

EXPOSURE TO RADON IN ABOVE GROUND WORKPLACES

THE EXPERIENCE IN GREAT BRITAIN (GB)

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ABSTRACT

Regulations regarding exposure of employees and others to ionising radiation including exposure to radon were introduced in GB in 1985. Research by HSE over a number of years has identified the type and location of workplaces most affected by radon. Exposures in excess of the action levels in the regulations have been identified and appropriate action taken. Further research is underway to identify other affected areas and compare methods of measurement. Liaison has taken place between government departments to produce advisory material for employers and employees.

REGULATORY BACKGROUND

In Great Britain (GB) safety regulations for employees and others affected by their work are made under the Health and Safety at Work Act 1974. In 1986 the Ionising Radiations Regulations 1985 (IRR85)¹ were introduced. These regulations include requirements which are binding on GB by virtue of its Membership of the European Community. The requirements are contained in the Euratom Directives of 1980 and 1984 and are traceable to International Commission on Radiological Protection (ICRP) publications 26(1977) and 30(1979).

The requirements in IRR85 for radon are introduced under "work with ionising radiation". This is any work in which there is any exposure of a person to an atmosphere containing the short lived daughters of radon 222 at a concentration averaged over any 8 hour working period of greater than $6.24 \times 10^{-7} \text{ J m}^{-3}$ ie 0.03 Working Levels (WL). This corresponds to a dose of 5 mSv over a 2000 hour working year which is the supervised area level. Strictly exposure to 0.03 WL for 2000 hours corresponds to a dose of about 3.5 mSv, with a conversion factor of 10 mSv per WLM, and after allowance for exposure to natural sources other than radon 222. An important requirement of the regulations is the appointment of a radiation protection adviser at a concentration of 0.1 WL. Guidance on application of the regulations is given in an approved code of practice² which contains advice on for example restriction of exposure, personal dosimetry and area monitoring. Guidance has also been produced for HSE inspectors and environmental health officers. The latter inspect premises such as offices and shops. Inspectors have also been given training and are backed up by radiation specialists who have appropriate experience and radon monitoring equipment.

WORKPLACE STUDIES

In 1983 HSE commissioned a series of research programmes designed to obtain information on the type and location of premises where the IRR85 were likely to apply³. The first studies concentrated on Devon and Cornwall where it was known that high levels existed in some homes. NRPB undertook radon monitoring work for HSE using their track etch plastic detector, which is mounted in a housing which acts as a diffusion chamber and also acts as mechanical protection. Earliest measurements also included active sampling.

Monitors were sent by post individually to each employer with instructions for placement and return. Employers were asked to put the monitors in places that were routinely occupied. Account was also taken of the time of year in which the monitoring took place to allow for the annual variation that occurs in radon levels whereby levels are generally lower in summer than in winter. Since measurements of radon daughter concentrations can be laborious and time consuming, measurements with passive monitors over one month have been adopted in the UK as the routine method of screening to decide whether workplaces are likely to be affected by Regulations. Some care is needed in translating the results of radon gas measurements over one month to a radon daughter concentration during working hours, but for a typical diurnal variation, a screening value of 400 Bq m⁻³ measured with passive monitors over a month during winter provides an effective means of identifying workplaces where concentrations during the day might exceed 0.03 WL. Since these monitors are cheap, simple to use and can be sent through the post, they provide an effective means of screening large numbers of workplaces.

These initial studies showed that in premises such as workshops and production areas with good natural or forced ventilation it was unlikely that the action level of 0.03 WL would be exceeded. However places such as offices schools and hospitals may well exceed this level. Of the 50 workplaces studied 10 exceeded the supervised area level and 3 exceeded the controlled area level. The highest estimated annual dose was 24 mSv. The information was communicated to employers. Further research⁴ on the feasibility of simple methods of reducing radon daughter concentrations concluded that underfloor suction systems were likely to be very effective in many properties and that other methods were unlikely to achieve consistent and substantial reductions.

The latest studies undertaken by HSE surveyed a total of 670 premises in Cornwall, Devon, Derbyshire, Northamptonshire, Somerset and Scotland. The complete analysis is not available at the time of writing, but of the 145 results processed, 23 premises had levels in excess of the supervised area level. The highest radon gas concentration reported was 3000 Bq m⁻³ which gives an estimated 40 mSv dose for a 2000 hour exposure time. Although the premises with the highest concentrations were in Cornwall 20 premises in the other areas were identified as having concentrations likely to exceed the supervised area levels. Other studies have identified levels of several thousand Bq m⁻³ in a workplace in Derbyshire.

Further research has been commissioned with NRPB to obtain estimates of the distribution of radon gas concentration in workplaces throughout the country. This will be based primarily on correlation

with existing data for homes. Another area of current research is comparison of methods for monitoring exposure to radon. This work is designed to give further information on the accuracy and applicability of the methods for the purpose of complying with IRR85.

PROVISION OF INFORMATION

A recent development in GB in the approach to the radon problem is the consideration by government of exposures both at work and at home. This approach was advocated in the recent recommendations of the House of Commons Environment Committee⁵. It emphasised the need for a person to be given adequate information about the overall risk from exposure to radon. A leaflet is being prepared by the HSE which gives simple background facts about radon, gives guidance on action to be taken by employers and explains how to obtain assistance from the Department of the Environment for monitoring at home. In workplaces where it has been found necessary to take action to reduce radon levels employees are strongly recommended to have their homes tested as well. This is available free through the Department of Environment.

CONCLUSIONS

Research over the last 8 years has shown that workplaces with low natural ventilation in Cornwall and Devon are most likely to have the highest radon concentrations in GB. However other areas can have significant concentrations which require remedial action.

It is the experience in GB that a package of measures is necessary to achieve adequate protection from the risks posed by exposure to radon. This package should include research, regulations, production of guidance material, inspection and enforcement by the regulatory body.

It is likely that existing arrangements in GB will provide a good framework to cope with future developments in International Guidance and European Legislation for radon.

REFERENCES

1. The Ionising Radiations Regulations 1985 Statutory Instrument No 1333 Her Majesty's Stationery Office, London (1985).
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3. Investigation of Radon Decay Product Exposures in Workplaces. HSE/NRPB CONTRACT 1/2037.1983. An Investigation of Radon Decay Products Exposures in Workplaces with low ventilation Rates. HSE/NRPB CONTRACT 1984.
4. An Investigation of the Feasibility of Simple Methods of Reducing Radon Daughter Concentrations in Workplaces HSE/NRPB CONTRACT 12560/12596 1989.
5. House of Commons Environment Committee 6th Report Indoor Pollution. Her Majesty's Stationery Office 12 June 1991.