FROM THE SWEDISH NATIONAL INSTITUTE OF RADIATION PROTECTION, STOCKHOLM, SWEDEN.

A NEW LABORATORY FOR WHOLE-BODY COUNTING

by

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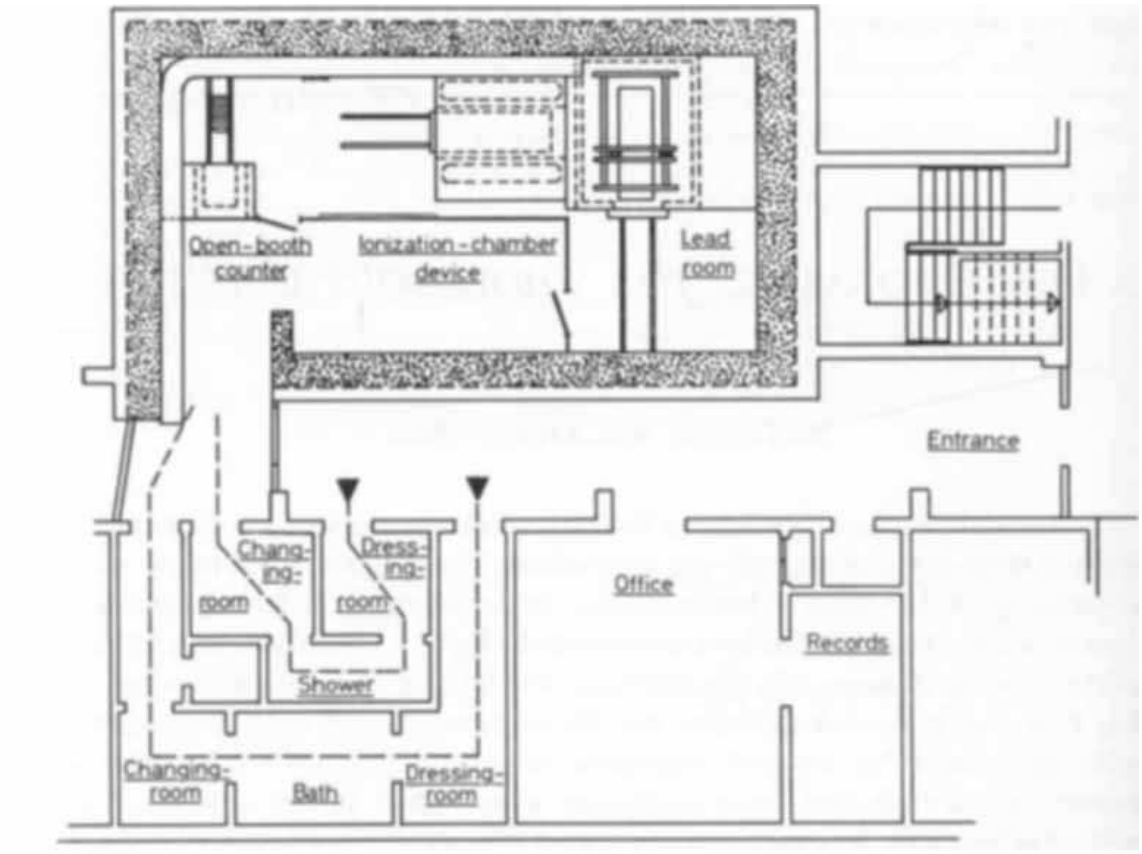
The Swedish National Institute of Radiation Protection, once a part of the Institute of Radiophysics, recently moved to a new building not far from the original buildings of the Gustaf V Jubilee Clinic. In the basement of the new building a low-activity laboratory has been constructed (Fig.). In addition to ancillary facilities (bath, showers, changing-rooms) the laboratory consists of a 5m × 10m room with special shielding for the purpose of reducing background variations caused by external radiation sources. At the planning stage a number of minerals had been examined with regard to the content of γ-emitting substances. A peridotite from Hofors ("hoforsite") was found to have a very low activity content. It was used together with the cement that was found to have the lowest activity (Limhamn cement) to make the concrete that was used for walls, roof and floor of the shielded room (LINDELL and REIZENSTEIN 1964). The background counting level for γ-measurements is only about 1/10 of the background in an ordinary concrete room.

In the shielded room the following equipment is available:

1. An open-both body counter (LINDELL 1962) moved from the old laboratory. It consists of open shielding with roof, floor and three walls with a total thickness of about 15 cm made up of 10 mm iron plates. The opening faces a ∅5" × 4" NaI crystal shielded with 10 cm of lead and it is mounted on a trolley that can be moved away from and towards the open booth, in which a patient is normally seated on a stool. The whole unit weights about 5.5 tons.

2. A pressurized ionization-chamber device of Sievert's design, moved from the low-background laboratory at Henriksdal (SIEVERT 1951). This unit consists of a bed surrounded by 12 cylindrical steel tubes (∅40 cm, length 125 cm), filled with nitrogen at a pressure of 20 kp/cm^2. The ionization current through the tubes is measured via the voltage across a high-ohmic resistance which is connected to an electrometer tube feeding a pen recorder.



Schematic illustration of the low-activity laboratory with ancillary facilities.

3. A whole-body counter with three ∅5" × 4" NaI crystals mounted at 120 degrees around a large vertical ring, centered around a horizontal bed. The ring with the three crystals can scan and oscillate simultaneously. With this motion it can simulate a cylindrical detector during the measurements, but the apparatus can also be used to obtain activity profiles in a more conventional manner (LINDELL 1962).

The electronic system serving the two units with scintillation detectors consists of two Intertechnique 400-channel pulse-height analyzers and a common IBM typewriter.

The "open-both" unit and the ionization chamber device are intended for measurements on persons in radiological work, e.g. in isotope laboratories. For such measurements, it is possible to check with the scintillation counter whether there is any detectable contamination and to identify the nuclides. Quantitative measurements can then be made with the ionization chambers, the sensitivity of which has been reduced in order to make it possible to decrease the measuring time in the microcurie range to a few minutes.

The scanning device is intended for research purposes. It is planned to use it for studies of the uptake, retention, localization and excretion of nuclides and substances of particular interest in radiation protection. It might also be used for "pilot" studies of isotope techniques which should not be carried out in full scale until all dosimetric aspects have been investigated.

REFERENCES

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