American Association of Radon Scientists and Technologists, Inc.

UPDATE Annoucement

Abstracts Currently Accepted For Presentations
at the
2015 International Radon Symposium
Bloomington, MN
September 20-23, 2015

June 18, 2015 - The following twenty-two abstracts have been initially accepted for presentation by the peer review committee of the 2015 International Radon Symposium, to be held this year in Bloomington, Minnesota from September 20-23, 2015. The Symposium reserves the right to accept additional abstracts for presentation, and to make changes to the program. An initial program has been published and delineate prospective speakers and presentation times.

All presentations and publication of subsequent papers are contingent upon the researchers acceptance and completion of the full requirements of the International Radon Symposium's Proceedings editorial committee.

Please check the International Radon Symposium web site for ongoing program updates: www.internationalradonsymposium.org

DETERMINATION OF INDOOR SOIL RADON CONCENTRATIONS IN AL MAFRAQ DISTRICT, JORDAN

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Abstract

Indoor and soil radon concentration measurements were carried out in the district of Al Mafraq, Jordan. Al Mafraq district consists of the city of Al Mafraq city (administrative center of the district) and several towns and villages. Time-integrated passive radon dosimeters containing CR-39 detectors have been used to determine the level of radon for 11 different regions in this district. Indoor radon concentrations were found to vary from region to region ranged from a minimum value of 20.2 $Bq.m^{-3}$ in the Al Mafraq city and a maximum value of 46.7 $Bq.m^{-3}$ in Hosha village. Radon in soil was measured at a depth of 40 cm below the earth surface. The minimum concentration was recorded in Al Mofraq city (3.3 $kBq.m^{-3}$), while the maximum value was in Hosha village (10.3 $kBq.m^{-3}$). A positive correlation was obtained between indoor and soil radon concentrations.

RADON IN HOMES: THE PROGRAMME OF THE INTERNATIONAL ATOMIC ENERGY AGENCY

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Abstract

The International Basic Safety Standards (BSS) is one of the IAEA's most important documents on radiation safety. The 2014 edition of the BSS contains, for the first time, substantive requirements on the control of radon in homes and workplaces. In addition, a safety guide, which provides advice on how best to apply the requirements in the BSS, has recently been published. In implementing its work program on radon in homes, the IAEA coordinates with the World Health Organization.

The BSS requires that national authorities provide information to the public on radon, including its health effects, and, if appropriate, to develop an action plan to control public exposure. The guidance on national action plans covers the following key issues (1) establish a reference level for homes not exceeding 300 Bq/m^3; (2) establish a reference level for workplaces not exceeding 1 000 Bq/m^3; (3) identify "radon prone" areas where there is a greater risk of high radon concentrations indoors; (4) implement corrective measures to reduce radon concentrations in existing buildings; and (5) develop building codes to prevent radon accumulation in new buildings. Advice is provided on measurement protocols and the review of national action plans.

The IAEA also undertakes an extensive programme of training and technical visits to assist Member States with their radon programs.

THE HISTORY OF THE RADON PROGRAM IN THE UNITED STATES FROM 1952-2014.

A.C. George

Abstract

The US Radon measurement program began in the late 1950's by the US Public Health Service in Colorado, New Mexico and Utah during the uranium frenzy. After the 1967 Congressional Hearings on the working conditions in uranium mines, the US Atomic Energy Commission (AEC) was asked to conduct studies in active uranium mines to assess the exposure of the miners on the Colorado Plateau and in New Mexico. From 1967-1972 the Health and Safety Laboratory (HASL) of the US AEC in New York investigated more than twenty uranium mines for radon and radon decay product concentrations and particle size in four large uranium mines in New Mexico. In 1970, the US Environmental Protection Agency (EPA) was established and took over some of the AEC radon measurement activities. Between1975-1978, the Environmental Measurements Laboratory (EML) of the US Department of Energy (DOE) conducted the first detailed indoor radon survey in the US. Later in 1984, the very high concentrations of radon found in Pennsylvania homes set the wheels in motion and gave birth to the US Radon Industry. The US EPA expanded its involvement in radon issues and assumed an active role by establishing the National Radon Proficiency Program (NRPP) to evaluate the effectiveness of radon measurement and mitigation methods. In 1998, due to limited resources EPA privatized the radon program. The paper presents a personal perspective of past events and current status of the US radon program. I will present an update on radon health effects, the incidence rate of lung cancer in the US and the number of radon measurements made from 1988-2014 using short-term test methods. More than 24 million measurements were made in the last 27 years and as a result more than 1.3 million homes were mitigated successfully. It is estimated that less than 2% of the radon measurements performed in the US are made using long-term testing devices. The number of homes above the US action level of 4 pCi/L) may be about 8.5 million because more than 50 million homes were added since 1990 to the home inventory. This paper will discuss the current instruments and methods used to measure radon in the US, and what is the effectiveness of radon resistant new construction, the current status of testing protocols and mitigation standards.

RADON AND TOBACCO SMOKE RISK REDUCTION FOR LUNG CANCER PREVENTION

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Abstract

Lung cancer is preventable through eliminating radon and tobacco smoke. We examined demographic factors and home testing at baseline of a larger study to test the effects of a tailored environmental feedback intervention to reduce home exposure to radon and secondhand smoke (SHS). A sample of homeowners (*n*=438) and renters (*n*=47) were recruited at an outpatient clinic. Homeowners were randomly assigned to treatment or control groups. Free home test kits for radon and SHS were provided to the treatment group and renters at enrollment; they received $20 to test. Likelihood to test did not vary by smoking status. Compared to homeowners, renters were younger, less likely to be Caucasian, and had less education and higher air nicotine levels. Renters (and landlords) are an important target for risk reduction measures. The ambulatory healthcare setting may be a promising location for risk reduction activities especially with those at high risk.

RADON EDUCATION AND AWARENESS WORKSHOP IN NORTHWESTERN ONTARIO: AN ATTEMPT TO COMMUNICATE RADON RISK TO A PRIORITY POPULATION

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Abstract

More than 13% of Northwestern Ontario homes tested above the radon guideline. Radon risk in this area is compounded by long winters and higher smoking rates. Additionally, a lack of certified radon professionals has precluded this community from meeting radon measurement and mitigation needs. Hence, there was an urgent need to take steps to reduce radon risk.

On November 20, 2014, the service of Ecosuperior, a local environmental non-government organization, was contracted to organize a day-long workshop in Thunder Bay, Ontario to inform local residents about radon risks and encourage local contractors to become certified radon professionals.

The workshop resulted in a tremendous response. Following the workshop, the sale of radon detectors increased dramatically, several local contractors became certified radon professionals, and news and media coverage resulted. This workshop had a significant impact by increasing knowledge of radon testing and mitigation, and of adverse health effects of radon and smoking.

RADON PREVENTION: MITIGATION TECHNIQUES USED IN COLD CLIMATES

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Abstract

Active soil depressurization (ASD) is an effective, commonly used radon mitigation technique. The basis is that an exhaust fan pulls just enough air from beneath the building to induce a small negative pressure in the soil relative to the building. Typically, the lowest power-consuming fan that can achieve the required depressurization is chosen, and operated continuously at full speed. Due to practical limitations of available fan sizes and seasonal variation of the depressurization required, this often results in more depressurization and energy consumption than is required.

This presentation discusses the results of a cold-climate investigation, whereby two ASD radon mitigation systems were retrofitted with a modulating-fan-speed-controller, which continually optimized the speed of the exhaust fan to only that which was required for radon control under varying conditions. Data analysis showed a clear expectation for energy savings through reduced fan electrical consumption, and promise of additional energy savings through the reduced exhaust flow volume.

MINNESOTA DEPARTMENT OF HEALTH'S RADON RESISTANT NEW CONSTRUCTION EFFECTIVENESS STUDY

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Abstract

This study assessed the effectiveness of Radon Resistant New Construction (RRNC) practices as installed by licensed residential contractors in Minnesota homes. Since June 2009 all new Minnesota homes have been required by either the state energy or building code to have passive RRNC features installed to reduce indoor radon levels. These passive features have been found to have varying levels of effectiveness, largely dependent on the installation practices. The primary goals of this study were to evaluate: 1. The radon concentrations in an estimated 800 Minnesota homes with 'as-built' passive RRNC features; 2. The change in radon concentrations when 100 of these passive RRNC homes are converted to active RRNC; and 3. The radon concentrations in 100 'as-built' active RRNC homes with features consistent with the MDH Gold Standard. Results from this study showed a decrease in the number of new homes built with elevated radon concentrations and a very successful radon reduction rate for those homes that were activated.

EVALUATION OF SOIL GAS RADON CONCENTRATION OF SOILS IN KOREA

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ABSTRACT

According to the natural background radiation map of Korean peninsula, nine locations have been selected to measure their uranium-238, radium-226 and soil gas radon-222 concentrations. Samples were collected from 1 m depth by removing upper and weathered layers. Rock samples were investigated for their radium and uranium content at Yonsei University environmental radioactivity center and Korea basic science institute with ICP-MS (inductively coupled plasma mass spectrometry). At each location soil gas radon concentration were measured by RAD7. Radon emanation was also measured at the lab using closed chamber. The results indicate direct correlation between uranium, radium and soil gas radon concentration.

ENHANCEMENT OF RADON REMOVAL EFFICIENCY USING ACTIVATED CARBON SUPPORTED BY NANO-SIZED CARBON COLLOIDS (NCC)

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Abstract

Granular activated carbon (GAC) is well-known as being able to adsorb radon. In this study, the effect of NCC-supported GAC on enhancement of adsorption capacity was conducted. NCC'S were produced by electrolysis method, and the nano-sized particles had high dispersability in water because of the carboxyl functional groups, which are hydrophilic.
500 ppm of NCC was supported onto GAC to investigate the enhancement of radon removal efficiency. The average amount of radon removed by pure GAC was 1,360.0 pCi/g, By contrast, the removal by NCC-supported GAC was 1,909.3 pCi/g. Considering the surface area of GAC, pure GAC captured radon with 1.2 pCi/m^2, and NCC-supported GAC captured radon with 1.9 pCi/m^2. Although it was considered that micro-pores filled up with nano - particles would enhance the removal capacity, it is assumed that the hydrophilic property of NCC affected removal capacity because of the high solubility in water characteristic of radon.

IS U.S. RADON PREVALENCE GREATER THAN 1 IN 15 HOMES ?

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Abstract

Over 20 years ago the U.S. Environmental Protection Agency (EPA) reported that about 6% of U.S. homes have annual average radon levels greater than 4 pCi/L (148 Bq/m^3). This approximation, which continues to be cited, was partly based on measurement data from nearly 6000 homes across the nation. Since then, many thousands of radon measurements have been conducted in U.S. homes, thereby providing sufficient data to re-evaluate the radon prevalence in the states. Using radon measurement data from both commercial laboratories and state entities (e.g., health departments), as well as 2010 Census data regarding housing types, the percentages of homes in most of the >3000 counties in the U.S. were determined. Results indicate that a significantly greater portion of U.S. homes contain radon above the 4 pCi/L recommended action level.

MEASUREMENT OF RADON IN NATURAL GAS AND IN PROPANE USING ELECTRET ION CHAMBERS

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Abstract

Electret ion chambers (known by the trade name, E-PERM$^{(R)}$) have been extensively used for measuring indoor and outdoor radon concentration in air. In view of the recent interest in measuring radon in natural gas, research is initiated to device arrangement for sampling and analyzing radon in natural gas. Natural gas is chemically very different from air both in terms of density and ionization potentials (energy needed to produce one ion pair) and is expected to have the response different from that of air. Further, Electret ion chambers (EICs) use ionization measurements compared to alpha counting used in scintillation cells, the other technique standardized for measuring radon in natural gas. Research results are presented in this paper, comparing the two technologies.

RADON CONTROL OPTIONS FOR NEW CONSTRUCTION IN LOW RISE RESIDENTIAL BUILDINGS: A CANADIAN PERSPECTIVE

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Abstract

In late 2013, the Canadian General Standards Board (CGSB) established a working group to develop a new national standard for radon control options for new low-rise residential construction. The working group reviewed "best practices" from other jurisdictions and standards bodies and built on those methodologies deemed compatible with Canadian requirements. The work culminated in the draft national standard, WD 1 CAN[1] CGSB-149.11 to provide builders and developers with design criteria, methods, and sample construction specifications to minimize radon entry into new dwellings and accommodate future mitigation measures if required. The new standard features consistent and progressive requirements for a three- level approach, ranging from a radon rough-in through to a full active soil depressurization system.

This paper details the standards development and consensus-building process with expected committee approval anticipated during fall 2015. CAN[1] CGSB-149.11 may also be cross-referenced by the Canadian National Building Code.

[1] Pending Standards Council of Canada approval

AMBIENT RADON CONCENTRATIONS IN A NEIGHBORHOOD WITH HIGH INDOOR RADON

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Abstract

The Reading Prong is a granitic based geological formation that runs from southeastern Pennsylvania into New Jersey, New York and up into New England. This area was the location of the original house that brought radon to national prominence when indoor concentrations exceeding 2000 pCi/l were found. Within the past year, new houses in this area of Pennsylvania have been found to have indoor radon concentrations exceeding 400 pCi/l, up to 3,700 pCi/l. This paper will present radon measurement data showing outdoor radon concentrations in the neighborhood where many houses have installed sub-slab depressurizations systems, as well as soil flux measurements and gamma surface measurements to determine the potential for exposure. Where data is available showing the pre-remediation sub-slab radon concentrations, this will also be presented. This study is designed to determine if numerous houses in a concentrated area are significantly increasing the ambient radon concentration near ground level and whether any increase is due to exhausted radon from the homes or natural emanation from the soil, and also the potential increased dose from gamma radiation from the underlying soil and rock formations.

EFFECT OF SUB-SLAB PRESSURIZATION ON INDOOR BASEMENT TEMPERATURE AND RELATIVE HUMIDITY

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Abstract

Pressurization as a mitigation strategy in radon mitigation is mentioned in training courses but is not widely practiced. Allied Radon Services, Inc. has encountered a house in which portions of the top of the foundation and sill plate are below grade. It is believed that radon is being drawn into the basement through the sill plate/foundation joint. By pressurizing the basement slab with two systems, the radon level is reduced to an average between 2.0 and 3.0 pCi/L. In order to determine the effect that pressurizing the slab has on indoor temperature and relative humidity, data loggers have been deployed. One is measuring conditions outdoors, two are measuring conditions at communication test holes in the slab, and the fourth is measuring conditions in the basement. This data will assist in determining whether it is necessary to take precautions to protect the indoor environment of the house.

RADON EXHALATION RATE IN SOIL SAMPLES OF KATHMANDU VALLEY

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Abstract

The concentration of indoor radon (^{222}Rn) depends primarily on building materials like bricks, sand, cement etc. and amount of radon in underlying soil. To reduce the level of indoor radon gas, the radon exhalation rate of the soil (either underlying soil or soil used to make building materials) is important. To account for this, levels of radon concentration and its exhalation rate in soil samples of Kathmandu Valley, Nepal have been studied by time integrated method using LR-115, type II plastic track detectors based on Solid State Nuclear Track Detector (SSNTD) Technique. It was found that the average Radon concentration lies between (750.00±1165.97) and (4918.00±1165.97) with average (2321.14±1165.97) Bqm^{-3}. Surface exhalation rates lie between (0.4368±0.6265) and (2.7913±0.6265) with an average of (1.2753±0.6265) $Bqm^{-2}hr^{-1}$ and mass exhalation rates lie between (0.00219±0.003207) and (0.01403±0.003207) with an average of (0.006410±0.003207) $BqKg^{-1}hr^{-1}$. Higher values of radon exhalation rates were found in the soil samples corresponding to the dwellings with high indoor radon concentration.

PROMOTING THE MEASUREMENT OF RADON ACTIVITY IN THE HOMES OF LUNG CANCER PATIENTS

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Abstract

The lung-cancer risks associated with protracted radon exposure are well established and health officials recommend sampling all homes for radon (WHO 2009). However, the frequency of radon testing in homes nationwide is well below 50%. It is proposed that a health-outcome based priority/pilot be the measurement of radon in the homes of individuals diagnosed with lung cancer. Such patients (both smokers & non-smokers) often want to know what factors contributed to their disease, often including the radon levels in their home, and if those factors may present a continued risk to other family members/occupants. These radon-associated patient home measurements can raise the awareness/education of oncology-nurses and physicians who can be persuasive spokespersons for measuring and lowering radon radiation exposures for all their patients and communities. CanSAR (Cancer Survivors Against Radon) and CRRR (Citizens for Radioactive Radon Reduction) support for such radon-measurements (e.g., loaning meters to all interested-volunteer lung-cancer patients) could provide an ongoing reminder of the importance of measuring radon to identify homes needing mitigation and help lower radon-associated disease.

CHOOSING THE RIGHT SIZE FAN; WHAT TO MEASURE AND HOW TO CALCULATE

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Abstract

In large buildings, or where the sub slab fill has high resistance to air movement, a standard 40 to 60 watt "radon fan" may not produce the sub slab suction needed to effectively prevent the flow of soil gas and radon into the building. The "diagnostic measurements" needed in this case are reviewed, and it is shown how to combine them with the system piping layout to select a fan. An example is given of the data and calculations needed to design an effective SSD system.

CURIE; BEQUEREL: WHO WERE THESE PEOPLE AND WHAT DO THEY HAVE TO DO WITH RADON?

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Abstract

This is a brief review of the work of the early natural radioactivity investigators. On December 28, 1895 Roentgen announced his discovery of X-rays, and in March 1896, Bequerel announced that uranium compounds emitted "invisible rays" that could also penetrate materials. This discovery was overshadowed by the enormous interest in X-rays at that time. In 1898, Marie Curie chose to investigate the neglected Becquerel rays. This physics problem soon turned into a chemistry problem, which identified the radioactive elements polonium, radium and ultimately radon.

MEASUREMENT OF RADON LEVELS IN CAVES: LOGISTICAL HURDLES AND SOLUTIONS

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Abstract

The caves in Northeastern Iowa are the location for a number of radon studies currently in progress. Cave temperatures tend to be fairly uniform and resemble the mean year-round surface temperature above the cave: this is not greatly different than what might be seen for routine basement/cellar radon measurements. The other environmental variables contrast more significantly with those expected in basement/cellar environs. Caves tend to have relative humidity values exceeding 90 percent, have an extremely heavy burden of particulate aerosol matter, are typically wet and muddy, and may require equipment transport involving small physical cross sections, climbing, or even swimming en route to sampling sites. The caves are often in remote locations and typically off-the-grid in nature. This presentation reports the performance of the radon monitoring equipment in this environment, and details special transport and deployment techniques that were adapted to ensure the fidelity of the results.

CURRENT INITIATIVES OF HEALTH CANADA'S NATIONAL RADON PROGRAM

Jeff Whyte and Renato Falcomer

Radiation Protection Bureau, Health Canada.

Abstract

This presentation will highlight recent scientific developments within the National Radon Program and will also summarize recent education and awareness efforts.

A summary of the results from the recently completed residential thoron survey across 33 census metropolitan areas, and of an active soil depressurization system mitigation field study evaluating discharges near ground level will be discussed. The on-going progress with the Canadian General Standards Board for the development of two national radon mitigation standards (for new & existing construction) will be highlighted. Health Canada & the Canadian-National Radon Proficiency Program's collaborative initiative on the implementation of enhanced quality assurance measures for measurement professionals will also be discussed. The preliminary results of the current residential mitigation actions follow-up study, progress in two other new research surveys, and current mitigation research will also be highlighted. Work within the education and awareness side of the program will also be summarized.

FOLLOW-UP ON RADON MITIGATION AND PREVENTION IN AUSTRIA

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Abstract

This presentation will mainly cover the final results of a 2014 completed pilot study, accomplished in co-operation with the Department of Environmental Protection in Upper Austria.

For the evaluation of the long term effectiveness of preventive or remediation measures, 18 new buildings (1 town hall, 1 school, 16 residential houses) and 37 existing buildings (4 town halls, 3 kindergartens, 6 schools, 24 residential houses) were examined.

About 22% of these new buildings with radon preventive measures exceeded the national design level for new buildings (200 Bq/m³) and about 38% of existing radon remediated buildings were above the national reference level (400 Bq/m³) - caused by failed preventive or remedial measures.

After correction of faults over 92% of the buildings were below the national reference level of 400 Bq/m³.

At the end there will be a brief overview of a current radon remediation in a private building (indoor radon concentration up to 20.000 Bq/m³) located in the Tyrolean community of Umhausen (radon prone area).

Abstracts Accepted For Presentations and/or Poster Sessions
2015 International Radon Symposium – Bloomington, MN U.S.A.

EVALUATION OF PERFORMANCE OF INDOOR RADON MITIGATION MATERIALS FOR NEW BUILDING USING A TEST STRUCTURE

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Abstract

As awareness of the effects that radon can have on health became widespread throughout in South Korea recently, much researche on reduction methods of indoor radon concentration is in progress.

There are specific reasons for installing radon reduction systems during construction. Special mats have been developed as a part of the system. However, in Korea, since there are no studies and evaluation data for such materials based on local, geological characteristics of the country, it is not a practical to simply apply them on construction sites.

This study aims to evaluate performance of Soil Gas Collector Mat and Anti-Radon Membrane for radon reduction purpose, by conducting field test at a conditioned construction site. The results of this study would be used for establishing a radon reduction in new construction in South Korea.