

Topical session on characterization of rooms and buildings

Abstract: Radiological Characterization of Buildings at the Ranstad Uranium Works

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In 1965 – 1969 uranium was mined and milled on a semi-commercial scale at the Swedish Ranstad works located 150 km northeast of Gothenburg. The plant was then used for development activities for another 20 years. After that, part of the plant was used for recovering uranium from process wastes from nuclear fuel fabrication plants and for non-nuclear activities. The plant is now in the last stage of decommissioning and dismantling. This includes dismantling and demolishing three buildings where uranium shale has been processed and uranium produced. As a first step the radioactive contamination of the buildings has been mapped and evaluated.

Scintillation detectors have been used for the overall mapping. Measurements have been made on selected test surfaces. The number of test surfaces was adapted to the expected local contamination.

Gamma spectroscopy was used to identify the nuclide specific contents of the contamination. Both in-situ and laboratory measurements were made. Special attention had to be paid to the naturally occurring radioactive materials of the building construction materials. The naturally occurring radioactive materials basically comprise the same nuclides as the contamination.

The nuclide specific measurements and theoretical considerations were used to define nuclide vectors describing the contamination of the buildings.

In order to transfer the results of the scintillation detector measurements into nuclide specific activities, the detector readings had to be calibrated. In-situ gamma spectroscopy was used for this. Measurements were made both before and after removal of the contamination of certain test surfaces. Nuclide vectors as defined above were used.

In order to facilitate planning of the decontamination of the buildings and the final disposal of the building rubble, the buildings were divided into "system identities". Within a system identity, there is a common material, the contamination is more or less homogeneous, the need for decontamination is the same and all the resulting waste can be disposed of in the same way.

In the radiological mapping, test surfaces cover only a fraction of the building surfaces. Each measurement is also associated with measurement uncertainties. For these reasons it is necessary to apply relevant statistical methods for evaluation of measurements to be compared with established clearance levels. Monte Carlo simulation is used for calculating uncertainty distributions of averages for example for system identities. The 95th percentile of the uncertainty distribution is considered to be the highest plausible value for the average. Bayesian methodology is used to find the highest plausible value. The value for which there is a 5 % probability that an additional measurement would result in a higher value is considered to be the highest plausible value for the maximum.

The methods described above have been used to evaluate the contamination of the Ranstad sorting works.