8638

Radon and buildings: 3. Protecting new extensions and conservatories

Radon can enter a new extension or conservatory by a number of routes, with the result that radon levels may also increase inside the existing house. This leaflet describes how to minimise the amount of radon entering the new building, and discusses the additional protective measures it may be necessary to install during its construction. It will be of interest to anyone involved in reducing indoor radon levels.

HOW DOES RADON GET INTO A BUILDING?

Radon mainly gets into buildings through openings between the building and the underlying soil or rock. Such openings include:

- cracks in solid floors,
- gaps in suspended timber floors, and
- cracks and cavities in walls.

However, radon is unlikely to get into a new extension or conservatory by these particular routes, provided that the new building has a modern solid concrete floor incorporating a damp-proof membrane. In this case, radon is much more likely to enter through:

- construction joints,
- gaps around service entries,
- underfloor ventilation grilles, and
- openings made in the floor of conservatories to act as plant and flower beds.

The problem is twofold: radon can get into the extension or conservatory, but it can also pass through the new building into the house itself (see Figures 1 and 2). There tends to be a greater risk of radon entering the house from an extension than from a conservatory. This is because an extension is likely to be used in the same way as the rest of the home, and its services will be connected to the main house. A conservatory, on the other hand, often has its own heating and ventilation, and is generally separate from the main house, ie it has its own distinct use, is not continuously occupied, and the door to the main house is often kept closed.

Underfloor vents

If the main house has suspended ground floors, it is important to ensure that the new building does not impair the underfloor ventilation of the existing floor. This is particularly important with suspended timber floors where adequate ventilation is necessary to reduce the risk of timber rot. In the past it has been common practice for existing underfloor vents to be

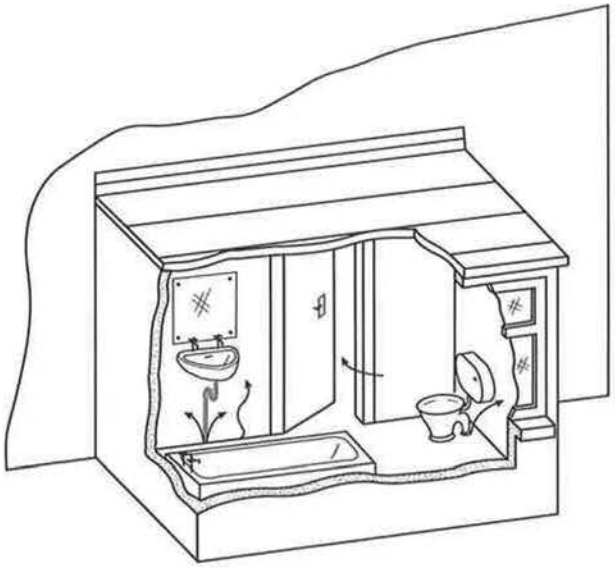


Figure 1 Routes by which radon enters an extension

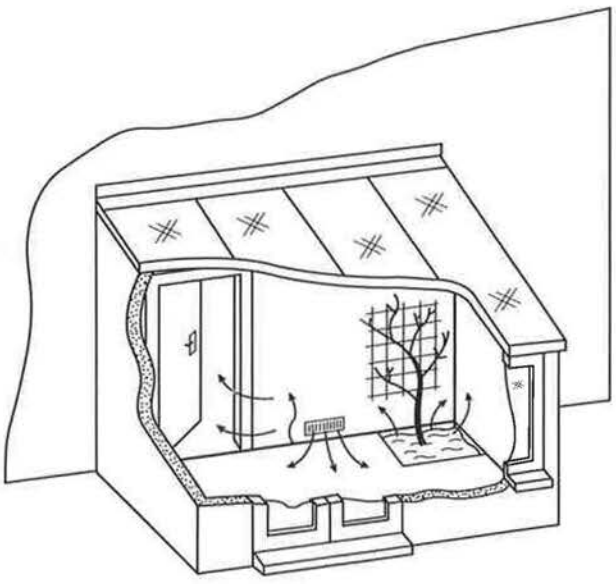


Figure 2 Routes by which radon enters a conservatory

Published by the Building Research Establishment, Garston, Watford, WD2 7JR
Telephone 0923 894040 Fax 0923 664010

either permanently blocked, or left so that they open directly into the new building. However, in areas known to be affected by radon, the correct practice is to:

- block up the vents permanently and provide an alternative air supply to the void under the floor, or
- where the vents are low enough, open them up and duct air under the floor of the new building (see Figure 3).

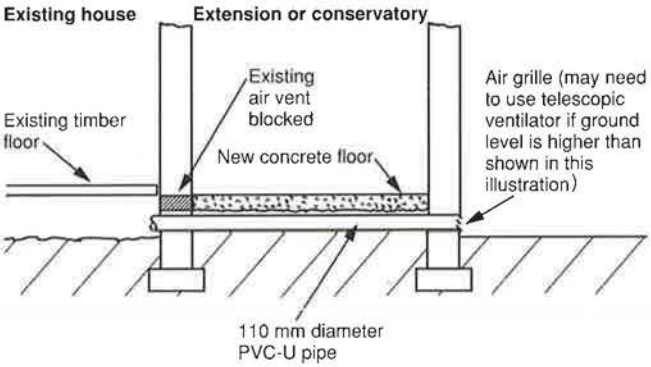
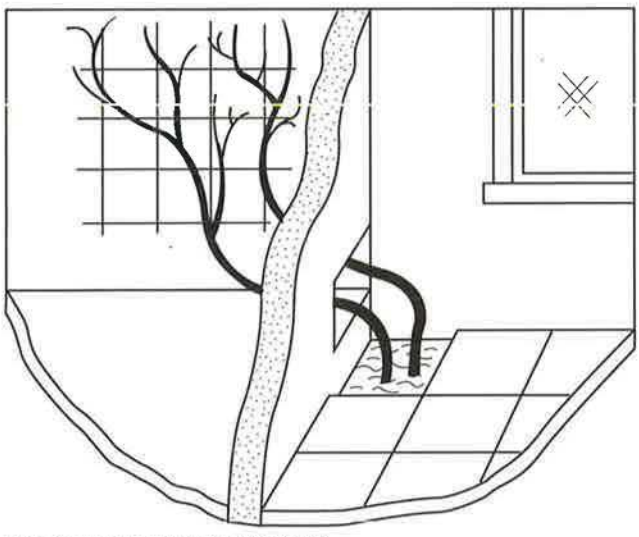


Figure 3 Ventilating a suspended timber floor by ducting air under the floor of the new extension or conservatory

Plant and flower beds

It is quite common for part of a conservatory floor to be omitted so that plants growing inside, eg vines, can be planted directly into the soil. Unfortunately, plant and flower beds can be major entry routes for radon, particularly where the adjacent outdoor area is paved. There are other ways to achieve the same effect which will not affect indoor radon levels, eg growing the plants outside the conservatory and training them through an opening in the wall (see Figure 4), or planting them inside in tubs.



(Hole in conservatory wall not to scale)

Figure 4 Plants can be grown outside the conservatory and trained through an opening in the wall

Suspended timber floors

In radon-affected areas it is not advisable to install suspended timber floors in conservatories and extensions. Floors of this type are commonly associated with high levels of indoor radon, even where the floor has good ventilation and the soil underneath is covered with a polyethylene damp-proof barrier and concrete.

Service penetrations

Routing services through the floor is not recommended in radon-affected areas. Where this cannot be avoided, seal around each penetration by either:

- sealing the service pipe to the radon-proof or damp-proof barrier with a suitable adhesive tape or proprietary sealing collar, or
- sealing the gaps in the floor after it has been installed. Fill large gaps with sand-cement mortar, and small gaps with a bathroom sealant or mastic. For further advice, see *Sealing cracks in solid floors: a BRE guide to radon remedial measures in existing dwellings*[1].

Construction joints

If possible, the construction joint between the new floor and the existing house should be sealed. Where radon-proof barriers have been incorporated in both the new floor and the existing floor, the two barriers should ideally be jointed where they meet within the wall of the house. However, it will be necessary to break out some mortar from the wall to gain access to the radon-proof barrier in the existing house: this can easily result in the barrier being damaged. A simpler alternative is to cut a chase in the wall, slightly above or below the existing barrier. The new barrier, ie the one incorporated in the floor of the conservatory or extension, can then be tucked into the chase in the wall (see Figure 5).

Where the existing floor does not incorporate a radon-proof barrier, the joint between the floor of the new building and the wall of the existing house can be sealed with a bathroom sealant or other flexible filler.

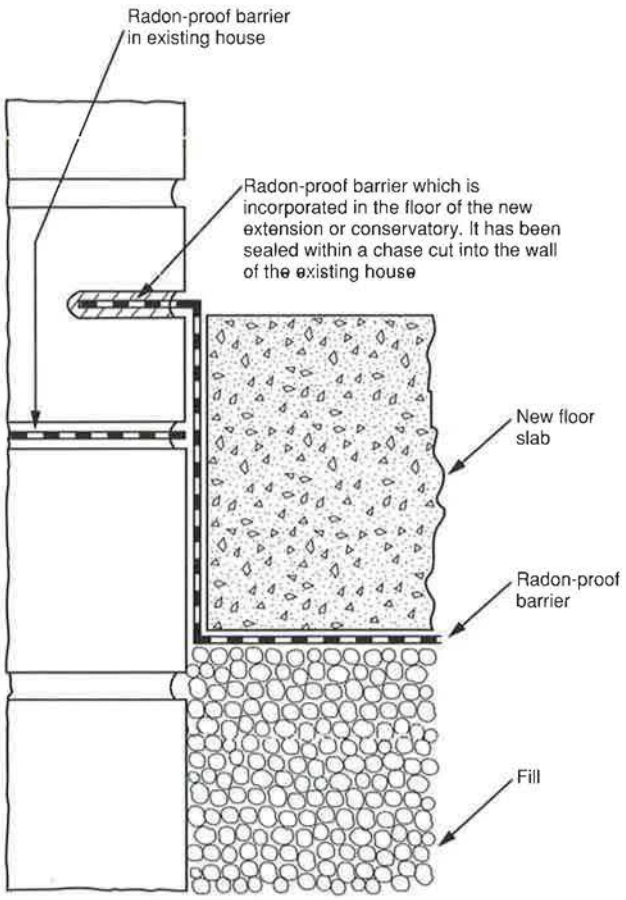


Figure 5 Possible method for linking the radon-proof barrier in a new floor to the barrier in an existing floor

HOW TO REDUCE RADON LEVELS IN THE WHOLE DWELLING

Measuring radon levels before building begins

Before building an extension or conservatory, it is advisable to measure the radon level inside the existing house. If the house is found to contain high levels of radon, protective measures can then be incorporated into the new building. These measures will help to reduce radon levels in the whole dwelling.

Indoor radon levels fluctuate from season to season, from day to day, and by the hour. Therefore, to obtain reliable results, it is advisable to monitor radon levels over as long a period as is practical. The ideal is to monitor for three months using etch-track (plastic) detectors. For further information on radon monitoring, contact the National Radiological Protection Board (their address is given at the end of this leaflet).

Installing radon-protective measures

Whether or not you have measured radon levels inside the existing house, it may still be worth installing radon-protective measures in the new building, with the aim of reducing radon levels in the whole dwelling.

If the existing house and the new building both have solid concrete floors, it may be appropriate to install a radon sump during the construction of the extension or conservatory. If the house is known to have a high indoor radon level, a complete sump system can be installed and activated. On the other hand, if the radon level inside the house has not yet been measured, it is possible simply to install the sump and pipework: if necessary, the system could be activated at a later date.

In either case the most appropriate location for the sump is beside the wall of the existing house (see Figure 6). To maximise the effect of the sump on the main house, it should be connected through the wall to the fill beneath the house (see Figure 7).

More detailed information on radon sumps is given in *Radon sumps: a BRE guide to radon remedial measures in existing dwellings*[2].

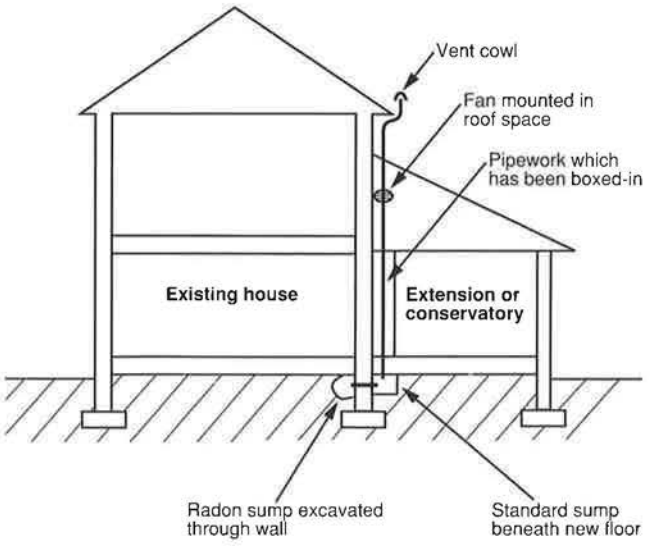


Figure 6 A sump system in the new building could reduce radon levels throughout the whole dwelling

Remeasuring radon levels after construction

Even if you have taken the precautions against radon entry described in the first section of this leaflet, there is no guarantee that overall indoor radon levels will not rise when the new building has been completed. It is quite possible that radon which used to be harmlessly dispersed outside could now be diverted into the house by the new extension or conservatory. Consequently it is advisable to remeasure radon levels in the whole dwelling when the new building is finished.

BUILDING REGULATIONS

In certain areas of the United Kingdom, it is necessary to install radon-protective measures in extensions and conservatories to comply with the Building Regulations. You should contact your local authority building control department to find out whether protective measures are necessary in your area. Requirement C2 of Schedule 1 of the Building Regulations 1991 for England and Wales[3] refers to guidance included in a BRE Report[4]. This guidance is as follows.

> It is advisable when a house is extended that radon-protective measures be incorporated in the new work. For **a house with radon-protective measures** the extension should include protective measures equivalent to those in the existing house. Consideration should be given to linking the radon-proof barrier in the new floor to the radon-proof barrier in the existing house.
>
> Within the [defined] areas..., an extension to **an unprotected house** only requires secondary protection [provision for future subfloor extraction, ie radon sump and extract pipe or ventilated subfloor void] when the ground-floor area of the extension is greater than 30 m^2.

Where the house is unprotected, there is no requirement for radon-protective measures to be incorporated in an extension or conservatory with a ground floor area of less than 30 m^2. However, even if the new building does meet these criteria, it might still be prudent to install protective measures for the reasons discussed in previous sections of this leaflet. For more detailed guidance on the construction of dwellings in radon-affected areas, refer to *Radon: guidance on protective measures for new dwellings*[4].

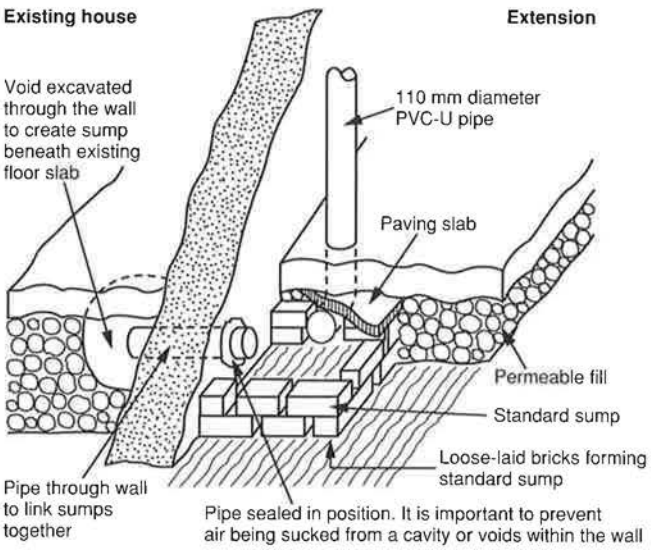


Figure 7 The sump should be connected through the wall to the fill beneath the existing house

CONCLUSION

By taking a few simple precautions at the time of construction, adding an extension or conservatory to an existing house need not increase the indoor radon level. It is also possible to incorporate measures into an extension or conservatory which can reduce the indoor radon level within the whole dwelling.

FURTHER INFORMATION

For additional information on measuring radon levels, contact:

National Radiological Protection Board
Chilton
Didcot
Oxon
OX11 0RQ

Telephone: 0235 831600

For further advice regarding building matters, contact:

BRE Advisory Service
Building Research Establishment
Garston
Watford
WD2 7JR

Telephone: 0923 664664

Help with radon-related problems of all kinds is available from the BRE Radon Hotline (telephone: 0923 664707). For specific advice on the subject of this leaflet, contact its author, Chris Scivyer, at BRE. Additional literature on radon and radon-protective methods[1,2,4] is available from the BRE Bookshop (address opposite).

REFERENCES

1 **Building Research Establishment.** *Sealing cracks in solid floors: a BRE guide to radon remedial measures in existing dwellings.* BRE Report. Garston, BRE, 1992.

2 **Building Research Establishment.** *Radon sumps: a BRE guide to radon remedial measures in existing dwellings.* BRE Report. Garston, BRE, 1993.

3 **Department of the Environment and the Welsh Office.** *The Building Regulations 1991.* Statutory Instrument 1991 No 2768. London, HMSO, 1991.

4 **Building Research Establishment.** *Radon: guidance on protective measures for new dwellings.* BRE Report. Garston, BRE, 1991 (revised 1992).

Further copies of this leaflet can be obtained, price £2 each, from the BRE Bookshop, Building Research Establishment, Garston, Watford, WD2 7JR (telephone 0923 664444; fax 0923 664400).

Building Research Establishment
XL10
April 1994

Printed in the UK for HMSO Dd.8392697, 4/94, C10, 38938