



Radon in Minnesota Homes

Environmental Health Division
Indoor Air Unit

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INTRODUCTION

This fact sheet provides information from the Minnesota Department of Health (MDH) on radon and how to protect your family's health. The U.S. Surgeon General, the U.S. Environmental Protection Agency (EPA) and MDH recommend that every Minnesota home be tested for radon. Radon is not regulated in Minnesota, so it is up to homeowners to decide for themselves how much radon is acceptable in their home. The good news is, homeowners can act to lower the amount of radon in their home and reduce the risks to their family.

Why is radon important?

Radon is the main source of ionizing radiation that most of us are exposed to. Ionizing radiation can harm the cells that make up our body's tissues and organs. The type of radiation that radon produces is mainly an internal hazard – it produces damage when it gets into the body. The result of such damage is that radon causes cancer in humans.

The World Health Organization, the EPA, and the U.S. Department of Health and Human Services' National Toxicology Program have all concluded that radon is a known cancer-causing agent in humans. The National Academy of Sciences' Biological Effects of Ionizing Radiation VI report (1998) concluded that radon causes between 15,000 and 22,000 lung cancer deaths each year in this country. A more recent risk assessment from the EPA states radon causes 21,000 premature cancer deaths each year in the United States (2003). The Surgeon General of the United States has warned that radon is the second leading cause of lung cancer in the United States – second only to smoking. For non-smokers in this country, radon is the number one cause of lung cancer.

What is radon?

Radon is a radioactive gas – that means it continuously decays and releases radiation. It is produced from minerals in soil, such as uranium and radium.

Although radon is present throughout the environment, when high levels are present indoors people are exposed to more of its radiation and their risk of cancer increases. Such a situation can be discovered easily and corrected.

Why is radon a common problem in Minnesota homes?

Much of the soil in the Upper Midwest contains widespread uranium and radium. These minerals continuously break down to release radon gas. Therefore, Minnesota's geology provides an ongoing supply of radon.

In addition, a large percentage of Minnesota homes have high levels of radon in the indoor air because of how they are built and how they operate in our climate. One important factor is that many Minnesota homes have basements that are used as living spaces. MDH estimates that about one in three (1/3) Minnesota homes has enough radon to pose a large risk to the occupants' health over many

years of exposure. In some areas of the state, the percentage of homes that have high levels of radon is even larger. Homeowners can reduce this risk, but they must act.

How does radon enter a home?

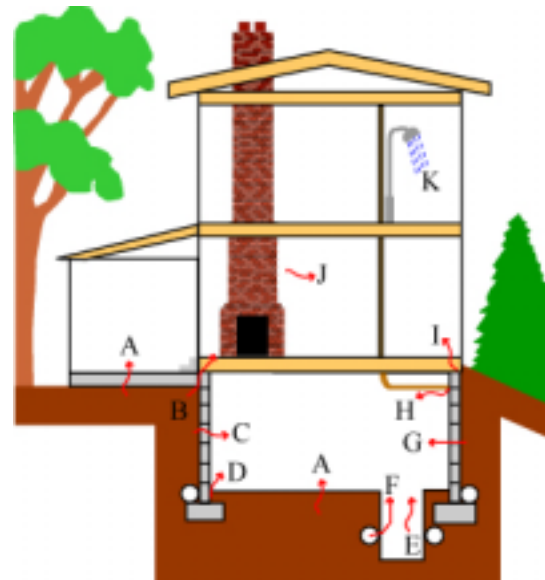
Radon, because it is a gas, is able to move through spaces in the soil or fill material around a home's foundation. Minnesota homes tend to operate under a negative pressure – this is especially true in the lowest portions of the home and during the heating season. This negative pressure acts as a vacuum (suction) that pulls soil gases, including radon, into the lower level of the structure. Some causes of home vacuum are:

- Heated air rising inside the home (stack effect).
- Wind blowing past a home (downwind draft effect).
- Air used by fireplaces, wood stoves, and furnaces (vacuum effect).
- Air vented to the outside by clothes dryers and exhaust fans in bathrooms, kitchens, or attics (vacuum effect).

Radon can enter a home through the floor and walls -- anywhere there is an opening between the home and the soil (see list of Major Radon Entry Routes below). Examples of such openings include dirt floor crawl spaces, unsealed sumps, cracks in slab-on-grade floors, utility penetrations, and the tiny pore spaces in concrete block walls. A basement, of course, provides a large surface area that contacts soil material.

MAJOR RADON ENTRY ROUTES

- A. Cracks in concrete slabs.
- B. Spaces behind brick veneer walls that rest on uncapped hollow-block foundations.
- C. Pores and cracks in concrete blocks.
- D. Floor-wall joints.
- E. Exposed soil, as in a sump or crawl space.
- F. Weeping (drain) tile, if drained to an open sump.
- G. Mortar joints.
- H. Loose fitting pipe penetrations.
- I. Open tops of block walls.
- J. Building materials, such as brick, concrete, rock.
- K. Well water (not commonly a major source in Minnesota homes).



What happens after radon gets into the home?

Once radon enters a home it moves freely throughout the indoor air and people can breathe it into their lungs. Understanding how it distributes through the home environment can help explain why timing and location are important factors to consider when conducting a radon test.

The level of radon is often highest in the lower part of the building. Radon moves through a house by diffusion and natural air movements and it can be distributed by mechanical equipment such as a forced-air ventilation system. As radon moves away from the home's foundation or other entry points, it mixes (and is diluted) into a greater volume of air. In addition, more dilution often occurs in the upper levels of the home because there is more fresh air ventilation there.

Greater dilution and less house vacuum may also occur when the house is more open to the outdoors during the non-heating season. This generally results in lower indoor radon levels in the summer compared to the winter.

How can I find out if my home has a radon problem?

Radon is colorless, odorless and tasteless. Therefore, a radon test is the only way to find out how much radon is in your home. Performing a radon test on your own is easy, inexpensive, and can be done privately. Every home is unique due to its local soil, construction details, maintenance and degree of depressurization. Therefore, test results from nearby homes cannot be relied upon to predict the radon level in another home. Likewise, previous test results may not reflect current and future radon levels for a home that has been remodeled, weatherized or had changes made to its heating, air conditioning or other ventilation systems such as exhaust fans.

The MDH recommends that all Minnesota homeowners test their homes for radon. The results of a properly performed radon test will help homeowners determine for themselves if they need to take further action to protect their family from the health risks of radon in the home.

Contact the MDH Indoor Air Unit for more information on where to obtain low cost radon test kits, the types of test kits, how to perform tests properly and how to use the results. You may also consult the MDH fact sheet *Minnesota Radon Testing and Use of Test Results* which is available by calling MDH or on our website.

How can I protect my family from radon?

A number of steps can be taken to lower the amount of radon in a home. A quality radon reduction (mitigation) system is often able to reduce the annual average radon level to below 2 picoCuries per liter (see *Minnesota Radon Testing and Use of Test Results* for discussion of radon levels and health risks). Experienced radon mitigation professionals can install appropriate control systems. Contact MDH for information regarding radon mitigation.

Building a New Home?

MDH recommends that all new homes in Minnesota be built to include radon-resistant construction features that minimize radon entry into the home and make future radon problems easier to fix should they occur. It is more cost-effective to include radon-resistant features when building a home rather than retrofitting an existing home. If elevated radon levels are found after you move in, radon-resistant features can be easily activated to become radon reduction systems. Ask your builder if they are currently using radon-resistant construction techniques.

All newly built homes in Minnesota should be tested for radon after they are completed and occupied. Early detection of elevated radon levels can help protect the homeowner's financial interests if the radon problem is due to construction problems and can allow the homeowner to take appropriate actions to lower the radon level and protect the health of their family.

Where can I get more information on radon or other indoor air quality issues?

MDH Indoor Air Unit
Phone: (651) 215-0909
(800) 798-9050

View the Air Quality web page at:
www.health.state.mn.us/divs/eh/air

To request this document in another format, such as large print, Braille or cassette tape, contact the Minnesota Department of Health Indoor Air Unit at (651) 215-0909; TDD (651) 215-0707; or toll-free through the Minnesota Relay Service at (800) 627-3529.