

Simple answers seem best against radon

Jim Simpson finds little reason to believe complex extractor systems are the best way to remove radioactive radon from homes

Radon has hit the headlines again. The Director of the National Radiological Protection Board, Dr Roger Clarke, told the newspapers: "Radon may be responsible for anything up to 2500 or more lung cancers in a year out of the total UK incidence of 41,000."

Radon is a radioactive gas that seeps into houses from the ground below because of differences in pressure.

There is some public clamour for builders both to carry out remedial work and to alter the designs for new buildings to keep out the gas. But the Building Research Establishment, which is carrying out detailed studies in the main areas affected, urges restraint. Stephen Wozniak, the research scientist in charge of the BRE programme, says that detailed guidance will be issued towards the end of this year.

"In quite a few cases there are things that house builders and builders can do which would have a big effect on radiation levels without getting into the cost and complexity of the underfloor fan systems suggested," he says.

The Department of the Environment issued interim guidance regarding radon and the construction of new building in August last year, together with advice to householders. But, according to Mr Wozniak, this was based on North American and Scandinavian examples and, since it was written, the industry has gained a lot more experience in dealing with houses that have a high level of radon.

Concern about radon started in the USA 10 years ago but only came to light in this country after the National Radiological Protection Board published the results of a national survey of 2000 homes in 1985. The survey showed that homes in Devon and Cornwall suffered far higher levels of radon than elsewhere in the country. Isolated pockets, namely the High Peak district in Derbyshire and part of Deeside in Scotland, approached the same level.

The reasons for this, according to Martin Green, the NRPB scientist in charge of radon surveys in homes, is geological. Radon is an inert gas produced when uranium, present in

all rocks, breaks down. Radioactive radon escapes when the rock is porous, such as Cornish granite or the carboniferous lime stone of the Peak District. Radon gas has very small molecules, but many rocks, such as Aberdeen granite, are sufficiently solid to contain it.

Radon gas eventually disintegrates into another radioactive substance — polonium — which is a solid. If radon enters a house and builds up sufficient concentrations it can cause lung cancer if it is breathed in and forms particles of polonium which lodge in the lungs.

As a result of the survey by the NRPB, the Department of the Environment issued interim guidelines that set acceptable limits for radon, which is measured in Becquerels per cubic metre. For new buildings this is 100 Bq/m³ and for existing buildings it is 400 Bq/m³ — any level above this is one the householder should take action about.

However, scientists disagree about the dangers of radon. The NRPB says radon is very important and that 45 per cent of the radiation to which the average person is exposed comes from the gas. The BRE is far more relaxed. Stephen Wozniak argues that the risk is slight. "The statistics show that there is a 5 per cent risk of a person developing lung cancer if they are exposed to radon at the action level. But these figures include smokers and the risk is only 1.5 per cent for non-smokers," he says.

Furthermore, the levels of radon found even in the worst-affected buildings in the country are relatively low. In the USA houses have been found where the radiation level is 50,000 Bq/m³ but in Britain the highest level found is 1200 to 2000 Bq/m³.

The NRPB measures the amount of radon in a property free of charge if it is convinced there is a good case — generally in the West Country, around Devon, Cornwall or Somerset. The board provides two plastic detectors, one for a living room and another for an occupied bedroom, which are sent back to the board for processing. If preliminary results justify it measurements are taken over a year to find the average. If the level is 1500 Bq/m³ or above, the BRE

will give construction advice free of charge — a sign, says Mr Wozniak, that the problem is small.

As matters stand the remedial work for existing buildings consists of sealing floors with polythene, such as 1000 gauge dpm, after sealing cracks in solid floors or where services enter. After this, the recommendation is to draw off the radon-laden air with mechanical ventilation, though extra air-bricks might be sufficient with a suspended floor.

For solid floors the advice is to reduce the air pressure in the ground beneath the house by sucking air with a fan. A 4 in. plastic pipe runs beneath floor level from a small hole dug in the floor to form a sump to the outside wall where a fan discharges air.

This is all quite expensive. The fans alone cost upwards of £60 and would use £30-£60 worth of electricity in a year, while the installation could cost up to £1000.

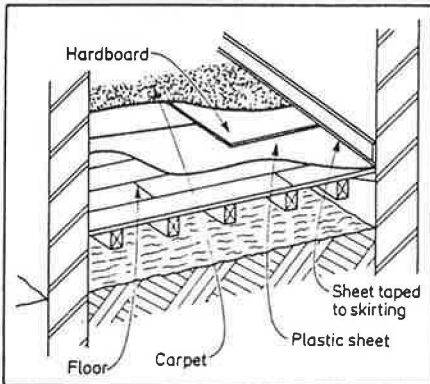
However, Mr Wozniak believes that depressurisation is unlikely to be necessary. He argues that radon build-up could well be caused by houses being too well-sealed and that some form of ground floor ventilation — perhaps just a trickle vent — would be sufficient to cure the problem without resorting to the inconvenience and cost of underfloor systems. The Solid Fuel Advisory Board says worried householders could consider fitting a fire that takes its air from under the floor.

The BRE is just building up to a field trial involving 20 to 30 houses with a radon level of between 400 Bq/m³ (the action level) and 800 Bq/m³, which will find out whether sealing floors and increasing ventilation at the ground floor is sufficient.

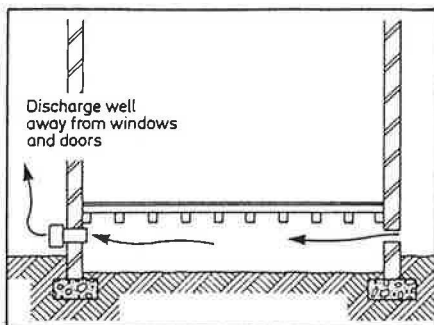
Further studies are investigating the success of measures taken in new building in the West Country to keep out radon. These steps were taken after the interim guidance issued in 1988.

Mr Wozniak's advice to those concerned about radon level is to wait for detailed guidance at the end of this year before acting, unless the level is more than 1500 Bq/m³ — at which point the BRE will provide free advice anyway. ○

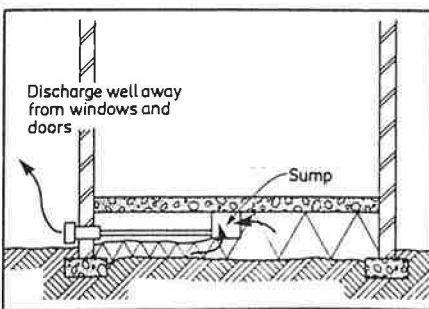
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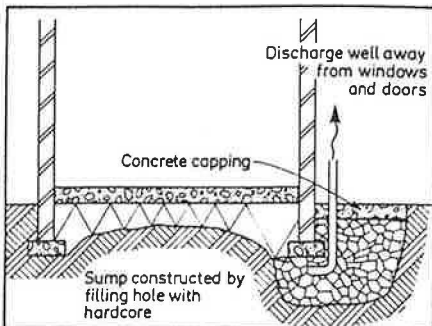
Sealed floors may leak



Extractor fan and suspended floor

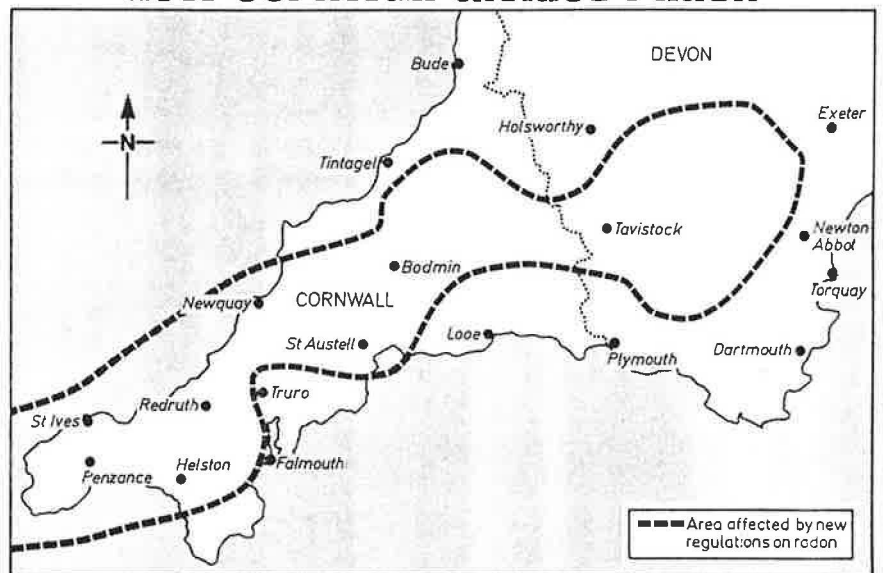


Fan, sump and solid floor



Sum offers radon easiest exit

How Cornwall tackles radon



Homes in Devon and Cornwall suffer higher radon levels than the rest of the UK

Trevor Gregory of Cornwall County Council's department of architecture is the man probably most affected by the debate over methods to deal with radon. He administers a programme to deal with radon in some 700 premises owned by the council. So far it has tackled a dozen.

The Health and Safety Executive has allowed the council to do the tests, carry out remedial treatment and then test the treatment's success.

The programme divides test results into four. Any building with a reading over 1000 Becquerels per cubic metre requires urgent attention, more than 400 needs action, anything below 400 is further divided into 200 to 400 and 0 to 200. "We make a note of buildings where the radon level is more than 200 becks," says Mr Gregory. "The Institute of Environmental Health Officers is campaigning to adopt this level as the legal maximum.

"We have tried a number of approaches to remedy the problem in existing buildings. Mostly we dig a hole in the floor slab and install a small, brick-built sump and then run pipework to draw the gas away

with a non-stalling fan."

Cornwall council has also experimented with making the air pressure inside buildings higher than outside. "Drawing air in and draught stripping stops the radon seeping in. This might work in an air-conditioned building but it doesn't work well elsewhere," said Mr Gregory. "We found it cured the problem but only because we didn't have high levels."

The Cornish programme has avoided the simple approach of sealing floors and increasing ventilation. "Literature from the US suggests that if you can't seal the floor entirely all the gas comes through cracks you missed - a case of sealing the draught and it coming through the keyhole."

New buildings, however, have sealed floors. "We have installed a continuous gas-proof membrane that extends throughout the ground floor from dpm to dpc. The services in the floor slab are sealed and a sump and pipework have also been installed. The building is then tested as if it were an existing building. If it fails, then an extraction fan is connected to the pipework to draw off the radon."