the guide tube because the pigtail had disconnected from the drive cable. The radiographer's error was further compounded when the drive cable was not removed before moving the device, which would have allowed him to identify the absence of the source pigtail within the shielded assembly.

Case 2: A radiographer was performing radiographic exposures of welds on a series of pipelines that were located approximately 6.1 meters (20 feet) above ground. The radiographer used a 1.8-meter (6-foot) guide tube with collimator and a 7.6-meter (25-foot) control cable. The radiographer hung the device from the pipeline to perform the work with the control cables hanging down to the ground. After an exposure, the radiographer retracted the source, placed the control cables on the ground, and used a hydraulic lift to get to the camera.

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Because the camera was suspended above the lift, the radiographer had to move the camera to reach the locking mechanism. He moved the camera by grasping the control cables with his right hand and locking the camera with his left hand. He continued with his left hand to disconnect the guide tube from the camera. At this point, he noticed that the sealed source was protruding approximately 10 centimeters (4 inches) from the camera port. (Note: His alarming ratemeter did not sound because it was not turned on. This violation of 10 CFR 34.33, which can result in a civil penalty, is addressed in Information Notice 91-49: "Enforcement of Safety Requirements for Radiographers").

Reenactments of the incident showed that when the radiographer turned the device, the crank handle could drag on the ground, exposing the sealed source. The radiographer was then able to lock the device over the drive cable, with the sealed source protruding approximately 10 centimeters (4 inches). Analysis of the locking mechanism after the event did not identify any obvious defects with the mechanism. Tests performed showed that the device could still be locked with the source in the exposed position.

NRC Evaluation:

The findings in both of these cases raised concern among NRC staff that, under certain conditions, radiographers could have false confidence in the locking mechanisms. If exposure devices can lock when the source is outside of the shielded position, then radiographers could incorrectly believe that they are protected from exposure when, in fact, the source is not in its fully shielded position. We are also concerned that exposure devices are moved while the drive cables are still connected.

To evaluate the effectiveness of the locking mechanism on radiography exposure devices and to determine whether radiographers commonly move the devices with drive cables still connected, NRC inspectors observed licensee equipment tests and interviewed radiography personnel. From the data collected, we determined that a majority of exposure devices can be locked when the source is in a variety of positions, rather than only when the source pigtail is properly seated, with the source in the fully shielded position. Many source pigtails include a "locking ball," designed to prevent the source from moving forward when the lock is engaged; however, our observations show that some exposure devices may be locked both when the source is not fully retracted and while the drive cable is seated under the locking pin, thereby circumventing the locking-ball feature. This may result in a source being positioned where it is not fully shielded.

Many radiographers acknowledged to NRC inspectors that they often leave drive cables connected when moving an exposure device from one location to another at temporary job sites. In addition, some acknowledged leaving the guide tube connected. One licensee stated that this practice had resulted in a source being forced out of the exposure device while the device was carried to a new location at a temporary job site. This licensee noted that the device was locked at the time, but the source had not been fully retracted before locking the device.

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Discussion:

All licensees are reminded of the importance of ensuring that the sources used in radiography exposure devices are properly secured and fully shielded before

moving the device. Radiographic exposure devices manufactured and new equipment acquired by licensees after January 10, 1992, must meet new design requirements in 10 CFR 34.20. These require that, among other safety features, the device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. However, many radiographic exposure devices currently in use do not include the newer safety features, and licensees are not required to use devices that comply with 10 CFR 34.20 requirements until after January 10, 1996. Certain radiography exposure devices still in use today may be able to be locked with the source in the exposed position.

Experience has shown that when an older exposure device is in use, the locking mechanism is not an indicator that the source is fully retracted and secured. The use of engineered safety features, like the lock mechanism, **MUST BE** coupled with a proper survey (10 CFR 34.43) **AND** use of an alarm ratemeter (10 CFR 34.33), to prevent the unintentional exposure of personnel. Surveys must be sufficient to detect a change in exposure readings taken at the source tube outlet, to determine whether the source is fully retracted to a shielded position (10 CFR 34.43). Alarm ratemeters serve as an additional warning method. Additionally, it is recommended that radiographers disassemble the source guide tube, remove the drive controls, and install the safety plugs or covers, before moving the radiography exposure device to another location. The failure to do so has been identified as a contributing factor in the unintended exposure of personnel, as well as in incidents where radiographers failed to notice that the source was not retracted into the device.

Sealed sources for radiography are capable of delivering significant exposures to radiography personnel and to members of the general public, when handled by individuals who are inattentive to radiation safety procedures. It is recommended that all workers understand the consequences of improperly handling radiographic devices, and that workers be encouraged to use necessary precautions when working with these devices.

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No written response is required by this information notice. If you have any questions about this matter, please contact the appropriate NRC regional office or the personnel listed below.

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Attachments:

1. List of Recently Issued NMSS Information Notices
2. List of Recently Issued NRC Information Notices

