



Report from a UK incident

Baggage x-ray inspection unit: engineers exposed during maintenance**Description of the incident**

Two engineers were working on a conveyor-type x-ray baggage inspection unit located 2 metres behind another similar unit in a production facility. The units produce 140 kV x-rays in a highly collimated beam. Under normal circumstances the X-ray beam is shielded by the x-ray detector assembly, and dose rates outside the equipment are less than 1 $\mu\text{Sv/h}$. In this incident the array was not installed on the front unit. A contractor, unaware that this had been removed, placed the unit in continuous operation mode, which led to the exposure of the two engineers.

The detector assembly had been found to be faulty earlier in the day and had been removed and would be replaced when another became available. The contractor had been told that it was intended to operate all the units in continuous operation mode by the end of the day. The contractor thought it was not possible to generate x-rays without all the shielding in place and was unaware that the interlocks had been overridden. It is not normal practice for contractors to operate the x-ray equipment, nor was this contractor instructed to turn this unit on.

X-rays were generated for approximately 20 minutes before the engineers working on the adjacent unit discovered what was happening. They checked their work position with a dose rate meter which indicated $>5000 \mu\text{Sv/h}$ (ie above the maximum scale reading). They immediately turned off the unit, noting how long it had been operating. The incident was not reported until the following day because the company's Radiation Protection Supervisor was not available. The incident was subsequently reported to the **Radiation Protection Expert** who carried out a full investigation.



Example of a radiation survey around a baggage inspection unit after maintenance

Radiological consequences

One of the engineers had been issued with a whole body dosimeter, which recorded 0.0 mSv but was unlikely to have been in the primary x-ray beam. Measurements indicated that the equivalent dose within the primary beam would have been 8 mSv. Due to the high degree of beam collimation, the effective (whole body) dose to each engineer was estimated to be 0.04 mSv.

Lessons learned

All relevant staff – including contractors and other temporary staff - must be provided with adequate information, instruction and training to ensure that they follow safe working procedures. In this case, the local rules prohibited persons from generating x-rays without all shielding and guarding fitted in place, but these rules were not followed. In such cases, the level of supervision provided for the work should also be questioned.

During maintenance, x-ray equipment should not be left unattended while x-rays are being generated, or even where it is in a state of readiness to generate x-rays.

A radiation survey should always be carried out following any maintenance, and the results should be recorded.

All incidents must be reported without delay. In this case, by the time the incident had been reported, the x-ray machine had been installed at a customer's premises. Consequently, it was not possible to carry out a detailed dose assessment.