Passive sumps as a method of reducing radon levels in Irish dwellings

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1 INTRODUCTION

Radon gas is the second biggest cause of lung cancer after smoking and is directly linked to approximately 350 lung cancer cases in Ireland each year. It is a serious public health hazard, and the Government has published a National Radon Control Strategy to tackle the problem. The most cost-effective way of protecting the population from radon is to ensure that new dwellings are built to prevent the entry of this gas from below the building.

The two methods most commonly used to protect new buildings from radon are the installation of a radon membrane and a mechanism to depressurize the building. Since 1998, Irish Building Regulations have required that all new dwellings are fitted with a capped standby sump which can be activated if high radon levels are measured. Dwellings built in areas that are more at risk from radon (High Radon Areas) are also required to have a radon membrane installed. EPA data has shown a decrease of 13% in the average indoor radon level in Irish dwellings since the introduction of these requirements.

The protection of new buildings through depressurisation has been successfully achieved in other countries through the installation of a passive radon sump. The application of this simple, effective and inexpensive measure in Irish dwellings was researched by University of Galway in laboratory studies. This research showed that passive radon sumps have significant potential to reduce indoor radon levels and that the fitting of a static cowl to the passive sump increased its effectiveness. A limitation of the University of Galway study was that the system was not tested with natural wind conditions in dwellings.

2 METHODOLOGY

To address this limitation, a field trial of passive radon sumps and static cowls was carried out in a sample of Irish houses built to the requirements of the Building Regulations. The study focused on six adjacent, south-east facing houses of identical construction to reduce the factors that cause variations. This meant that the study was carried out under highly controlled conditions.

The radon levels in each of the houses were measured using digital radon monitors over a 6-week period under three test conditions:

1. Passive sump closed (test condition A)
2. Passive sump open (test condition B)
3. Passive sump open with a static cowl installed (test condition C)

3 RESULTS AND DISCUSSION

The results show an average reduction of 65% in radon levels due to the installation of a wind-driven passive sump (test condition B). The number of observations that exceed the Government's Reference Level for dwellings of 200 Bq/m^3 was reduced from 38% to 9% when the passive radon sump was in operation. This result has been confirmed as statistically significant. The cumulative effect of the installation of a passive sump plus a static cowl was an average reduction in radon levels of 75% (test condition C). The number of observations that exceed the Reference Level of 200 Bq/m^3 was reduced from 38% to 0% when a passive radon sump and static cowl were installed. The study concludes that the installation of a passive sump fitted with a static cowl in new houses is a low cost, effective method of reducing radon exposure in new Irish houses.