STUDY CASE N° 10: RADIOGRAPHY INCIDENT IN SWEDEN

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❑ Description of the incident

During one evening of May 1999, two radiographers, using a portable X-ray unit, examined welds on a large pipe of a steam extraction system at a Swedish nuclear power plant. Between exposures, which each took about 1.5 minutes, they moved their apparatus around, handled plates and prepared for the subsequent exposure. The used X-ray unit produces a rather narrow beam. The work was performed in a closed area, with a collimated beam, and with full control over all entrance doors. The radiographers were not aware of the cleaning work mentioned below, and they did not foresee that someone could enter the area inside of the pipe! At the same time, another work team had been ordered to perform clean-up work at the steam extraction system. One person, P, was to remove debris left inside of the pipe as the result of grinding work. P, equipped with the tube of a suction system, entered the pipe through a man-hole and two of his colleagues, positioned at the man-hole, fed him tube as he moved along. P started cleaning the inside and advanced about 20 meters forward. At that point he reached the place were the radiography work was performed. At this section the pipe opens up and P stood up, turned around, and reverted to the place were he entered the pipe. P did not hear or notice anything unusual during the 15 minutes he stayed in the pipe.

It is difficult to estimate exactly how long time P has spent at the section of the pipe were the radiography work was performed. He estimated himself that he was standing up for about 15 seconds before he again crouched down and crawled back to the man-hole. P was equipped with a thermoluminescence dosimeter (TLD) but he had removed his electronic dosimeter since he thought it would hinder his movements inside of the pipe. The radiation level at the place where the work was performed is usually neither high nor changing. P and his colleagues were not aware of the radiography work.

At one point of time, while the radiographers were rearranging their equipment, vibrations were noticed from the pipe system. They tapped on the pipe but P, inside the pipe, did not hear this. They stopped their work and when they went around the corner they saw the two workmates of P who were busy feeding the tube. Everyone now realised the seriousness of the situation and the radiation protection unit was contacted.

The X-ray plates were checked for disturbances or shadows but such were not found. The TLD belonging to P was promptly evaluated and exhibited a total dose of 0.5 mSv which compared well with the 0.75 mSv of P's electronic dosimeter. P was sent for blood tests to the nearby hospital during the same night and the result of the analysis showed normal values. A test set-up with several dosimeters was exposed at the place were the radiography work was done. It was estimated that the maximum dose received by a person situated in the collimated beam during one exposure of 1.5 minutes would be in the order of 30 to 40 mSv.

The Swedish Radiation Protection Institute and the Swedish factory inspection were informed about the incident in the morning of the following day. Debriefing was offered to the involved personnel.

❑ Lessons learned

The incident was quickly reported and the follow-up work was performed well.

The routines for management of work permits at the power plant must be improved. Radiography work and/or clean-up work must be governed by work permits which are coupled to the work permit for the main work (construction, repair work) so that all activities can be fully co-ordinated and controlled. In the present case, the lack of information to the involved persons and the missing co-ordination was evident.

A firm which performs X-ray examinations must take full responsibility for their radiography work, regardless of whether it is performed at a nuclear power plant or not.

The radiographers should have ensured that nobody could be exposed. The assumption made, unconsciously or not, that no one would enter into the beam inside of the pipe was apparently wrong.