

How Radon Enters a House

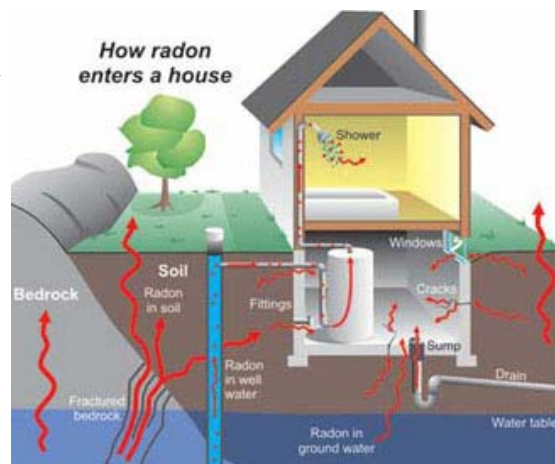
The enemy from below

We know radon gas is harmful, but how does it get into our homes? Knowing this may help keep it out. That's why it's important to recognize where radon comes from.

Radon is estimated to cause many thousands of lung cancer deaths each year. In fact, the Surgeon General has warned that radon is the second leading cause of lung cancer in the United States. Radon is a naturally occurring radioactive gas produced by the breakdown of uranium in soil, rock, and water. Whenever air enters a building from underneath, radon will most likely come in as well if radon is present. In the United States, radon gas in soil is the principal source of elevated radon levels in homes.

The Enemy From Below

Normally, radon travels first through the soil before entering a structure. Radon moves from its higher concentration at its source to areas of lower concentration in the soil to a point where it will be drawn in by pressure-driven transport. This process is called diffusion.



Pathways in soil are created from high soil porosity, void space, fissures in underlying geology and/or preconstruction excavation. All make soil more permeable. Radon will also follow loose fill in plumbing trenches. And, although wet clays are low in permeability and can retard radon entry; dry clays crack and allow soil gas to channel up.

Frost or saturated upper soil horizon can cap the soil so the negative pressure of a building is exerted on larger areas. This is why rain can elevate levels of radon within a home.

Your house acts like a vacuum. Soil pressures, referred to as air pressure differentials, cause air from soil to be pulled through the smallest of openings in the foundation openings. Soil gas can enter any structure in contact with the ground and radon in the soil enters with it.

Negative pressure causes most radon entry. Because buildings are typically at a lower pressure than the surrounding air and soil, and because it's a gas, radon is drawn into the house air.

Environmental factors like rain, wind and falling barometric pressure also play a role. These cyclical changes are one of the reasons why levels of radon will vary with time.

There are several reasons why air pressure differentials occur. One cause is the effect that exhaust fans have when removing air from a building. When air is exhausted by mechanical systems, outside air enter the building to replace it. Home exhaust systems include bathroom fans, clothes dryers, central vacuums and combustion appliances. Wood fireplaces, open and air-tight wood stoves also can contribute to air pressure differentials. Related causes are the effects of unbalanced forced air HVAC Systems due to leaky return air ductwork. Much of this replacement air comes in from the underlying soil. Another reason is the stack effect from heating.

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Temperature differentials are another contributing factor. When interior temperatures are higher than outside temperatures, thermal effects occur inside of the building. As indoor air is heated, warm air rises then vacates a building and is displaced by cooler outside air. Some of this outside air comes from the soil.

There are many pathways that will allow radon to enter including cold joints and expansion joints in basements, hollow blocks, plumbing penetrations, electrical service penetrations and openings under tubs and showers. Even the smallest crack in foundations and concrete slab-on-grade floors can be problematic. Radon can pass through porous drainage beds of "French Drains" towards homes and frequently are routed to interior sump pits.

Some foundation types are bigger culprits than others. Because of their large soil surface, crawlspaces rank high for potential problems. Crawlspace vents are of little help, especially in winter. The use of plastic vapor barriers in crawlspaces, while important in controlling moisture from migrating out of the soil below a house and into the house environment, is not a radon barrier.

Other Causes

In a small number of homes, the building material (e.g., granite and certain concrete products) can also result in elevated levels in homes by giving off radon. The rate of emanation or release depends on radium content and surface area. The radon gas is typically dissipated by normal ventilation.

Radon may also be present in well water and can be released into the air, in homes when water is used for showering and other household uses. This process is known as outgassing. In most cases, radon entering the home through water is a small risk compared with radon entering your home from the soil.

Radon Entry and Indoor Concentrations Are Variable

Amounts of uranium and radium beneath a structure, diverse soil conditions, rapidly changing air pressure and temperature differentials, varying mechanical systems, different foundation types, and various potential pathways can make concentrations of radon gas vary from home to home within the same neighborhood. These are compelling reasons why the Surgeon General recommends that all homes be tested.

For more information on Radon visit the EPA Radon Website www.epa.gov/radon

Our homeowner tips are only general guidelines. Since each situation is different, please consult with a specialist regarding your questions or specific issue. More home safety and maintenance information is available online at www.national-inspection.com.

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