



Radon Gas

Bryan W. Shaw and Monica L. Denny*

Every home should be tested for radon, an invisible, odorless, radioactive gas that occurs naturally. Radon is estimated to be the second leading cause of lung cancer in the United States. However, with proper equipment, radon is easy to detect, and even dangerously high levels can be removed from homes.

Radon is produced when uranium breaks down naturally in soil, rock and water. It typically moves up through the ground and mixes in the air we breathe. Radon enters a home through cracks and other holes in the foundation as well as through well water. Once inside, radon can become trapped in a home.

Dangerously high levels of radon have been found in homes in every state in the United States. Even though Texas has a low to moderate geologic potential for radon (Fig. 1), homes in Texas have been found to have radon levels that exceed U.S. Environmental Protection Agency (EPA) recommendations. Every home is susceptible to a radon gas problem.

HEALTH/CANCER RISKS

Radon produces no immediate physical symptoms. Typically, people must be exposed to it for years before problems surface.

The primary hazard from radon is caused when you breathe in the gas and the highly radioactive, heavy metallic particles that are produced when it decays. These particles collect on dust in the air. After you



**Geologic Radon Potential
(Predicted average screening measurement)**

■ Low (< 2 pCi/L) □ Moderate (2-4 pCi/L) ■ High (> 4 pCi/L)

Figure 1. Generalized geologic radon potential of the United States by the U.S. Geological Survey

inhale radon, the dust and smoke particles become deeply lodged or trapped in your lungs, where they penetrate the cells of the mucous membranes and other tissues.

Lung cancer from inhaling radon decay products is the only known health problem associated with radon. Scientists estimate that in the United States, 5,000 to 20,000 people die of lung cancer every year because of radon. The EPA calculates that radon causes about 14,000 deaths each year. It is the second leading cause of lung cancer in the United States, according to American Lung Association estimates.

*Assistant Professor and Extension Agricultural Engineering Specialist; Extension Assistant-Safety; The Texas A&M University System.

Radon Risk if You Have Never Smoked

Radon level	If 1,000 people who never smoked were exposed to this level over a lifetime...	The risk of cancer from radon exposure compares to...	What to do:
20 pCi/L	About 8 people could develop lung cancer	The risk of being killed in a violent crime	Modify your home
10 pCi/L	About 4 people could develop lung cancer		Modify your home
8 pCi/L	About 3 people could develop lung cancer	10 times the risk of dying in an airplane crash	Modify your home
4 pCi/L	About 2 people could develop lung cancer	The risk of drowning	Modify your home
2 pCi/L	About 1 person could develop lung cancer	The risk of dying in a home fire	Consider modifications if between 2 and 4 pCi/L
1.3 pCi/L	Less than 1 person could develop lung cancer	(Average indoor radon level)	Reducing radon levels below 2 pCi/L is difficult
0.4 pCi/L	Less than 1 person could develop lung cancer	(Average outdoor radon level)	Reducing radon levels below 2 pCi/L is difficult

Note: If you are a former smoker, your risk may be higher.

Source: EPA, 1992

Tobacco users are more likely than nonusers to develop lung cancer when exposed to radon, according to a 1989 study by researchers from the National Institute for Occupational Safety and Health, the Centers for Disease Control and the Harvard School of Public Health.

TESTING FOR RADON

The amount of radon that accumulates inside a home is caused by factors relating to the home's structure and geographic location. Because the radon concentration varies greatly even among homes in the same neighborhood, each home must be tested to determine its radon level. Such testing is highly recommended by the EPA, the U.S. Surgeon General, the American Lung Association, the American Medical Association, and the National Safety Council. The EPA recommends that people check their homes for radon if the home has a basement or if they live on the first or second floor.

RADON TESTING METHODS

With proper equipment, radon is relatively easy to detect. The quickest way to test for radon is with a short-term "do-it-yourself" radon test kit, available by mail order or from a grocery store. Common short-term devices used for testing are charcoal canisters, alpha track detectors, liquid scintillation detectors and continuous monitors.

For a short-term test, all doors and windows must be closed 12 hours before the test and throughout the testing period. The test kit is placed in the lowest lived-in level of the home. When the test is completed, the kit is mailed to a laboratory for analysis. The lab will mail back the results within a few weeks.

Long-term tests give a better measure of a home's average radon concentration year-round. These tests require more than 90 days. Common long-term testing devices are the "alpha track" and "electret" detectors.

Once high levels of radon are detected, they must be reduced and further infiltration prevented. Even

extremely high levels of radon can be reduced to acceptable levels. To lower the risk of developing lung cancer, it is recommended modifications be made to any house with a radon level of 4 picocuries (a measure of radioactivity) per liter of air or higher.

MITIGATION METHODS

The cost of modifications to lower the radon level in the average home ranges from about \$500 to \$2,500. There are two ways to reduce radon levels in homes:

- Prevent the radon gas from entering the home.
- Ventilate from the home the air containing radon and its decay products.

RADON REDUCTION TECHNIQUES

Most methods to reduce radon levels in houses either prevent radon from entering the house or reduce the levels after it enters. Prevention is generally the preferred approach. This is typically done by venting air below the foundation to the outdoors. Air can be vented with fans and ducts or in some cases with natural ventilation; the type of foundation dictates the most appropriate technique.

Other reduction methods include sealing cracks in the foundation, house pressurization, and increased air exchange with a heat recovery system.

The National Environmental Health Association maintains a list of certified radon professionals. This list is available from the Web at <http://www.radongas.org/>.

Radon Risk if You Smoke

Radon level	If 1,000 people who smoked were exposed to this level over a lifetime...	The risk of cancer from radon exposure compares to...	What to do: Stop smoking and...
20 pCi/L	About 135 people could develop lung cancer	100 times the risk of drowning	Modify your home
10 pCi/L	About 71 people could develop lung cancer	100 times the risk of dying in a home fire	Modify your home
8 pCi/L	About 57 people could develop lung cancer		Modify your home
4 pCi/L	About 29 people could develop lung cancer	100 times the risk of dying in an airplane crash	Modify your home
2 pCi/L	About 15 people could develop lung cancer	2 times the risk of dying in a car crash	Consider modifying home if between 2 and 4 pCi/L
1.3 pCi/L	About 9 people could develop lung cancer	(Average indoor radon level)	Reducing radon levels below 2 pCi/L is difficult
0.4 pCi/L	About 3 people could develop lung cancer	(Average outdoor radon level)	Reducing radon levels below 2 pCi/L is difficult

Note: If you are a former smoker, your risk may be lower.

Source: EPA, 1992

SUMMARY

- Radon is a naturally occurring gas that results from the breakdown of uranium commonly found in soil.
- Surveys show that 1 out of 5 homes in the United States have elevated radon levels.
- Radon is the second-leading cause of lung cancer.
- Radon testing kits can be purchased through the mail or from your local grocery store. Look for a test certified by the state or listed by the EPA.

FOR MORE INFORMATION

For Texas radon information, contact:

Texas Department of Health
Bureau of Radiological Control
1100 West 49th Street
Austin, TX 78756
(512) 834-6688
Contact: Gary L. Smith

To download A Citizen's Guide to Radon (Second Edition):

<http://www.epa.gov/iaq/radon/pubs/citguide.html>

To access the U.S. Geological Survey's Radon web site:

<http://energy.cr.usgs.gov/radon/radonhome.html>

Produced by AgriLife Communications and Marketing, The Texas A&M University System
Texas AgriLife Extension publications can be found on the Web at: <http://AgriLifebookstore.org>

Educational programs of the Texas AgriLife Extension Service are open to all people without regard to race, color, sex, disability, religion, age, or national origin.