



Report from a UK incident

Failure of automated wind-out system in gamma radiography enclosures- 2 examples

INCIDENT 1 - Description

The incident occurred in a gamma radiography compound when a 130 GBq cobalt-60 source in a mechanically-driven source container became stuck in the guide tube. The source assembly was unusual in that a solid (rather than flexible) 'pencil' was used. It is thought that, during several years of operation, the end cap of the pencil became unscrewed. Consequently, the end cap and the source capsule were left in the guide tube.

The radiographer failed to notice the exposure warning lights (three flashing and one continuous) and entered the compound at least twice –to reposition radiographic films, and to diagnose why the source would not advance to the end of the guide tube. It was only then that the radiographer noticed the warning lights. He used a radiation monitor to confirm that the source was exposed, and vacated the compound, locking the door behind him. He immediately contacted the Radiation Protection Supervisor.

The source was subsequently recovered with the assistance of the Radiation Protection Expert. A short section of the guide tube containing the source was isolated, and this section was loaded into a transport container for return to the manufacturer.

Following this particular incident the company elected to re-position the flashing beacons into more noticeable locations and install an audible exposure alarm.

Radiological consequences

The film badge worn by the radiographer recorded a whole body dose of 7.6 mSv.

The Supervisor and two RPE personnel recorded doses of 0.1, 0.8 and 0.2 mSv, respectively.

INCIDENT 2 - Description

The incident involved a purpose-built radiography compound and a remote exposure container holding a 680 GBq iridium-192 source. There was an installed automatic wind-out mechanism which was interlocked to the door: under normal conditions the opening the door would cause the source to be automatically retracted into the shielded container.

In this incident, the operator turned off the power to the wind-out mechanism (using the key on the control panel) while the source was still exposed. When he entered the compound, the interlocks on the door were no longer able to retract the source automatically.

Inside the facility was an independently powered gamma alarm system. The audible warning signal was not operating (in fact, it was designed to operate only when the emergency cut-off switch was pressed), but the flashing red exposure warning light was operating correctly. The operator did not notice this warning light, or that the alarm on his own radiation monitor was sounding.

The operator approached within 1 metre of the exposed source, before being alerted by a second person outside the compound; he then immediately left the area. The operator was inside the compound for approximately 15 seconds.

Radiological consequences

The personal dosimeter worn by the operator during the incident recorded a dose of 0.0 mSv (the whole body dose had been pessimistically estimated to be 0.4 mSv).

Lessons learned (both incidents)

- These incidents show that automated gamma radiography exposure systems can and do fail, and when they do, the consequences are essentially the same as with a manually operated system.
- Any automatic wind-out mechanism should be designed such that turning off the control panel always retracts the wind-out cable before turning off the power. Even then, operators should never rely on the automatic retraction of the source. A radiation monitor must be used after every exposure to confirm that the source has properly returned to the container.
- The safety and warning systems installed in radiography enclosures need to be designed with care. In both incidents, the radiographers failed to notice the exposure warning lights inside the enclosures. Lights must be clearly visible (taking into account ambient light conditions), and located in positions that are readily observable to persons attempting to enter an enclosure, and at all positions inside.
- The operator of any facility must have a good understanding of all the installed safety systems. Notices explaining the significance of the warning signals must be posted at strategic positions.
- Undertaking radiography in a properly-designed enclosure (ie as opposed to site radiography) provide a greater level of radiation protection – under normal operations and in the event of a non-retracted source. Where such incidents occur, the enclosure should assist in terms of planning an effective source recovery in which the radiation dose received are relatively low.