Radon-the seeping

Last week Building *revealed dramatic new evidence which showed radon kills up to 1500 people each year in the UK. Here are the details.* Graham Ridout *reports.*

RADON-INDUCED lung cancer could be killing as many as 1500 people in the UK each year.

Yet five years ago radon was a joke. Nobody believed *Building* when, in April 1983, we warned that many could die. Health risks associated with radon were quantified by this magazine as responsible for around 600, and perhaps up to 1500, deaths each year in the UK. The lower figure was ratified towards the end of 1986 by the Government's watchdog body – the National Radiological Protection Board.

Last month the NRPB raised its estimate of the number of annual deaths caused by the gas by a staggering 250%. In an article in the NRPB bulletin, radiological measurement department head Mike O'Riordan reported that "lifetime risks imply that 1500 people may die of lung cancer each year in the UK from indoor exposure to radon and radon daughters". This figure appeared almost as a footnote in the article.

Most at risk are people living in regions where a form of uranium, U-238, occurs naturally in granite bedrock. This form breaks down to produce radon gas and other radioactive materials such as radon daughters – minute radioactive particles which can attach to dust particles and be inhaled into the lungs.

Seeping danger

If the granite is near the surface, the main danger is from radon gas which can seep through fissures in the rock and pass into a house. Daughters can also be carried in by air movements of radioactive dust. An additional, almost unquantifiable risk comes from using building materials produced from minerals containing uranium U-238.

The NRPB's new estimate comes from the latest revised risk factors emanating from the international committee on the Biological Effect of Ionising Radiation (BEIR).

As such, the estimate is subject to the normal vagaries when assessing risk factors. Nevertheless, O'Riordan warned "this altered evaluation of radon risk makes it even more important that action be taken to reduce high radon levels in houses".

Equally chilling is the statistic mentioned by O'Riordan that one in 20 people will die if exposed to a radon exposure level of 400 becquerels/m^3 (equivalent to 20 milliSieverts per year).

This month the search hots up for ways of reducing the health risks associated with exposure to radon. But the question remains whether the exposure levels set by the various regulatory bodies undertaking this work are sufficient.

First there is the Health & Safety Commission's approved code of practice which sets the permissible dosage and exposure levels for workers exposed to radon gas and radon daughters. This was published at the beginning of the month.

The HSC's code of practice sets a dose limit of 50 mSv.

One in eight people will die of cancer when exposed to this level of radon. This figure is drawn from interpolating figures produced by the NRPB.

Even the dosage level set by the HSC at which employers have to notify safety inspectors is woefully high. The HSC sets a level of 30 mSv which, according to NRPB figures, would produce a fatality rate of 7.5%.

Another organisation heavily engaged in the efforts to discover ways of reducing the hazards of the killer gas is the Building Research Establishment.

Currently the BRE is finalising details of a research programme to monitor the concentration of radon inside existing houses. And within the next four weeks, the BRE expects to issue details of acceptable means of eliminating radon from new housing.

The latter will take the form of drawings laying down the acceptable specification for the design of new floors. These centre on incorporating a membrane across the complete area of the floor structure, thereby forming an impermeable barrier to the gas.

Suspended floors will be easier to seal and easier to rectify than concrete floor slab construction. Consequently, the BRE is recommending sub-slab extraction systems, where floors are built directly on to the ground. The most suitable method, according to the BRE, is to lay a network of ducts to which an extractor fan could be fitted at a later date.

Most of the guidelines are based on recommendations currently in force in the USA and Sweden. In both countries, the number of areas at risk from radon are appreciably higher than in the UK.

The BRE's guidelines, which have to be endorsed by the Department of the Environment's Construction Industry Directorate for building regulations approval, aim to limit exposure to radon gas to 100 becquerels/m^3 in new-build houses.

Better than the USA?

If the BRE achieves its objective of a 100 Bq/m^3 target, it will be better than the current limit in the USA, which is about 150 Bq/m^3. Nevertheless, one in 80 runs the risk of dying from radon – if the NRPB figures are proved accurate.

The guidelines will apply only to the areas of the country considered "at risk". These are principally confined to parts of Devon and Cornwall, but spill over into a small area of Somerset.

Other areas with a high background level of radioactivity exist in Cumbria, Snowdonia and Anglesey, a wide band running along the Grampian mountains between Aberdeen to the east and Fort William to the west, the north eastern tip of Scotland including the Orkneys, and parts of Dumfriesshire and Galloway.

In addition, pressure is starting to mount for including areas of Derbyshire and North Yorkshire, mainly in response to calls from local politicians. These areas have lower levels of background radioactivity, according to figures released by the Institute of Geological Sciences.

The BRE is also about to embark on research into ways of

sickness

For five years the warnings have been ignored.

preventing gas seeping into existing houses.

This will involve incorporating different types of remedial measures inside 20 existing dwellings and monitoring the exposure levels.

An exposure level of 400 Bq/m^3 has been set as the target by the BRE. Relating this to NRPB figures, one in 20 would die if exposed to this level of radiation.

This research programme will be looking at ways of sealing existing walls and floors. Underfloor extraction methods will also be investigated. The BRE hopes to be able to issue guidance to houseowners this summer.

BRE scientists also have two other research programmes underway. One is a radon test site at the BRE's Garston headquarters, where a large test pit has been excavated and filled with naturally occurring radioactive sand obtained from Morocco.

Model test houses will be built on a radioactive sandpit and the results used to help design radon-resistant dwellings.

The second programme involves developing a computer model which can be used to simulate radon escaping from the ground. The computer model will correlate the emission of radon under differing temperature, air pressure and wind patterns. The BRE hopes to substantially complete this work by 1989 and is using the BREVENT program, which simulates air movements inside a house, as the model for the new computer program.

Also due out this year are the results of a major monitoring programme presently being carried out on 17 000 homes in the UK by the NRPB.

Only last week, two of the NRPB's senior scientists spoke at the International Radiation Protection Association conference in Sydney, Australia. At the conference Geoffrey Webb and Dr Tony Wrixon said that radon and its by-products account for half of the ionising radiation inflicted on the UK public.

Considering this statement and the way the NRPB has uprated its estimate of radon-associated deaths, it appears the 1500 suggested mortality rate is still on the low side.