



 INDOOR AIR QUALITY

Radon in the Home

John L. Merrill

Radon is a radioactive gas produced naturally from the decay of uranium and radium. Small amounts of uranium and radium are common in many soils. Radon is odorless and colorless, so you cannot see or smell it.

Radon gas itself is not a major health concern. The real problem is that radon continues to decay, producing other radioactive materials. These new materials — called radon progeny — are solids, not gases. These can stick to dust particles and be inhaled.

Radon and Your Health

When you breathe in this radon-contaminated dust, it can collect on the surface of your lungs. Studies have linked extended exposure to high levels of radon gas progeny with increased risk of lung cancer.

Radon concentrations are measured in picocuries per liter (pCi/L) of air. A picocurie represents the decay of about two radon gas atoms per minute in about a quart of air. The U.S. Environmental Protection Agency (EPA) recommends that action be taken to lower radon levels higher than 4 picocuries.

The EPA has determined that an average lifetime exposure of 4 picocuries gives nonsmokers two chances in a thousand of dying from lung cancer. At that level of radon exposure, the danger is nearly 15 times greater for smokers.

Determining If Radon Is a Problem in Your Home

Concern about radon increased dramatically when a Pennsylvania nuclear power plant worker discovered he was receiving a higher dose of radiation at home than at work. While homeowners want to know whether radon is a problem where they live, experts do not have accurate systems for predicting which homes in which parts of the country are likely to have hazardous radon levels.

In a 1987 study by EPA and the Wisconsin Department of Health and Social Services Division of Health, about one-fourth of Wisconsin single-family homes had radon levels high enough to require further testing. Fewer than 1 percent of those homes — about one in 400 — had radon levels high enough to require owners to take immediate action. About

7 percent were confirmed to be at levels above EPA guidelines for taking action to lower the radon. Homes with elevated radon levels have been found in all areas of the state.

The rock and soil underlying your community is probably the most important factor in determining whether you need to be concerned about high radon levels in your home. Yet in communities where geology suggests high concentrations of radon should be found, some homes did not have high radon levels. In other communities, high levels were found despite the lack of uranium in the rock. To understand why this variation occurs, look at how radon enters a home.

Radon gas originates in soil and rocks. It diffuses, as does any gas, flowing along the path of least resistance to the earth surface and then to the atmosphere. Being a gas, radon can move into any air space, including basements, crawl spaces and caves.

Radon gas and its solid progeny are diluted in outdoor air when they move directly from the soil to the atmosphere. But radon that moves through cracks and openings into basements of buildings can be trapped in the small volume of air. Since indoor radon has less air with which to mix, indoor radon can build up to dangerous levels.

In some homes, furnaces, other combustion appliances, clothes dryers and other equipment exhaust large volumes of air. This creates a slight vacuum, or negative pressure. Outside air is then sucked through cracks to replace the exhausted air. Air may come from the soil through openings in basement walls and floor or exposed soil in a crawl space, and may bring radon in with it.

Common entry paths for radon include earth floors, sump pump wells, floor drains, gaps in floors and around pipes, visible and microscopic cracks, holes left from form ties, construction joints and hollow concrete block walls.

But inspecting for possible entry points in your basement won't tell you how much radon is in your home. The only way to determine if your home has a high radon level is to conduct a radon measurement. The initial screening measurement is taken with a device known as a charcoal canister. Follow the instructions the manufacturer provides with the canister. The canister and analysis should cost no more than \$20.

Usually, homeowners open the canisters and place them on a table in the lowest lived-in level of the house — not the basement, unless you live there; not a kitchen or bathroom. After a few days, you close, seal and mail the canister back to the company for analysis. You will receive a report of the test results in the mail.

This type of test should be conducted when radon concentrations are highest — during the winter heating season when windows are closed and the furnace is running. If this first test reveals radon levels near or above 4 picocuries, take another measurement using a device that can be exposed for several months. This second test determines whether the first measurement was a temporarily high radon level or truly represents the level in your home.

For names of companies that provide reliable tests and for more information on radon, contact the Radon Information Center serving your county (listed below), your local public health agency or county UW-Extension office.

Reducing Indoor Radon Levels

If tests confirm near 4 picocuries or higher for a year, hire a professional to reduce radon levels. They will typically combine sealing with a system known as sub-slab ventilation. They drill holes in the basement floor, and fit pipes into the holes. The pipes connect to a fan. This sucks out the air in the soil under the house and vents it through the roof. Prices for this work should range between \$1,000 and \$2,500. Retest when the work is done.

A Radon Information Center or your local public health office can furnish a list of contractors trained to do radon reduction work. Ask for the list of Radon Mitigation Contractors in the U.S. EPA Radon Contractor Proficiency Program.

Resources

The EPA distributes a variety of publications on radon:

- *Citizen's Guide to Radon (Second Edition): The Guide to Protecting Yourself and Your Family From Radon* (ANR-464, 1992)
- *Home Buyer's and Seller's Guide to Radon*
- *Consumer's Guide to Radon Reduction* (1992)

For copies of these publications or other information, contact the Radon Information Center that serves your county.

Radon Information Centers

Eau Claire

(800) 499-4718

Serving Barron, Buffalo, Burnett, Chippewa, Clark, Dunn, Eau Claire, Pepin, Pierce, Polk, Rusk, St. Croix and Washburn counties.

Fond du Lac

(800) 547-3640

Serving Calumet, Dodge, Fond du Lac, Green Lake, Sheboygan and Winnebago counties.

La Crosse

(608) 785-9872

Serving Crawford, Jackson, LaCrosse, Monroe, Trempealeau and Vernon counties.

Lancaster

(608) 723-6416

Serving Grant, Iowa, Juneau, Lafayette and Richland counties.

Wausau

(800) 236-7236

Serving Ashland, Bayfield, Douglas, Florence, Forest, Iron, Langlade, Lincoln, Marathon, Menominee, Oneida, Price, Portage, Sawyer, Shawano, Taylor, Vilas, Waupaca and Wood counties.

Waukesha

(800) 540-3620

Serving Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington and Waukesha counties.

For all other counties, contact the state Radiation Information Center: Radiation Protection Unit, Division of Health, P.O. Box 309, Madison, WI 53701-0309, (608) 267-4795.

A video titled *Radon in Wisconsin: Should You Worry?* is available from your local library or county University of Wisconsin-Extension office (listed under county government in your telephone directory).

Author: John Merrill, professor, Department of Environment, Textiles and Design, University of Wisconsin-Madison, and housing specialist, UW-Extension.

Reviewers: Michael Mudrey, associate professor, Wisconsin Geological and Natural History Survey; Barbara J. Roder, family living agent, Fond du Lac County UW-Extension; Conrad Weiffenbach, nuclear engineer, Radiation Protection Unit, Division of Health, Bureau of Public Health, Wisconsin Department of Health and Social Services.

Produced by Cooperative Extension Publications, UW-Extension. Editor: Rhonda Lee.

University of Wisconsin-Extension, Cooperative Extension, in cooperation with the U.S. Department of Agriculture and Wisconsin counties, publishes this information to further the purpose of the May 8 and June 30, 1914 Acts of Congress. UW-Extension provides equal opportunities and affirmative action in employment and programming, including Title IX requirements. If you need this material in an alternative format — large print, braille, audio tape or computer disk — contact Cooperative Extension Publications, (608) 262-8076.

This publication is available from your Wisconsin county extension office or: Cooperative Extension Publications, 30 N. Murray St., Room 245, Madison, WI 53715, (608) 262-3346.