

**National radon levels**

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# Radon Fact Sheet



The U.S. Environmental Protection Agency (US EPA) and the [Surgeon General's Office](#) have estimated that as many as 20,000 lung cancer deaths are caused each year by radon. Radon is the second leading cause of lung cancer. Radon-induced lung cancer costs the United States over \$2 billion dollars per year in both direct and indirect health care costs. (Based on National Cancer Institute statistics of 14,400 annual radon lung cancer deaths - Oster, Colditz & Kelley, 1984)

According to the US EPA, nearly 1 in 3 homes checked in seven states and on three Indian lands had screening levels over 4 pCi/L, the EPA's recommended action level for radon exposure.

The alpha radiation emitted by radon is the same alpha radiation emitted by other alpha generating radiation sources such as plutonium.

A family whose home has radon levels of 4 pCi/l is exposed to approximately 35 times as much radiation as the Nuclear Regulatory Commission would allow if that family was standing next to the fence of a radioactive waste site. (25 mrem limit, 800 mrem exposure)

An elementary school student that spends 8 hours per day and 180 days per year in a classroom with 4 pCi/l of radon will receive nearly 10 times as much radiation as the Nuclear Regulatory Commission allows at the edge of a nuclear power plant. (25 mrem limit, 200 mrem exposure)

Most U.S. EPA lifetime safety standards for carcinogens are established based on a 1 in 100,000 risk of death. Most scientists agree that the risk of death for radon at 4 pCi/l is approximately 1 in 100. At the 4 pCi/l EPA action guideline level, radon carries approximately 1000 times the risk of death as any other EPA carcinogen. It is important to note that the action level is not a [safe level](#), as there are no "safe" levels of radon gas.

## What is radon?

### A layman's description

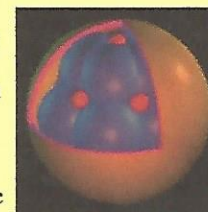
Radon is a cancer-causing [radioactive](#) gas. You cannot see, smell or taste radon, but it may be a problem in your home. The Surgeon General has warned that radon is the second leading cause of lung cancer in the United States today. If you smoke and your home has high radon levels, you're at high risk for developing lung cancer. Some scientific studies of radon exposure indicate that children may be more sensitive to radon. This may be due to their higher respiration rate and their rapidly dividing cells, which may be more vulnerable to radiation damage.

### A scientific description

**PROPERTIES:** Radon is a gaseous highly radioactive element discovered by English physicist Ernest Rutherford in 1899. The discovery is also credited to German physicist Friedrich Ernst Dorn in 1900. More specifically, Rutherford discovered radon's alpha radiation and Dorn discovered that radium was releasing a gas.

Radon is a colorless chemically-unreactive inert gas. The atomic radius is 1.34 angstroms and it is the heaviest known gas--radon is nine times denser than air. Because it is a single atom gas (unlike oxygen, O<sub>2</sub>, which is comprised of two atoms) it easily penetrates many common materials like paper, leather, low density plastic (like plastic bags, etc.) most paints, and building materials like gypsum board (sheetrock), concrete block, mortar, sheathing paper (tarpaper), wood paneling, and most insulations.

Radon is also fairly soluble in water and organic solvents. Although reaction with other compounds is comparatively rare, it is not completely inert and forms stable molecules with highly electronegative materials. Radon is considered a noble gas that occurs in several isotopic forms. Only two are found in significant concentrations in the human environment: radon-222, and radon-220. Radon-222 is a member of the radioactive decay chain of uranium-238. Radon-220 is formed in the decay chain of thorium-232. Radon-222 decays in a sequence of radionuclides called radon decay products, radon daughters, or radon progeny. It is radon-222 that most readily occurs in the environment. Atmospheric releases of radon-222 results in the formation of decay products that are radioisotopes of heavy metals (polonium, lead, bismuth) and rapidly attach to other airborne materials such as dust and other materials facilitating inhalation.



**USE:** Radon has been used in some spas for presumed medical effects. In addition, radon is used to initiate and influence chemical reactions and as a surface label in the study of surface reactions. It has been obtained by pumping the gases off of a



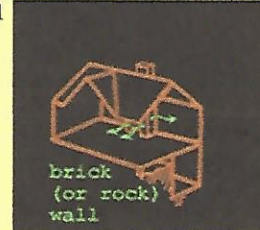
solution of a radium salt, sparking the gas mixture to combine the hydrogen and oxygen, removing the water and carbon dioxide by adsorption, and freezing out the radon.

**PRODUCTION:** Radon is not produced as a commercial product. Radon is a naturally occurring radioactive gas and comes from the natural breakdown (radioactive decay) of uranium. It is usually found in igneous rock and soil, but in some cases, well water may also be a source of radon.

**EXPOSURE:** The primary routes of potential human exposure to radon are inhalation and ingestion. Radon in the ground, groundwater, or building materials enters working and living spaces and disintegrates into its decay products. Although high concentrations of radon in groundwater may contribute to radon exposure through ingestion, the inhalation of radon released from water is usually more important.

**RADON IN THE WORKPLACE** In comparison with levels in outdoor air, humans in confined air spaces, particularly in underground work areas such as mines and buildings, are exposed to elevated concentrations of radon and its decay products. Exhalation of radon from ordinary rock and soils and from radon-rich water can cause significant radon concentrations in tunnels, power stations, caves, public baths, and spas. The average radon concentrations in houses are generally much lower than the average radon concentrations in underground ore mines.

Workers are exposed to radon in several occupations. In countries for which data were available, concentrations of radon decay products in underground mines are now typically less than 1000 Bq/m<sup>3</sup> EEC Rn (approx. 28 pCi/l). Underground uranium miners are exposed to the highest levels of radon and its decay products. Other underground workers and certain mineral processing workers may also be exposed to significant levels.



## Should you test for radon?

Testing is the only way to know your home's radon levels. There are no immediate symptoms that will alert you to the presence of radon. It typically takes years of exposure before any problems surface.

The US EPA, Surgeon General, [American Lung Association](#), [American Medical Association](#), and [National Safety Council](#) recommend testing your home for radon because testing is the only way to know your home's radon levels. There are no immediate symptoms that will alert you to the presence of radon. It typically takes years of exposure before any problems surface.

Radon is a national environmental health problem. Elevated radon levels have been discovered in every state. The US EPA estimates that as many as 8 million homes throughout the country have elevated levels of radon. Current [state surveys](#) show that 1 home in 5 has elevated radon levels.

## Can you fix the problem?

If your home has high concentrations of radon there are ways to reduce it to acceptable levels. Most radon problems can be fixed by a do-it-yourselfer for less than \$500. If you want or require the assistance of a professional you may wish to look at the list of [certified radon mitigators](#) for your state.

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# National Radon Program Services

— increasing public knowledge of radon and the need to test and fix homes

## Radon Testing in Real Estate

- [What information is available regarding radon and real estate transactions? \(#radon-and-real-estate\)](#)
- [I'm buying a house. Should I have it tested for radon? \(#buying-house-radon-testing\)](#)
- [I'm selling a house. Should I have it tested for radon? \(#selling-house-radon-testing\)](#)
- [Can vacant houses be tested for radon? \(#vacant-house-radon-testing\)](#)
- [The seller of the house I want to buy disclosed a radon level of 2. Should this be a deterrent to buying? \(#radon-level-2-buying-house\)](#)

### What information is available regarding radon and real estate transactions?

The EPA publication [Home Buyer's and Seller's Guide to Radon](http://www2.epa.gov/radon/home-buyers-and-sellers-guide-radon) (<http://www2.epa.gov/radon/home-buyers-and-sellers-guide-radon>) details several aspects related to radon testing during real estate transactions. You can find information on radon, the protocols for radon testing during real estate transactions, and guidance as to how to interpret your radon test results.

### I'm buying a house. Should I have it tested for radon?

The EPA recommends that all houses, regardless of what radon zone the house is located in, be tested for radon during point of sale. The most common procedure for radon testing during real estate transactions is for the potential buyer to request the radon test as part of the overall home inspection. The radon test is generally a separate service and must be requested. If the radon test is 4 pCi/L or greater, the EPA recommends the potential buyer negotiate with the seller to have a radon mitigation system installed with the stated goal of bringing the radon level in the home below 4 pCi/L.

### I'm selling a house. Should I have it tested for radon?

The homeowner of a house can test their home prior to listing the home for sale. If the homeowner does perform a radon test, most if not all states will require that the test result be disclosed on the whole house disclosure form you will fill out with your realtor. If the initial test by the homeowner comes back less than 4 pCi/L, potential buyers may still request an additional radon test as part of their home inspection. If an initial radon test by the homeowner is 4 pCi/L or greater, the issue will need to be addressed in the real estate transaction. A buyer may want to have a confirmatory test conducted. With an average radon level of 4 pCi/L or greater, it is recommended that a radon mitigation system be installed prior to placing the house on the market, to bring the radon level to less than 4 pCi/L.

### Can vacant houses be tested for radon?

Yes. Radon levels in a home, under typical operating conditions, will commonly reach a steady state with mild fluctuations about 12 hours after the house is closed up. Vacant houses will experience factors that may drive radon levels to lower or higher than normal averages, but the effect cannot be predicted. If the house is opened up for ventilation purposes prior to the test, it should then be closed up and a test started no sooner than 12 hours later. If short-term radon testing is being used, then the house has to be kept closed except for normal entry and exit, as if it were the winter heating season. It is recommended that the home's heating and cooling system be operated normally for the season. If the average indoor level is 4 pCi/L, then it is expected that the radon level will be near to that average after 12 hours of a house being closed.

### The seller of the house I want to buy disclosed a radon level of 2. Should this be a deterrent to buying?

This level should not be a deterrent to buying a home. In fact, any level should not be a deterrent to buying a home because radon can almost always be reduced in a home, and to levels below the EPA guideline of 4. Many times post mitigation tests are in the range of 1-3. The level of 2 would be a very good result for a home that had a mitigation system installed to reduce the level from a much higher number. As long as the issue is resolved in the real estate transaction, the radon level should not be a deterrent to buying any home. Achieving lower radon levels when the starting concentration is between 2 to 4 is not likely to be something a radon contractor would guarantee under typical conditions for a set price.





## What is Radon Gas?

### What is Radon?

Radon is an invisible radioactive gas that has been found in homes all over the United States. It comes from the breakdown of uranium in soil, rock and water and gets released into the air. Radon moves up through the ground to the air above and into your home through cracks and other holes in the foundation. Radon can also enter your home through well water.

### What Homes Have Radon?

Any home can have radon. Grand Rapids and West Michigan are not exempt from Radon gas. A complete home inspection including a Radon Gas test can help provide peace of mind. This means all homes, new or old, with or without basements. You spend most of your time at home, which is where you are most likely to be exposed to Radon. Radon levels vary house by house, so every home should be tested. About 7 percent of US homes are estimated to have an high radon level (4 pCi/L or more). High levels of radon gas have been found in homes in Grand Rapids and throughout West Michigan.

### What Should I Do?

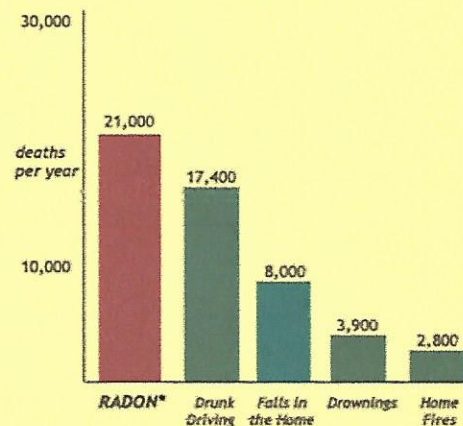
Performing a home radon test is the only way to find out your home's radon levels. A Radon test can be performed and the results documented for your peace of mind.

### If I have Radon Can I Fix It?

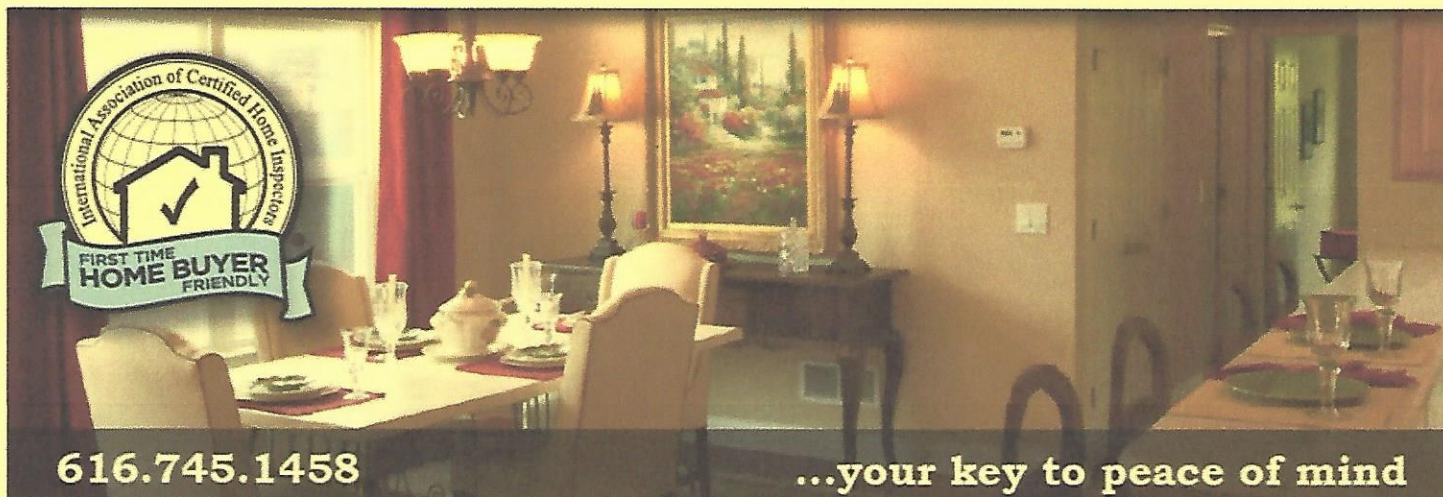
If you find that you have high radon levels, there are ways to fix a radon problem. Even very high levels can be reduced to acceptable levels.

### If You Are Buying A Home

### EPA Estimates for Deaths due to Radon (from "A Citizen's Guide to Radon")







## Radon Testing & Inspection

Radon is an invisible radioactive gas that can be found in homes all over the United States and can be very dangerous to you and your family's health if found in high levels in your home. Any home, new or old, can have a radon problem and the Grand Rapids and West Michigan areas are not exempt from the dangers of Radon.

You can't see or smell radon, but it still may be in your home. Testing your home is the only way to find out your home's radon gas levels. Therefore, the EPA recommends that all homes be tested for elevated radon levels. A radon test can be started with your home inspection and a written report provided by a certified independent lab within a few days.

### Safeguard Your Family

At Key Home Inspection, our radon detection and testing services will determine if your home currently has elevated or dangerous radon levels. A key to ensure the safety and well-being of your family.

To learn more about radon gas, please go to our [radon gas information](#) page. If you would like to schedule a radon test, please contact us at 616.745.1458 or [order an inspection](#).



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