

Report of Proceedings of the Second Irish National Radon Forum

Preamble

The purpose of this report is to reflect the content of the second national radon forum held in Galway on the 23 October 2003. This report does not purport to be an absolute account of all matters discussed. Moreover the views expressed in this report should be regarded only as the expression of the views of the individuals concerned and should not necessarily be viewed as an expression of policy of the bodies that they represent.

Introduction and brief Overview

The second meeting of the Irish National Radon Forum was held on October 23 in the Quality Hotel, Oranmore, Galway. 43 people (see appendix 1) representing the Radiological Protection Institute of Ireland (RPII), University College Dublin (UCD), Environment and Heritage Service of Northern Ireland (EHSNI), Health and Safety Authority (HSA), Health and Safety Executive for Northern Ireland (HSENI), Department and Environment Heritage and Local Government (DOEHLG), Enterprise Ireland, Homebond, Local Authorities, Radon Mitigation Companies, Radon Supply Companies and Health Boards attended the meeting.

Dr Tony Colgan, RPII, opened the meeting welcoming all and explaining that the forum is organised under the banner of ERRICCA (European Radon Research and Industrial Collaboration Concerted Action). He then gave a brief overview of the agenda - the main areas of focus to be radon in workplaces, the planned revision of building regulations and radon remediation. Dr Colgan emphasised that radon is a serious issue (10 to 15% of the 1500 lung cancer cases are due to radon) and that perceptions need to be changed in order to decrease the risk from radon exposure. He also stressed that a strong and competitive radon mitigation industry is an essential component in a national radon programme.

Session 1 Communicating Risks

Chairman Dr Tony Colgan Radiological Protection Institute of Ireland

Presentation 1: Radon Risk Perception: ways to effectively communicate the risks from radon to the public.

Dr James McLaughlin, University College Dublin

Dr McLaughlin began by explaining that radon along with environmental tobacco smoke is a Group A carcinogen as described by the WHO.

He continued with a historical background of radon: the first reference to radon dates back to a 1490 medieval document. Studies of 19th Century silver miners found 75% of these miners probably had lung cancer caused by exposure to radon progeny. In the 1970s and 1980s population studies were conducted which led to the action levels that were implemented in the 1980s to the present day.

Evidence that radon poses a risk comes from human epidemiological studies (miners, residential), animal models (tumour induction, cellular affects) and radiation dosimetry (lung modelling, linear hypothesis)

Dr McLaughlin went on to explain that a person exposed to 200 Bq/m³, which is the Reference Level in Irish domestic dwellings receives an annual effective dose of 3-5 mSv and this gives rise to 1 to 2% lifetime risk of developing lung cancer.

He pointed out that radon is a concern for everyone: member of the public, workers, health authorities, regulators, trade unions, employers, construction industry, radon industry, and financial institutions. The lack of concern about radon stems from the fact that we have no sensory perceptions, no prompt health effects, radon exposure is natural, no one to blame (no enemy), scepticism, financial and practical aspects. He made the point that even though radon is natural, indoor radon is not (homes are manmade).

The estimated number of dwellings remediated in the US, Sweden and the UK is 320,000, 30,000 and 8,000 respectively. The figure for Ireland is unknown.

The methods by which the public obtains information about radon are important. There are various routes: direct contact, through the media, public relations/ marketing companies, local authorities, financial agencies, publicly respected professional groups such as general practitioners (GPs) and school teachers. Dr McLaughlin made the point that we need to choose our communication channels better and use people such as GPs who are well respected and to whom people will be listened.

Presentation 2: The Radon Programme in Northern Ireland

Mr Robert Larmour, Environment and Heritage Service, Northern Ireland.

Mr Larmour's presentation focused on the radon programme in domestic dwellings in Northern Ireland

The first report published concerning domestic radon monitoring in Northern Ireland was published on the 1st April 1989.

The second report was published in October 1993 in which 1,500 dwellings were tested. Householders in this survey were offered free measurements 22% of householders agreed to participate. This survey identified the South Down area as having a particularly high density of homes with radon concentrations above 200 Bq/m³ Reference Level.

The results of the most significant radon survey in domestic dwellings were published in May 1999. This was a geographical based survey which used 5 km ordnance survey grid squares as sampling units. A total of 15,700 measurements were made and the mean radon concentration was 19 Bq/m³. The highest individual radon concentration found in a dwelling was 4,900 Bq/m³. This survey indicated that 4,000 out of a total number of 640,000 dwellings are predicted to have average radon concentrations above the Reference Level of 200 Bq/m³ and to date approximately 1,100 have been found.

Mr Larmour then went on to talk about other initiatives that were undertaken in Northern Ireland to make people more aware of the radon problem and to encourage them to undertake radon measurements in their dwellings. One such initiative was to offer free measurements to householders in areas where >5% of the total housing stock is predicted to have radon levels above 200 Bq/m³. The radon programme in NI ran a radon road show in conjunction with Local Authorities. There was a press release given in advance followed by local media coverage. The road show was based primarily in local supermarkets in South County Down. Of the 1,500 people they talked to, 800 people were offered a free radon test. Another initiative involved direct contact with the public by calling door to door and offering free measurements. In 2002 all householders in one 5 km grid square in South County Down were targeted in this way and 67% of householders agreed to have their dwellings tested for radon.

Also when a report on radon is released, this is usually followed up by seminars and meeting with interested groups.

Concern was expressed at the lack of interest householders have in carrying out remedial work. For example, thirty-nine householders that had previously measured very high levels of radon ($< 1000 \text{ Bq/m}^3$) in their dwellings were contacted by letter offering a confidential discussion on radon. Only one person responded to this initiative.

The requirements of the Building Regulations governing radon which came into effect on 1 April 2001 were outlined. In areas where greater than 10% of dwellings are predicted to have radon concentrations in excess of the Reference Level a radon barrier and radon sump and stump must be provided. In areas where less than 10% of dwellings are predicted to have radon concentrations in excess of the Reference Level a radon barrier membrane must be provided.

To date of the 640,000 homes in Northern Ireland, 21,500 measurements have been made, the mean is 19 Bq/m^3 and the highest value is $4,900 \text{ Bq/m}^3$.

In the coming months it is hoped to start a radon in water survey, offering free measurements in specific areas. There also plans to complete 1km grid square mapping in selected High Radon Areas.

Session 2. Radon in Workplaces.

Chairman Mr Ger Lally Radon Centre

Presentation 1. Radon in the Irish workplace – a HSA perspective

Ms Hilary Byrne, Health and Safety Authority (HSA)

The first part of the presentation deals gives a general overview of the role and functions of the HSA.

- The Board is composed of a chairman, 3 union representatives, 3 employers representatives and 4 ministerial nominees.
- 95 inspectors out of 159 staff in total, based throughout the 6 population centres of the country.
- In 2002, 10,000 inspections were carried out in total. During inspections, inspectors provide information and advices (guidance) to the employer. The overall outcome of these inspections was that 40 workplaces were shut down temporarily.
- HSA also carries out research on workplace hazards.
- HSA works with government departments and liaises with Environmental Protection Agency, Office of Tobacco Control and RPII.
- HSA has an information phone line which is open 5 days per week.

Ms Byrne then outlined the HSA's position concerning radon in the workplace. Expertise and specific legislation lies with the RPII Workplace hazards expertise and legislation lies with HSA

- Radon is a potential hazard in the workplace and therefore needs to be assessed.
- Under Health, Safety and Welfare in Work Act, 1989, section 12 states that every workplace has to have a Safety Statement where hazards are identified, risks are assessed and adequate control measured are explained.
- Radon must be included in the Risk Assessment of all indoor workplaces in High Radon Areas, as well as some underground workplace namely mines and show caves. Outdoor workplaces are not required to carry out radon measurements.

Presentation 2 Radon in workplaces – the Northern Ireland experience

Dr Rowland Jones, Health and Safety Executive for Northern Ireland (HSENI)

Dr Jones explained that HSENI is enforcing the legislation concerning radon in the workplaces. The Health and Safety at Work [NI] Order 1978, Management of Health and Safety at Work Regulations [NI] 2000 and Ionising Radiation Regulations [NI] 2000 are the pieces of legislation governing radon in the workplace in Northern Ireland.

Under The Health and Safety at Work [NI] Order 1978 the main responsibilities of an employer are as follows:

- To ensure the health and safety of employees so far as is reasonably practicable.
- To ensure the health and safety of people who are not employees.

Under the Management of Health and safety at work Regulations [NI] 2000 there is a duty on employers to assess the risk and to take appropriate remedial action to reduce any risks to an acceptable level or eliminate if possible.

The main legislation which deals with radon in the workplace is the Ionising Radiation Regulations [NI] 2000. The regulations apply in the following areas:

- To any work (other than a practice) carried out in an atmosphere containing radon-222 gas at a concentration in air averaged over any 24 hour period exceeding 400 Bq/m³ except where the concentrations of short-lived radon-222 daughters in air averaged over any 8 hr working period does not exceed $6.24 \times 10^{-7} \text{ Jm}^{-3}$.
- Where a dose limit for non classified worker exceeds 6 mSv.
- Where a dose limit for a member of the public (incl. school pupils) exceeds 1 mSv
- There is a requirement for an employer to assess the risk of exposure to ionising radiation to any employee and other person to restrict the exposure.

Dr Jones then outlined the main strategy adopted by the Northern Ireland Authorities in addressing radon in the workplace.

In 1989 an initial survey measured radon in 25 workplaces and 1 was found to be above 400 Bq/m³ and subsequently had remedial work carried out. Therefore, 4% of all workplaces are potentially affected.

In 1998, public bodies (e.g. Schools, Education Library Boards, Health trusts, Government Agencies) were asked to survey their premises to fulfil their duties under Management of Health and Safety at Work Regulations.

A total of 369 premises were surveyed and 18 of these had radon concentrations in excess of 400 Bq/m³.

Workplaces with radon levels in excess of the Reference Level have been found in some lower risk (1-3% of dwellings above Reference Level of 200 Bq/m³) areas and is estimated that approximated 5% of workplaces with high radon levels are within these areas.

Survey work is ongoing and all educational establishments will have been surveyed by the end of 2004.

Presentation 3. The RPII's workplace campaign: review and the way forward

David Fenton, Radiological Protection Institute of Ireland (RPII)

As an introduction Mr Fenton outlined the statutory functions of the RPII. He then went on to briefly to describe the National Radon Survey in domestic dwellings and the end use of the radon prediction map which is incorporated into national regulations (SI 125 of 2000).

He then outlined the legislative framework governing the regulation of radon in the workplace. Two sets of regulations are applicable

- The Health, Safety and Welfare at Work Act, 1989, for which the HSA is the regulatory authority and
- The Radiological Protection Act, 1991 Ionising Radiation Order, (SI 125 of 2000) for which the RPII is the regulatory authority.

Under the Health, Safety and Welfare at Work Act

- All employers with premises in High Radon Areas must survey these premises for radon.
- Radon must be included in the Safety Statement.

Under Statutory Instrument No 125 of 2000

- SI 125 of 2000 applies to workplaces where a work activity takes place in an area having a radon concentration of greater than 400 Bq/m³ average over any 3 months.
- There is no general duty to measure radon levels; an employer has to be directed to do so by the RPII.
- The RPII has the power to prosecute employers in breach of the regulations contained in the SI.
- If levels are found to exceed 400 Bq/m³, the employer must evaluate if remedial measures to reduce radon levels are justified. (The RPII is to issue guidance on this subject shortly).

Mr Fenton then reviewed the RPII's recent pilot direction campaigns in Ennis and Tralee. This involved directing by letter some 3,000 individual employers in both towns to carry out radon measurements in their workplaces. The Ennis campaign was then considered in more detail.

The Ennis campaign was publicised by means of a seminar for employers that was held just prior to start of the campaign. Initially 1,300 employers were sent direction letters in August 2001. This was followed by two reminder letters. In March those employers that had not responded to the initial direction or subsequent reminder letters were sent by registered mail a second direction letter. The overall response to this initiative has been poor with only 25% of employers who ought to have carried out measurements having done so.

Mr Fenton concluded his presentation by outlining the future strategy of the RPII concerning radon in workplaces. The key areas of this strategy are as follows:

- A repeat of direction campaigns similar to those in Ennis and Tralee could not be recommended.
- Future efforts will focus on increasing awareness.
- Future direction will be made on a selective basis.
- RPII guidance material has been revised to take account of the HSA position.
- Employers who fail to comply with a direction from the RPII to carryout a radon measurement are liable to be prosecuted.

Session 3 Building Regulations and Radon Prevention

Chairman Mr Michael McCarthy, Department of Environment, Heritage and Local Government

Presentation 1. Radon concentration in homes – the effect of the amending building regulations

Hugh Synnott, Radiological Protection Institute of Ireland (RPII)

Mr Synnott presented an evaluation of the impact the amending Building Regulations are having on radon concentrations in new homes in the Ennis Area of Co Clare which is High Radon Area. Technical Guidance Document C of the Amending Building Regulations require that all new dwellings which commenced construction after July 1st 1998 must have a radon sump installed and if located in a High Radon Area must have a radon barrier installed over the footprint of the building. A second objective was to assess the householder's awareness of radon preventative measures in their homes.

Householders were invited to participate in a free radon survey and a total of 90 householders completed measurements. Average radon concentrations measured in the new houses were significantly lower than those measured during the National Survey however 12% of dwellings still had average radon concentrations in excess of the Reference Level.

Participating householders were asked to fill in a short questionnaire which sought information about their dwellings and their awareness of the radon preventative measures that were installed in their dwelling. A total of 83 householders completed this questionnaire. The level of awareness amongst householders concerning the radon preventative measures installed in their dwellings was low with a total of 25 and 36 percent respectively of householders indicating that a radon sump and radon barrier had been installed in their dwelling.

A number of key recommendations were made:

- All new houses once occupied should have a radon test done.
- Information on radon prevention should be given to all householders on purchasing a new house.
- Sump outlets should be clearly marked to enable location identification should this be required at some stage in the future.

Presentation 2. Radon Prevention in New Buildings

Ms Sarah Neary, Department of the Environment, Heritage & Local Government (DOEHLG)

Ms Neary gave an overview of building control in Ireland and reviewed the Building Regulations with respect to radon.

The Building Regulations are divided into 12 parts. The Regulations were first drafted in 1991 and came into force in July 1992. In response to an overall review and comments from the RPII a review of the Regulations took place in 1997 and came into force on July 1st 1998. Section C3 of these Regulations deals specifically with radon. The primary enforcers of the Building Regulations are the Building Control Authorities

Methods of compliance with the Building Regulations are contained in the Technical Guidance Documents (TGDs). TGD-C deals with radon. TGDs are updated as required. Ms Neary presented the proposed changes outlined in the new draft of TGD-C. This document

was available for public consultation and suggested changes should have been submitted to DOEHLG before 30th October 2003.

DOEHLG is developing an information leaflet on radon preventative measures in new dwellings for publication in 2004 aimed at house owners/buyers and tenants. It is envisaged that it will be distributed via Construction Industry Federation, Irish House Buyers Association and mortgage lenders.

Presentation 3 Practical experience in implementing the Building Regulations

Mr Michael O'Gabhláin, Remedia Limited

Mr O'Gabhláin began by stating that the aim of the Building Regulations pertaining to radon is to reduce the incidence of lung cancer. He stated that it is important to realise that the radon sump put in new houses gives no protection at all and that in the new draft of the TGD we should move away from the phrase "passive" sump and use a different term such as "inactive" sump. As many householders are not clear about the function of the sump and many believe that it is somehow preventing radon entry.

He agreed with previous speakers that every new house should be tested shortly after building is completed.

He stated that the Building Regulations assumed people would test their houses once they moved in but in reality they don't. He suggested perhaps that this be made compulsory. He asked should we make the builder do this.

Mr O'Gabhláin then went on to describe practical problems on site. Like others he agrees that it is very difficult for a builder to lay a fully airtight barrier. He stressed the need for a 100% gas tight fit for a radon barrier membrane and that this is impossible to achieve in practice. Therefore it is not surprising that a number of dwellings from the Ennis survey have high radon levels despite the installation of radon barriers. Furthermore if 98% of cracks are sealed, 98% of radon can seep through the remaining (2%) of cracks left unsealed.

He then went on to outline the reasons for barrier failure:

- Barrier can be punctured on the top of a wall.
- Unsupported membranes with a bridging gap give rise to tear.
- Loose flaps not taped down.
- Prefabricated membranes not always suitable.

Session 4 Building Regulations and Radon Prevention

Chairman Mr Michael O'Gabhláin Remedia Ltd.

Presentation 4. The Properties of Barrier Membranes

Mr Brendan Dollard, Enterprise Ireland.

Mr Dollard began by outlining the process in which radon enters a building. The purpose of a radon barrier membrane is to have an airtight seal so as to prevent soil gas radon from entering a building through pressure driven flow mechanisms.

There are different types of materials that can be used as a barrier e.g. concrete slabs (150mm), bitumen or plastic (HDPE, LDPE). The latter maybe layered with EVA, EVOH, and Foil or is reinforced.

The thickness of a radon membrane (polyethylene) varies from country to country. In the US a thickness of 0.15mm is used. The UK uses 0.3mm and in Ireland a thickness of 0.35mm - 0.4mm is specified. In the Czech Republic 1mm – 2mm is used.

Mr Dollard then outlined the main reasons for membrane failure, the main reasons are as follows:

- Tear/puncture hole in membrane;
 - Impact
 - Tearing at overhangs
 - Puncture from above and below
 - Cuts before during and after installation
 - Burn through
 - Vandalism
- Failure of joint;
 - Incorrect application
 - Dirt/water/moisture
 - Low temperatures
 - Difficult joint locations
 - Permeability of membrane
 - Irish Agreement Board certified barriers are required to have a diffusion co-efficient of less than $10 \times 10^{-12} \text{ m}^2/\text{s}$
 - Only barriers manufactured using virgin polyethylene are allowed
- Quality of manufacture & durability;
 - Quality system
 - Qualified supplier

In concluding his presentation Mr Dollard outlined the key physical properties of radon barrier membranes

- Barriers and joints must be gas tight to eliminate convective flow of ground gas.
- Barrier materials must be resistant to physical damage and must be able to accommodate building movement.
- Diffusion of radon through the membrane must be limited.
- Membranes must be durable and resistant to soil corrosion.
- The presence of a membrane does not guarantee low indoor radon levels and the building should be tested.

Presentation 5. Radon Remediation – practical considerations and essential requirements

Mr Allan Ellard, Radon Council of Ireland

Mr Ellard described five essential requirements that a radon remediation company should have and indicated that it was the aim of the radon Council of Ireland to promote these matters.

- Professionalism
- Expertise;
 - Staff must be trained (internal and external), competence in performing the job and have a good track record.
- Reliability;
 - Must have a high quality product and service.
 - Must understand the needs of the customer.
 - Show transparent pricing.
 - Address the present and future needs of the customer.

- Confidence
 - Must have a good track record and references provide good customer service.
 - Good attitude towards staff.
 - Provide a guarantee.
- Accountability
 - Provide certification on completion of job.
 - Have external and site controls.
 - Carry out external audits.

Mr Ellard mentioned that there are approximately 8 companies in Ireland, most of whom are members of the Radon Council of Ireland are involved in there area of radon remediation.

Discussion

The main areas of discussion are detailed below:

- Responsibilities for the Regulation of Radon in the Workplace.
A number of questions were asked regarding the regulation of radon in the workplace.

Will there be any more directions issued to employers?

An RPII spokesperson said a repeat of the campaign in Ennis could not be recommended and into the future directions will be issued on a selective basis. The main focus will be on advertising and promoting the legislation.

Is it the RPII or the HSA who is responsible for the regulation of radon in the workplace?

The HSA representative indicated that the primary legislation rests with the RPII and since the RPII have the most expertise concerning radon the RPII would be the main organisation responsible for the regulation of radon in the workplace. A representative of RLS, an approved radon measurement service, commented that the division of responsibility between the RPII and HSA was unhelpful as it led to confusion. In addition it could lead to ambiguity as regards who was responsible for ensuring workplace measurements were carried out. A Radon Council of Ireland representative enquired if the HSA is in position to enforce remediation. The RPII said the power to force an employer to remediate a workplace should the prior evaluation justify this, lies with the RPII and failure of an employer to carry out remediation could result in a prosecution.

What is required of employers in areas other than High Radon Areas?

High Radon Areas are being prioritised as a greater proportion of workplaces with a radon problem are likely to exist in these areas. For this reason a general duty on employers to measure radon in High Radon Areas exists under the Safety, Health and Welfare at Work Act, 1989. It was also pointed out that the RPII's "Radon in Workplace" brochure states that a building with radon concentrations in excess of the Reference Level can occur anywhere in the country and employers are urged to take a pro-active approach concerning the measurement of radon in their workplaces.

- Current Status of dwellings that have been remediated.
A representative from the Radon Council of Ireland estimated that approximately 100 houses have been remediated in Ireland (RPII had previously thought a value of approximately 50 homes based on its information).

- List of Radon Remediation Companies as issued by the RPII.
A representative from a radon remediation company asked why there were only 2 names on a list of remediation companies distributed by the RPII to householders who have high radon concentrations. The RPII replied that all companies of whom the RPII were aware were listed. However the RPII had no difficulty listing companies individually and agreed to do so.
- Building Regulations.
A representative of the DOEHLG mentioned that he was involved in bringing in the Regulations in 1997 and acknowledged there must be change as time progresses. He was pleased with the results of the pilot survey in Ennis which seemed to indicate that the building regulations were making an impact. He also said that they never expected 100% success with a radon barrier hence the reason for secondary protection of an active sump. He gave credit to Homebond with their useful publication *Right on Site* and the usefulness in organising regional seminars at the time. He also acknowledged the support of homebuilders in the industry.
- Radon Council of Ireland.
The meeting heard that the “Radon Council of Ireland” was set up by a number of companies concerned about the radon problem in Ireland. The issue of the “Radon Council of Ireland” and the “Radon Ireland Group” having the same telephone number was raised. It was pointed out that Radon Ireland, with the consent of the other members of the Radon Council, agreed to act as contact point for the Radon Council of Ireland. Clarification was sought as to whether the Radon Council of Ireland is a “self regulatory” or an “independent regulatory” body. A representative of the Radon Council of Ireland said it is self-regulating body and any indication otherwise was an error.
- Inspection of building under construction.
A DOEHLG representative indicated that each Local Authority aimed to inspect annually 12-15% of all new buildings under construction. But might not achieve this target in all cases. In Ireland there is currently a voluntary certification system in place. It was recognised that there was potential for improvements in the system including in the number of inspections carried out.
- VAT on properties
A question was asked whether VAT is paid on the purchase of a new property? A representative from DOEHLG responded by saying that VAT is not paid on the completed property but on the labour, materials etc that go in to the construction of the house.
- Radon Barrier Permeability
An RPII representative enquired how the permeability of a radon barrier membrane is determined. It was explained that testing is carried out by the Swedish National Testing and Research Institute and a uranium source is used.
- Relationship between DOEHLG and RPII
A question was asked given that RPII are under the aegis of the DOEHLG did the Department influence the RPIIs recent strategy with local authorities. The RPII replied that all local authorities were advised of their responsibilities under SI 125 of 2000. The meeting heard that the DOEHLG had not or would not influence future strategy in relation to the local authorities.

A representative of Wicklow County Council said that as far as he knew the local authorities were seriously considering measuring radon in the workplace. He added that it was very likely that Wicklow County Council would soon do so for its workplaces.

- Relationship between the HSA and commercial measurement services

The HSA representative was asked if the HSA was offering commercial measuring services to the workplaces they were inspecting. The HSA answered no because it felt there could be a conflict of interest. A further question asked if it was a problem for the HSA to collaborate with another regulatory body (the RPII) knowing that it was offering commercial measurements to workplaces. This was thought to be a matter for the RPII. A RPII representative pointed out that its prime role was to increase awareness of the radon issue and not to promote its radon measurement service. It was pointed out that it was open to all to now contact workplaces in High Radon Areas and advise them of their responsibilities under HSA legislation.

List of attendees of 2nd National Radon Forum, Galway, 23rd October 2003

Speakers and Chairman

Dr Tony Colgan, *Radiological Protection Institute of Ireland*
Dr James McLaughlin, *University College Dublin*
Mr Robert Larmour, *Environment and Heritage Service of Northern Ireland*
Mr Ger Lally, *The Radon Centre*
Ms Hilary Byrne, *Health and Safety Authority*
Mr David Fenton, *Radiological Protection Institute of Ireland*
Dr Rowland Jones, *Health and Safety Executive for Northern Ireland*
Mr Michael McCarthy, *Department and Environment Heritage and Local Government*
Mr Hugh Synnott, *Radiological Protection Institute of Ireland*
Ms Sarah Neary, *Department and Environment Heritage and Local Government*
Mr Michael O'Gabhlain, *Remedia Ltd*
Mr Brendan Dollard, *Enterprise Ireland*
Mr Alan Ellard, *Radon Council of Ireland*

Attendees

Olwyn Hanley, *Radiological Protection Institute of Ireland*
Suzanne Prenter, *Radiological Protection Institute of Ireland*
Lucy Doody, *Radiological Protection Institute of Ireland*
Mairin O'Colmain, *Radiological Protection Institute of Ireland*
Ms Eileen Loughman, *South Western Area Health Board*
Ray Daniels, *Waterford City Council*
Liam Tinney, *FF Radon Ltd*
Kevin Kelleher, *University College Dublin*
John Ryan, *Galway County Council*
Noel Carroll, *Department and Environment Heritage and Local Government*
Enda Hoey, *Galway County Council*
K. Higgins, *Radon Barrier Company*
Donal Higgins, *Radon Laboratory Services*
Brian Meenaghan, *Galway County Council*
Eugene Monahan, *The Radon Centre*
Eugene Farrell, *Homebond*
Mike O'Grady, *Homebond*
Tom Crotty, *Homebond*
Garret McLoughlin, *North Tipperary County Council*
Anne-Louise Grant, *Southern Health Board*
Mary Downes, *Department and Environment Heritage and Local Government*
David Hanlon, *Department and Environment Heritage and Local Government*
Dr Tessa Greally, *Mid-Western Health Board*
Peter Mercier, *Necoflex Ltd*
Tim O'Neill, *Necoflex Ltd*
Gerard Walsh, *Cork City Council*
Hugh Hunter, *Wicklow County Council*
Phil Widdop, *Icopal*
Bernie O'Halloran, *South Eastern Health Board*
Bernard Ward, *Member of the Public*