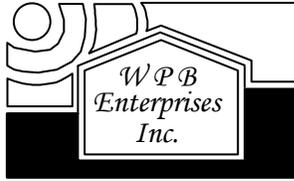


## Frequently asked Radon Questions & Answers



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### What is radon?

Radon originates from Uranium 238, a radioactive element. Almost anywhere in the world you can find some radioactive Uranium 238 in the soil. Pennsylvania in particular has a lot of it. Radioactive simple means that the element or atom occasionally loses part of itself and changes into a different element. During this radioactive decay the element releases energy and causes varying amounts of damage to whatever surrounds it. The average amount of time it takes before half of the element has decayed or changed is known as the elements half life. Uranium 238 has a 4.5 billion year half life. See the half lives listed below. Half of the uranium 238 is gone because the earth is also about 4.5 billion years old, but there's still plenty left in the soil. The next element, Thorium 234 has only 24 days before half of it is gone.

The following is the decay series from Uranium 238 to Radium 226.

Uranium 238	(all are solid particles)	4.5 billion years
Thorium 234		24 days
Protactinium 234	half life ->	1 minute
Uranium 234		1/4 million yrs
Thorium 230		80,000 yrs
Radium 226		1620 yrs

The next element after Radium 226 is RADON. See the decay series listed below. Radon is the only noble gas in the final decay chain. Noble gases have no charge (non-reactive) which means radon can freely move through the soil. Radon's half life is about 4 days, which is just enough time to float through the soil, get into our homes and decay into a series of short lived charged particles that can get lodged in our lungs and damage the lung cells.

Radon 222	(noble gas)	3.8 days
Polonium 218	(the rest are all solids)	3 minutes
Lead 214		27 minutes
Bismuth 214		19 minutes
Polonium 214		0.0016 seconds
Lead 210		22 years
Bismuth 210		5 days
Polonium 21		128 days
Lead 206		Stable

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### **What is 4.0 pCi/L?**

Radioactivity in the United States is measured in units of Curies which is equal to the decay rate of a gram of Radium. Curie comes from Madame Curie, the renown scientist who determined the decay rate of radium in the 1920's. One pCi/L is one trillionth of a curie of activity in a liter of air. The US EPA recommends that the level of radon in a home be reduced below 4.0 pCi/L. In Europe and Canada they use Becquerel's per cubic meter (Bq/m<sup>3</sup>). Four pCi/L is about equal to 150 Bq/m<sup>3</sup>.

### **What does radon do?**

Radon floating in the air of our homes decays back into solid particles that are charged (reactive). These short-lived radon decay products can become lodged in our lungs or enter our lungs attached to dust particles. The decay of these solid particles damages our lung tissue and if there is adequate exposure it increases the chances of protracting Lung Cancer.

### **Is Radon's connection with Lung Cancer scientifically valid?**

Every scientific group that has carefully looked at the available data has agreed that there is a connection between radon exposure and lung cancer. Radon has a Class A carcinogen rating because there is so much human data, animal studies and sound explanation of how it takes place. See actual scientific papers at: [Recent Scientific Papers](#)

### **Are radon levels below 4 pCi/l safe?**

Other environmental exposures are regulated to reduce the lifetime risk of cancer to one in 100,000. The EPA lists Radon risk exposure to 4.0 pCi/L for a lifetime (18 hours per day) to cause 7 additional lung cancers in a thousand non-smokers or 62 additional lung cancers in 1000 smokers. The risk is considered linear which means even 2 pCi/L for a lifetime would cause 3 additional cancers in a 1000 non-smokers. Fortunately, most of us are not exposed for a lifetime; however, we would get a similar risk if we were exposed to four times as much for a quarter of a lifetime or 16 pCi/L in your bedroom for 17 years.

### **What radon action level do other countries use?**

Canada recently lowered it's action level to 200 Bq/m<sup>3</sup> (equal to 5.4 pCi/L). Presently Australia, Ireland, Sweden and the UK also use 200 Bq/m<sup>3</sup> as the recommended action level. It is highly unlikely that the US EPA will raise the recommended action level from it's present 4.0 pCi/l level (150Bq/m<sup>3</sup>) to 5.4 pCi/L.

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### **Does radon cause other health problems or symptoms?**

Radon has not been shown to cause any other health problems. You cannot smell, taste or feel radon in the air.

### **How many homes in my area have elevated radon?**

The EPA has radon maps that show what the general risk of radon is in each county of each state. [EPA Zone maps](#)

Air Chek, one of the largest radon test kit suppliers in the country provides a graph of how many homes in a state have elevated radon levels. [Air Chek state radon levels](#)

Regional 3 EPA, which covers Pennsylvania, has state maps with radon levels broken down by zip code. [Region 3 zip code maps](#)

The PA DEP provides the highest and average radon level for each zip code in Pennsylvania. [PA DEP zip code data](#)

WPB has individual maps of every county in Pennsylvania with each zip code color coded by percentage of homes with radon levels above the guideline. [PA radon levels by zip code](#)

### **Should I do another radon test?**

If only one radon test was done in your home it is generally recommended to make a second measurement before deciding on mitigation. Radon tests are easy and inexpensive. You can purchase test kits from these two suppliers.

[Home radon test.com](#)

[Air Chek test kits](#)

If the home is in the midst of a real estate transaction then it is usually necessary to have a professional independent tester make the second measurement. You can, however, always test your own home. Note that a buyer may not accept test results made by a seller.

If the radon levels are greater than 10 pCi/l it is unlikely that the second test will be below the guideline. It becomes more prudent, however, to do a 2nd test the closer the first test is to the 4.0 pCi/L guideline. When radon levels are marginal or below the guideline it is recommended to test in an opposite season or do a long term test to better define the average radon levels.

### **Can I do my own radon test?**

It is not difficult to do your own radon test. You can always test your own home even if it is involved in a real estate transaction. A new buyer, however, may only feel comfortable with a radon test done by a certified independent radon tester.

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### **Are electronic radon monitors more accurate than passive testers?**

Electronic radon monitors that give hour by hour radon results can be more accurate than passive test kits such as charcoal detectors or E-Perms. All radon test kits and monitors used in Pennsylvania must pass proficiency tests. Electronic radon monitors offer the advantage of measuring the radon levels every hour, which can indicate unusual radon patterns or possible radon test tampering. The inexpensive Pro-Series 3 radon monitor does not give hour by hour radon measurements but does provide a continuous long term average. This monitor is new and has not been officially listed by the EPA or any state or national radon certification programs.

### **What is a long-term radon test?**

Short-term radon tests are generally 2 to 7 days in length. Short-term tests must be made with closed house conditions. A long-term radon test is three months to one year in length. Long-term tests do not require closed house conditions. If radon measurements during a real estate transaction are questionable, a long-term test is sometimes performed with money left in an escrow account to pay for a radon mitigation system if the long-term test results are above the 4.0 pCi/L guideline.

### **Should I test radon in water?**

The EPA states in the Home Buyers and Sellers guide to radon, "If you have tested the air in your home and found a radon problem, and your water comes from a well, have the water tested." Radon in water needs to be in the thousands to be a significant risk. One study indicated that about 1 in 20 wells in Pennsylvania will have radon levels of 3000 pCi/l or higher. For more information refer to the radon in water information page at: [Radon in Water info page](#)

### **Does a vacant house have higher radon levels?**

The upper floors of a vacant house will likely have higher radon levels than a similar occupied house if a normal occupied temperature is maintained. The basement ventilation level of a vacant house, however, is not likely to be significantly different than an occupied house and therefore is likely to be a similar radon level. Note that radon does not build up to higher levels the longer a home is vacant because of normal natural ventilation.

### **Can a person selling his home cause a radon test to pass?**

Radon levels will change when you open a window especially if the window is in the same area as the test kit. In general however the window or multiple windows have to be wide open in the test area to make a big change (cut radon levels in half). If the radon levels are just above the guideline they can however be reduced below the guideline by opening windows. Opening windows on floors above the area being tested can cause the radon levels to go either higher or lower. Moving the radon detector to a low radon area will obviously also change the results to the new location level but many testers will

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minimize this possibility with tamper resistant features. We have a full report on [test tampering](#) available as a download.

### **Does it make a difference if my house is drafty or very airtight?**

Radon levels are primarily due to three factors, location, location and location. How much radon is in the ground and how easily can gas move through the soil. The type of house and its airtightness is less important.

### **Do slab on grade or walk out basements have high levels?**

People assume that slab on grade or walk out basements will have low radon levels. Unless the windows or doors are left open radon from the soil can just as easily enter these types of buildings. All that is needed is radon in the soil, some openings through the slab and the building warmer inside than outside (rising inside warm air draws radon into the building).

### **Why are previous radon tests so different?**

Some difference is expected because radon levels fluctuate due to weather and house conditions. It is not un-common for radon levels to be twice as high or one half of previous measurements. Upstairs measurements in particular can be significantly different in heating versus cooling seasons. Basement measurements tend to be more consistent in different seasons. A basement measurement that is ten times higher or one tenth of a previous measurement would be unusual.

### **Should I move out or ventilate my house if I have high radon levels?**

Radon exposure is based on a combination of how long you are exposed and the radon level. In general it is not necessary to ventilate a house unless the mitigation system cannot be installed in the next few weeks and the radon levels are very high (greater than a hundred pCi/l). The best ventilation is leaving a basement window continuously open and/or a bedroom window open at night.

### **How does radon get into my house?**

Radon is typically drawn into a house from the soil directly under the home because the lower level of the house is negative in pressure as compared to the soil. The negative pressure is mostly caused by the air in the home being warmer than the outside and escaping out the top of the house. Many air-handling systems in homes also induce a negative pressure in the lowest level. This negative pressure draws radon laden soil gas into the house via cracks and openings in the lower level concrete slab or from a dirt floor crawl space.

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### **Can radon be reduced by sealing cracks and slab openings?**

Reducing the radon levels in a home by sealing cracks or a sump pit has not proven to be very effective. This is partially due to the radon levels in the soil building up to a higher concentration when the openings are sealed so that less soil air comes in but it comes in at a higher radon concentration. Sealing is still a necessary component of sub-slab depressurization radon mitigation systems.

### **How does a radon mitigation system work?**

The most common radon system is a sub-slab depressurization system. A fan, located in an attic or outside the building, is used to draw air out from under a basement, crawl space or slab on grade concrete slab. If done properly, the entire area directly below the slab becomes negative in pressure as compared to the air above the slab. This causes the normal airflow out of the soil to reverse and flow into the soil, which effectively stops all infiltration of radon laden soil gas. The sub-slab depressurization system needs to create this sub-slab negative pressure under all slabs that are contributing a significant amount of radon into the building. Refer to [mitigation system explanation](#) for a more detailed description and system drawings. See [mitigation system photos](#).

### **Must the vent pipe be outside and up to the roof?**

Active soil depressurization (ASD) must be vent above the roof line because the radon levels in the exhaust are often thousands of pCi/L. Sometimes it is possible to route piping from the basement up through a closet(s) to the house attic or through the garage to the garage attic. The fan can be installed in the attic and the exhaust would be routed above the roof by using a plumbing flashing through the shingles. We use downspout piping on the outside to minimize system appearance. See [Job Photos](#)

### **How big are the radon vent pipes?**

The radon vent pipes are typically 3" or 4" inside diameter PVC piping. Four inch pipe can easily move 150 cfm of air while three inch pipe can move 80 cfm. Many house can be fixed using only three inch pipes but four inch allows a margin of safety if more air needs to be moved through the system. Sometimes smaller 2" or even 1.5" pipes are used to draw small amounts of air out from under a membrane or a block wall.

### **How much does a mitigation system cost?**

Simple radon mitigation systems start at a cost of \$850 plus the cost of the post mitigation test, which is required in Pennsylvania. A new home with the radon piping pre-installed by the builder will be a couple of hundred dollars less. If the home requires extra sealing, extra suction holes, treatment of a crawl space or slab on grade the cost can be twice as much as a simple system (\$1600).

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### **Who can install a radon mitigation system?**

In Pennsylvania the following items are required by state law. A certified mitigation individual must either visit the home, typically as part of the estimate, or must be present at the initiation of the mitigation installation. A mitigation certified individual must inspect the completed system if the original mitigation system designed by the certified individual is changed. At least every fifth unchanged mitigation job in PA must be inspected by a mitigation certified individual.

A homeowner can always install his own mitigation system. I recommend you visit [Infiltec](#) to obtain your mitigation supplies and general installation information if you wish to tackle the job yourself.

### **How is radon mitigation handled if I'm buying or selling a home?**

Normally the buyer is responsible for having the home tested for radon. If the levels are above the guideline either the buyer or the seller is responsible for getting one or more radon estimates. Typically the seller pays for the radon mitigation. Sometimes the agreement of sale specifies the seller is responsible for a partial amount of the cost. After the system is installed, the seller is often responsible for paying for the post mitigation radon test unless it is defined differently in the agreement of sale.

### **How is a mitigation system tested?**

The PA DEP and the EPA RMS requires a post mitigation radon test be completed within 30 days after the mitigation system is activated. It is advisable to have an independent certified tester perform the test for all real estate transactions

### **How low will radon levels be after installing a radon system?**

85% of our post mitigation test results are less than 2.0 pCi/l. The remaining systems are between 2.0 and 3.9 pCi/l.

### **How much will it cost to run the radon fan?**

We use the most energy efficient fan sold that will effectively reduce the radon levels. Two thirds of our mitigation systems use a 60-watt fan that costs about \$70/year to operate. One third of our systems use an 20-watt fan that costs about \$20/year to operate. This super-efficient 20-watt fan is very quiet and will save \$500 or more in electrical cost over ten years.

### **Do the radon fans have to run continuously?**

If you turn a radon fan off, the radon levels will return to the pre-mitigation levels within a few hours. In addition, ground moisture will begin to enter the bearings and motor, causing a pre-mature failure of the fan so it is best to keep the fan running even if you go on an extended vacation.

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### **How do I know the radon system is working?**

Each system is installed with a u-tube monitor installed on the system piping. One side of the u-tube has a vinyl tube plugged into the radon pipe. The suction created by the radon fan draws the oil up the side of the tube connected to the radon pipe. The difference in height between the two oil levels indicates the actual suction in the pipe induced by the fan. If the two oil columns are level, the fan is off or not working and needs to be turned on or serviced.

### **Can a high efficiency or HEPA filter reduce radon levels?**

Radon is a noble gas which means it does not stick to anything including furnace filters, so filters will not reduce radon levels. Filters will capture radon decay products which are charged particles. There is some discussion among experts that this may reduce the health risk but the furnace fan would need to run continuously and filter every occupied room. The EPA does not recommend radon remediation using filters.

### **Does a radon system reduce basement humidity or mold?**

A large percentage of the humidity in a basement is from soil gas infiltration. A sub-slab depressurization system stops not only radon but also moist soil gas entry. Customers often report that their de-humidifier in the basement runs less and the basement smells less moldy. A de-humidifier may still be necessary to eliminate other sources of moisture. Jump to [Reducing Basement Moisture](#) for lots of additional information.

### **What is Thoron?**

Thoron is another naturally occurring radioactive noble gas that is can enter our homes from the soil or be present in building materials (most commonly via stone foundations). Thoron also decays into solid reactive particles that emit alpha energy and can be a health risk. Thoron however has a very short half life of 55 seconds. This typically does not allow enough time for thoron to enter the air in our homes before it decays and sticks to the soil it is produced in. Read more at [Making Thoron Measurements](#).