



CALIBRATION TECHNOLOGIES
CENTRAL CANADA REGION

**PYLON ELECTRONICS INC.
APPLICATION BRIEF NUMBER 3 –**

MEASURING RADON EXHAUST RATES IN MATERIALS

ENVIRONMENTAL RADON - RADON IN MATERIALS

Radon is a colourless, odourless, radioactive gas formed from the decay of radium. It is a member of the uranium 238 decay series. Building materials such as concrete, soil, some ceramics, rock, and many everyday materials found in the indoor or outdoor environment may contain radium and uranium and act as sources of radon gas.

Indoor radon can pose a health hazard and current research focuses on characterizing sources of radon, pathways into a house, and the house as a system. The task is to improve the air quality in residential and office buildings by minimizing the levels of radon and other pollutants such as formaldehyde, dust, carbon dioxide and carbon monoxide, fungi, etc. while maintaining a comfortable living and working environment.

In addition to the health hazard posed, there are many nuclear laboratories (neutrino) around the world where radon may present an undesirable background and there is a need to minimize the radon level and monitor it. Nuclear counting facilities, accelerators etc. are examples.

MEASUREMENT OF RADON EMANATION RATE

The low levels of radon emitted from materials (emanation rate) are characterized by sealing a container onto the surface being tested or alternatively, by placing a sample of the material to be tested inside a closed container (Figure 1.). In either case a sample(s) of radon is taken from the accumulator and measured with a sensitive monitor. In some cases a continuous sample is taken and the rate of accumulation of radon monitored.

The apparatus illustrated in Figure 1. employs the Pylon Trace Level Radon Detector (TEL). This detector functions in conjunction with a data logger such as the Pylon AB-5. The TEL is the only commercially available active radon detector with the sensitivity needed for emanation studies. It achieves this sensitivity by electrically focusing the radon progeny formed in the 20 liter sensitive volume of the detector onto a scintillator-photomultiplier based center electrode. Once inside the TEL the radon decays into its alpha emitting radioactive daughters, the first of which (RaA) is positively charged. The charged daughter is attracted to the negatively charged center electrode of the TEL. Since the center electrode is coated with a silver activated zinc sulphide phosphor, a strong light pulse is observed when impacted by an alpha particle from the radon daughter. The light pulse is detected by a photomultiplier tube, is counted, and the event logged by the AB-5

detector system. A series of measurements can then be dumped to a computer for analysis.

The high sensitivity of the TEL is due to its large sensitive volume (20 L) and low background noise level. In fact, the sensitivity can be readily varied by changing the volume to meet specialized measurement objectives such as the emanation rate of thoron from materials or the measurement of extremely low emanation rates.

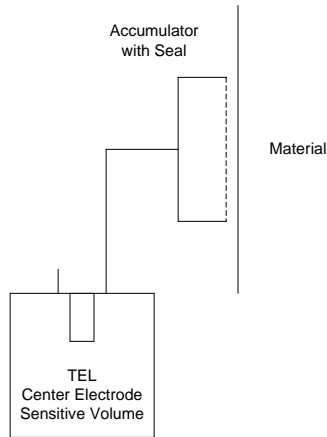


Figure 1 -
Sampling Set Up To Measure Exhaust
Rate From Material



CALIBRATION T E C H N O L O G I E S
CENTRAL CANADA REGION

Bibliography

Nero A.V., Nazaroff W.W., Characterizing the Source of Radon Indoors; In Indoor Exposure to Natural Radiation and Related Risk Assessment; Proc. Int. Seminar, Anacapri Italy, 1983

Folkerts K.H., Keller G., Muth H.; Experimental Investigation of Diffusion and Exhalation of ^{222}Rn and ^{220}Rn from Building Materials; In Indoor Exposure to Natural Radiation and Related Risk Assessment; Proc. Int. Seminar, Anacapri Italy, 1983

Ulbak K., Jonassen N., Boekmark K.; Radon Exhalation from Samples of Concrete with Different Porosities and Fly Ash Additives; In Indoor Exposure to Natural Radiation and Related Risk Assessment; Proc. Int. Seminar, Anacapri Italy, 1983

Gallyas M., Torok I.; Natural Radioactivity of Raw Materials and Products in the Cement Industry; In Indoor Exposure to Natural Radiation and Related Risk Assessment; Proc. Int. Seminar, Anacapri Italy, 1983

Contact Information

For more information on the Pylon TEL Detector and other Pylon products and services, Please contact us at:

Pylon Electronics Inc.
147 Colonnade Road,
Ottawa, ON K2E 7L9
Canada

Phone: (613) 226-7920

Phone: (800) 896-4439 (Toll Free North America Only)

Fax: (613) 226-8195

Email: <mailto:instrument@pylonelectronics.com>

or visit us at our web site at www.pylonelectronics.com.