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G00-1404 Radon in Nebraska Homes: Healthy Indoor Air for Healthy Nebraskans (Revised October 2003)

Rebecca L. Versch

University of Nebraska - Lincoln, bversch1@unl.edu

Shirley Niemeyer

University of Nebraska - Lincoln, sniemeyer2@unl.edu

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Radon in Nebraska Homes

Healthy Indoor Air for Healthy Nebraskans

Becky Versch, Extension Educator

Shirley Niemeyer, Extension Specialist, Environment and Housing

This publication will help householders understand radon — what it is, its effect on health, how to test for it, and some remodeling or new building techniques that can reduce radon levels in the home.

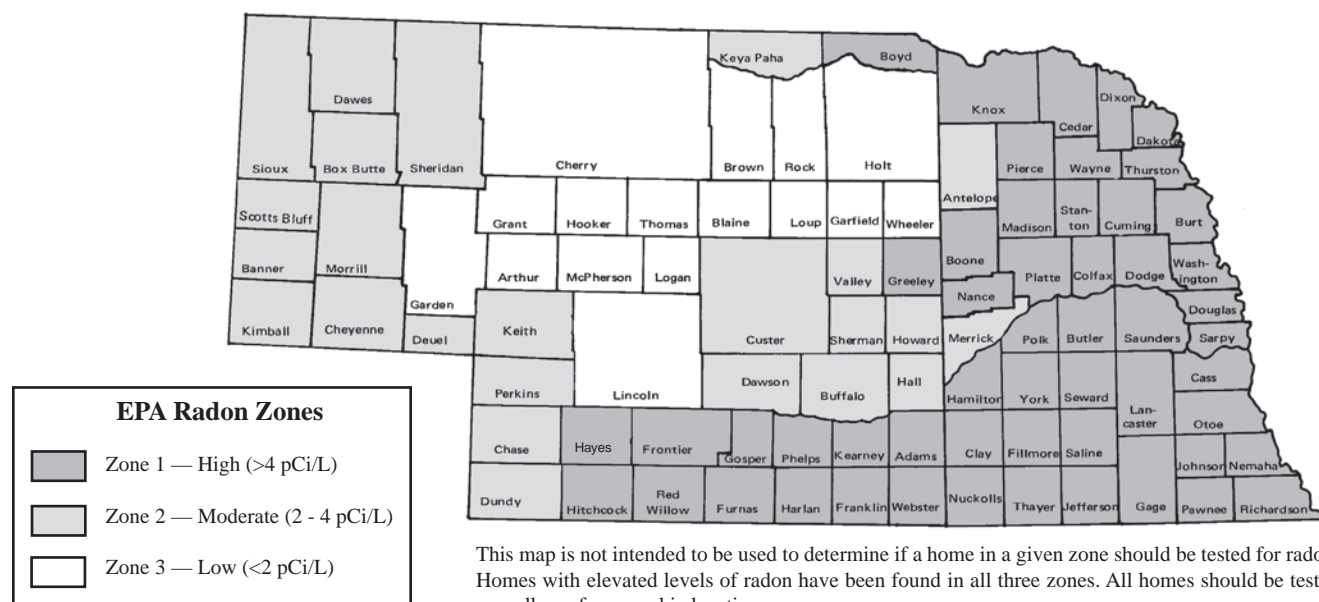
What is Radon?

Radon is a colorless, odorless, radioactive gas emitted from uranium, a naturally occurring mineral in rocks and soil. Normally, radon rises up through the soil and then dissipates in the air outside. Radon becomes a concern, however, when it seeps in through openings such as cracks, loose-fitting pipes, sump pits, dirt floors, slab joints, or block walls and accumulates in the home.

Air pressure inside your home is usually lower than pressure in the soil around your house's foundation. Because of the difference in pressure, your house acts like a vacuum, drawing radon in through foundation cracks and other openings.

Radon has been implicated as a risk factor in the development of lung cancer. Radon gas decays into radioactive particles that can get trapped in your lungs. These particles release bursts of energy that can damage lung tissue and lead to lung cancer. It is estimated that radon may be associated with 15,000 to 22,000 lung cancer deaths per year in the United States — second only to smoking.

The chances of getting lung cancer from radon depend on how much radon is in your home, the amount of time you spend in your home, and whether you smoke. Smoking, combined with radon, adds to the health risk.



This map is not intended to be used to determine if a home in a given zone should be tested for radon. Homes with elevated levels of radon have been found in all three zones. All homes should be tested regardless of geographic location.

Figure 1. EPA Map of Radon Zones, Nebraska.

Radon Risk Evaluation Chart

<i>Radon Level pCi/L*</i>	<i>If 1,000 people who never smoked were exposed to this level over a lifetime...</i>	<i>The risk of cancer from radon exposure compares to...</i>
20	About 8 people could get lung cancer	Risk of being killed in a violent crime.
10	About 4 people could get lung cancer	2 pack-a-day smoker
4	About 2 people could get lung cancer	The risk of drowning
2	About 1 person could get lung cancer	The risk from dying in a home fire

*pCi/L — picocuries of radon per liter of air

Radon in Nebraska

Over 50 percent of the Nebraska homes tested have radon levels above the U.S. Environmental Protection Agency's recommended action level. Although many homes test above the action level, very few Nebraska homes test at over 100pCi/L (NE Health and Human Services). Because radon levels are influenced by a variety of factors — soil type and moisture, how "tight" the home is, type of heating and ventilation system, movement of air and groundwater, air pressure, and lifestyle of the occupants — the only way to know if a home has elevated levels of radon is to test it.

Radon Testing

All Nebraska homes should be tested for radon. Only individual testing can determine which houses may have a radon problem. You cannot base your radon level on a neighbor's test result. Every house is different.

Measuring radon levels in your home is simple, inexpensive and takes only a few minutes. Test kits, which can be purchased, include complete instructions and return postage for mailing samples back to the analysis lab.

- **Short-term detectors** (such as charcoal canisters) are used for two to seven days. They provide quick screening measurements indicating potential radon problems. Short-term detectors should be placed in the lowest lived-in level of the house, preferably during winter.
- **Long-term detectors** (such as alpha track detectors) are left in place for three months to one year. They provide the advantage of averaging seasonal variations associated with radon levels. Long-term detectors generally are placed in main living areas.

Radon test kits cost about \$10 to \$20 for a short-term kit to \$20 to \$30 for a long-term kit, and usually include the laboratory analysis. If test kits are not available in your area, call the Nebraska Radon Hotline at 1-800-334-9491 (inside Nebraska) or the National Radon Hotline at 1-800-767-7236.

Research indicates some homeowners buy kits and then never send them in for the results. When you buy a kit, make a commitment to obtain the results.

When buying either type of detector, select one approved or listed by the EPA. Follow instructions that come with the test kit. If you are doing a short-term test, close windows and outside doors and keep them closed for 12 hours before setting out the testing device. Keep them closed throughout the test. Normal entry and exit is permitted but doors and windows should not be left open. These precautions are not as necessary when conducting the long term tests. Instructions are specific as to placement and the importance of not disturbing the test kit while it is monitoring.

Homes that have a basement or combination slab-on-grade and crawlspace should be tested in each different area due to potential differences in radon levels. Generally, radon levels are highest in the lower levels of the home. For this reason, some homeowners prefer to test in the basement and first floor. If basements are used for living and sleeping spaces, it is especially important to test there.

Once the test is finished, reseal or close the container and send it to the lab specified on the package right away. The lab fee for interpreting the results usually is included in the original cost of the kit.

You may choose to have radon measurements performed by a professional and especially if you are testing for a real estate transaction. The Nebraska Department of Health and Human Services Regulation and Licensure can provide a list of companies qualified to perform radon tests for homeowners in the state. Call 1-800-334-9491 or visit the NHHSS Web site at www.hhs.state.ne.us/enh/Radon/radon.htm

Understanding Test Results

Radon measurements show how much radon was present in the home during the test period. This level can vary depending on detector location and the time of year it was used. Radon levels are generally highest when the house is closed and in the basement or near possible radon entry routes. Readings average over an entire year are usually lower than those taken in a basement during winter.

Radon gas is measured in units of picocuries per liter (pCi/L), a standard measure of radioactivity. The EPA has set 4 pCi/L as a "recommended" action level. If a short-term measurement is over 4 pCi/L, the recommended action is to perform a follow-up test to better characterize the radon levels. If a long-term test measures over 4 pCi/L, action should be taken to reduce radon exposures.

Radon levels are categorized as low, slightly high, high, and very high. These are interpreted as follows:

- **Low — less than 4 pCi/L.** It is not necessary to take further action unless you desire.
- **Slightly high — 4 to 10 pCi/L.** Short-term results should be followed up with long-term measurements lasting approximately 12 months. Homes with long-term results in this range should take action to reduce exposures within the next few years.
- **High - 10 to 100 pCi/L.** Follow-up testing of no longer than three months is recommended. Homes with

long-term results in this range should take action to reduce exposures within the next few months. Contact the Department of Health and Human Services at (402) 471-0594 for more information.

- **Very high — over 100 pCi/L.** Confirmatory short-term follow-up measurements should be performed as soon as possible and action taken to mitigate (remediate). (Contact the Department of Health and Human Services for more information.

The average indoor radon level is estimated to be about 1 to 3 pCi/L, and outside about 0.4 to 0.8 pCi/L. The level of radon in a home may vary considerably from neighbor to neighbor.

Radon Mitigation

The cost of making repairs to reduce radon depends on how the home was built and the extent of the radon problem. Most homes can be fixed for \$750 - \$2,000.

A variety of methods may be used to lower radon levels in a home. These include sub-slab, drain tile, sump hole and block wall suction. Sealing cracks and other openings in the foundation and covering sump pump holes are a basic part of most approaches to radon reduction; however, sealing alone has not been shown to lower radon levels significantly or consistently.

The most commonly used technique — and generally the most effective method — is called “sub-slab depressurization.” This system uses pipes that extend from a permeable layer below the basement floor (such as gravel or drain tiles) upward (*Figure 2*) through the structure, venting out the roof. This system allows radon gas to be collected before it

enters the house and “funnels” it directly up through pipes and out of the home. If natural ventilation through the pipe system is not adequate to lower radon levels enough, a fan can be added in the attic to help draw gases through the system to the outdoors. Similar systems also can be installed in homes with crawl spaces.

Other methods used, although they have some disadvantages and may not be appropriate for a more permanent solution, include house pressurization and ventilation such as using a heat recovery ventilator (air-to-air heat exchanger). Whatever method you use, be sure to test for radon before and after the system is in place to be sure it is reducing levels to below 4 pCi/L.

Because the right system depends on the design of the home and other factors, most homeowners should not try to fix radon problems on their own. The Nebraska Health and Human Services System licenses radon mitigation service providers and can provide a list of contractors qualified to do radon mitigation in the state. Phone 800-334-9491 or visit its Web site at www.hhs.state.ne.us/enh/Radon/radonmit/htm.

In choosing the mitigation method, you and your contractor should consider the radon levels, system operation, structural changes, cost, house size, and foundation types. For houses with several foundation designs and levels, a combination of techniques may be needed.

The EPA recommends that you have a qualified contractor fix your home. Lowering high radon levels requires specific technical knowledge and special skills. Without proper equipment or technical knowledge, you actually could increase your radon level or create other potential hazards. If you must do the work yourself, get information on appropriate training courses and copies of technical guidance documents from the Nebraska Radon Office.

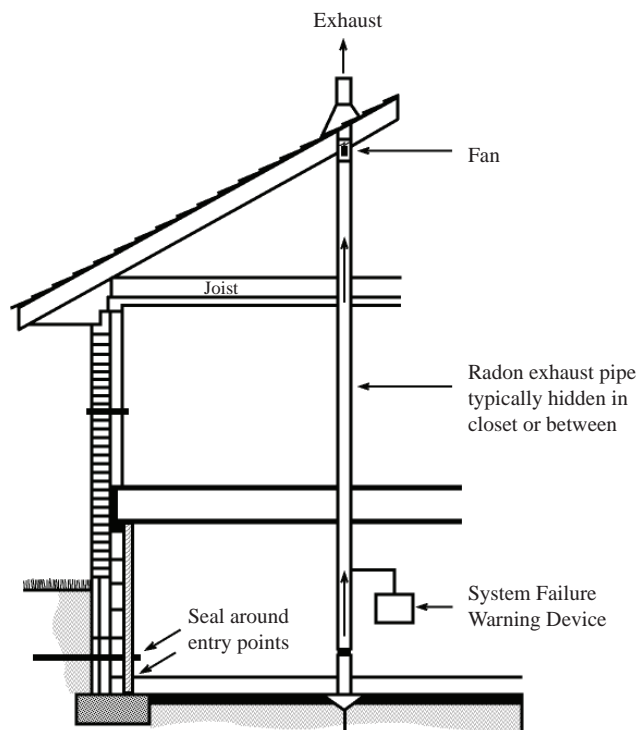


Figure 2. Typical radon mitigation system. (Courtesy Environmental Protection Agency)

Radon reduction methods can be planned for and installed during the construction of a new home. Installation costs generally are much lower during construction and careful planning can allow a variety of strategies to be integrated, ensuring the most effective radon reduction system possible.

The average cost to install a radon mitigation system in an existing home is about \$750 to \$2,000. To install radon-resistant features during construction of a new home is about \$350 to \$500. The Nebraska Health and Human Services System recommends that new homes constructed in areas of the state known to have high levels (See *Figure 1, Zone 1*) should include at least:

1. Passive sub-slab or crawlspace depressurization system;
2. Foundation barrier techniques; and
3. Dedicated intake and/or combustion air for exhaust and combustion appliances.

Homes in these areas should be tested after occupation and if radon levels remain above 4 pCi/L, the passive sub-slab system should be converted to an active system by adding a fan.

Homes in areas of the state known to have moderate levels of radon (Zone 2) should consider all of the same systems and techniques recommended for Zone 1 homes. Radon testing should be performed after occupation to determine if additional actions are necessary.

According to the EPA, Zone 3 homes, which are reported to have radon levels below 4 pCi/L, are not likely to need additional systems or techniques for controlling radon. Since homes with elevated levels of radon have been found in all three zones, radon testing should be performed after occupation to determine if any action is necessary.

Home Buyers and Renters

Buyers and renters should ask up front about environmental issues concerning property such as whether the home has been tested for radon and what the test results showed. Testing your home does not mean lowered sales value or less chance of selling. It means you can accurately inform potential buyers or renters of the existing condition of the property. Taking precautions now to mitigate for radon means your family's health is protected against adverse radon effects.

Information Sources

State Radon Contact:

(800) 334-9491 or (402) 471-0594
NE Department of Health and Human Services
Public Health Assurance Division - Radon
301 Centennial Mall South
Lincoln, NE 68509-5007

EPA Publications:

Order EPA radon publications at:
(800) 490-9198 or from their Web site:
<http://www.epa.gov/ncepihom/>
or view their Web site at
<http://www.epa.gov/iaq/radon/pubs/>
Home Buyers and Sellers Guide to Radon
EPA 402-K-00-008

National Radon Information Line:

(800) 767-7236
Radon Fix-It Program at Consumer Federation of America
(800) 644-6999
American Lung Association
(800) 586-4872
Clean Air for Your Family
(800) 725-8312
Environmental health line for lead, asthma, indoor air quality issues; distributes radon test canisters and some EPA publications
National Alliance for Hispanic Health (NAHH)
Information Line for general questions about radon in Spanish
(800) 725-8312 or
(202) 387-5000
The Environmental Law Institute:
(202) 939-3800
or Fax:
(202) 939-3868
A Radon Guide for Tenants

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Index: Consumer Education Consumer Information—General

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