Radon Mitigation Techniques

Any home can have a radon problem. This means new and old homes, well-sealed and drafty homes, and homes with or without basements. The EPA estimates that 1 out of every 15 homes in the United States have elevated radon levels above 4 pCi/L. Radon mitigation systems are highly effective in reducing radon concentrations to below 4 pCi/L. In New Jersey, sixty percent of the homes mitigated have been brought down to below 1 pCi/L.

Homeowners should consult a certified radon mitigation contractor to discuss the best method for reducing radon in their home. Homeowners may choose to do their own mitigation, but should be aware that significant home repair experience is required, and that there is potential danger from backdrafting of exhaust systems if the mitigation is not done correctly. Following are the most common techniques, with several often combined in one mitigation:

1. Active Soil Depressurization (ASD)
reduces the amount of radon accumulating underneath a building's foundation. Pipes are inserted into holes drilled through the foundation floor. The pipes are connected to an exhaust fan, which vents radon outdoors, preventing it from entering the interior of the home. In addition, possible entry points for radon are sealed which include sump pits, openings around utility pipes, gaps between floors and walls, and large cracks in basement floors.

The pipe pictured above is part of an ASD system.

2. Block-Wall Depressurization
is effective in cases where radon enters through hollow concrete block walls. This method depressurizes the air space in the walls by means of an exhaust fan. Sealing cracks in basement walls will increase the effectiveness of this method.

3. Drain-Tile Suction
involves the use of a continuous loop of perforated tiles along the perimeter of the house. An exhaust fan is installed into the network of tiles that is then vented above the house eave. The suction created by the fan pulls radon away from the surrounding soil and reduces the entry of radon into the home.

4. Submembrane Suction
reduces levels in crawlspace homes. This method involves covering the earth floor with a high-density plastic sheet. A vent pipe and fan are used to draw the radon from under the sheet and vent it to the outdoors.

A post-mitigation test should be performed upon completion of the mitigation system, regardless of whether the mitigation work was performed by a certified contractor or a homeowner, to determine if radon levels have been reduced to less than 4 pCi/L. New Jersey offers a free post-mitigation test to confirm these results which can be obtained by submitting a copy of the mitigation contract and the initial post-mitigation results. A retest should be performed every two years to ensure that the mitigation system is working properly.

Certification in New Jersey

New Jersey law requires that only certified individuals or the homeowner can conduct radon testing and mitigation in a home. New Jersey's certification program requires that certified individuals demonstrate required education and experience, take DEP-approved courses, and pass a written examination. Certified businesses must report test and mitigation data to the DEP, and comply with quality assurance and recordkeeping requirements.

New Jersey residents should check to make sure that businesses and individuals are certified, by asking to see proof of certification and checking the certification's expiration date. Even test devices sold in stores must be from companies certified in New Jersey, as evidenced by the New Jersey certification number ('MEB9', followed by four digits). To obtain a list of certified businesses in New Jersey or to request further information, please contact the DEP Radon Section at (800) 648-0394, or visit www.njradon.org

Radon: The Basics

- Radon is the second leading cause of lung cancer, after cigarette smoking.
- Testing is easy and inexpensive.
- The DEP recommends all New Jersey homeowners test for radon.
- If levels are elevated, homes can be mitigated to reduce radon levels.
- In New Jersey, all radon testing and mitigation businesses and professionals must be certified.

RADON

Information You Should Know

New Jersey Department of Environmental Protection
Radon Section
(800) 648-0394
www.njradon.org

Introduction

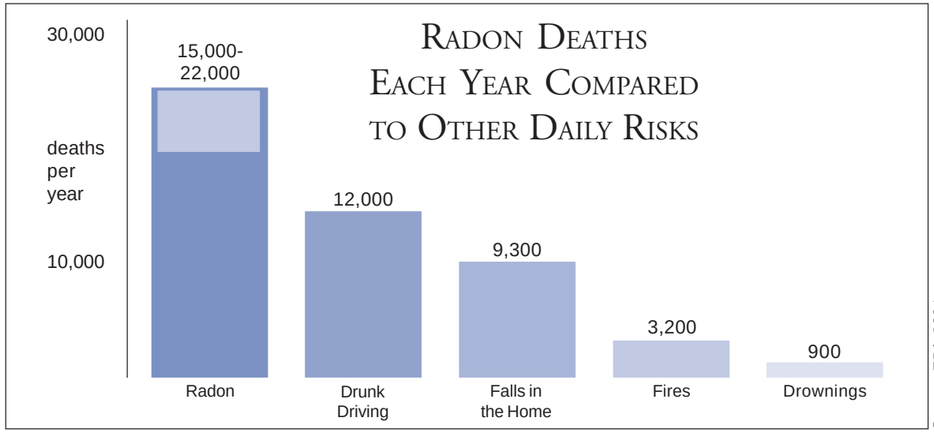
Radon is a naturally occurring radioactive gas formed by the decay of uranium in rock, soil, and water. Radon is invisible, odorless, and tasteless and can only be detected through specialized tests. The U.S. Environmental Protection Agency (EPA) ranks indoor radon among today's most serious environmental health problems.

While radon disperses quickly in the outdoor environment, it can accumulate in the home. Long-term exposure to radon has been linked to increased risk of lung cancer. The greater the concentration and the longer the exposure, the greater the risk of developing lung cancer.

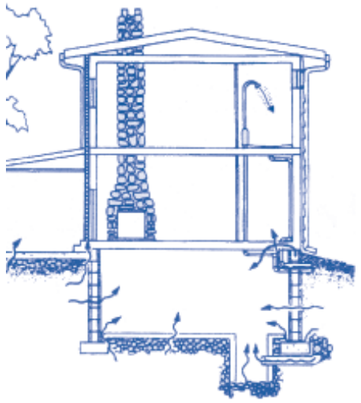
The New Jersey Department of Environmental Protection (DEP) recommends that all homeowners test their homes for radon, and mitigate (fix) their home if tests reveal levels of 4 pCi/L or more. Even in areas that generally have a low radon potential, elevated levels of radon have been found.

Radon can seep from soil into homes with the concentration affected by the following factors: the amount of uranium in the soil beneath the home; the ease with which radon moves through the soil; and the number and size of openings into the home (such as cracks in flooring, openings around pipes, and sump pits).

In addition, slight differences between indoor and outdoor air pressure will affect the rate at which radon enters the home. Reduced indoor air pressure draws radon gas into the house from underlying soil. Since warm air rises, and air in a house is often warmer than the outside air, this "stack effect" causes lower indoor air pressure. Lower indoor air pressure also results from exhaust fans, venting of air by furnaces, clothes dryers and other appliances, and opening the downwind windows in a home. Lower indoor air pressure increases radon concentrations.



Source: EPA 2004



Common entry points for radon.

Radon may also be present in well water and can be released into the air in your home when water is used for showering and other household uses.

All these factors vary greatly from home to home, and the lifestyle of a particular family can affect these factors as well (for example, how much the family uses vented appliances and heating systems). As a result, one home may have a high level of radon while the home next door may have a low level.

Radon undergoes a radioactive decay process which produces other radioactive materials which further decay and form solids. These solids can attach to particles in the air, such as dust or cigarette smoke, where they can be inhaled and become trapped in the lungs. As these particles further decay, they release small bursts of energy which continue to emit radiation that can damage DNA and harm sensitive lung tissue resulting in the possible formation of lung cancer.

The National Academy of Sciences estimates that between 15,000 to 22,000 deaths from lung cancer are caused by radon each year in the United States. Radon is the leading cause of lung cancer, second only to cigarette smoking. Approximately 2,900 of those diagnosed with radon-induced lung cancer have never smoked. Exposure to radon in combination with smoking greatly increases the risk of lung cancer. More people die from radon than from drunk driving, falls in the home, fires, and drownings. Radon exposure is easily preventable by testing.

Testing for Radon

The first step in determining if a home has elevated radon levels is to perform a radon test. Radon is most commonly measured in picoCuries per liter (pCi/L) of air, which is about one quart. The EPA and the DEP have established a guideline that homes with 4 pCi/L or more of radon should be mitigated. It is important to note that this action level was set because it was technologically achievable, not because it entirely eliminates risk from exposure to radon. There is no truly "safe" level of radon since lung cancer can result from very low exposures to radon; however the risk decreases as the concentration decreases.

The four most common radon test devices are the charcoal canister, continuous radon monitor, alpha track detector, and electret ion chamber. The charcoal canister and continuous radon monitor are used for short-term tests (2-7 days), the alpha track is for long-term tests (3-12 months), and the electret can be used for either short-term or long-term tests. Testing is easy and inexpensive.

Homeowners typically begin with a short-term test in the lowest livable level of the home; that is, the lowest level that is used or could be used as a living space. This would include the first floor in a home without a basement and a finished or unfinished basement, but not a crawl space. If a single short-term test reveals levels of 4 pCi/L or more, DEP data indicate that subsequent testing would confirm that levels in the home are 4 pCi/L or more in 80 percent of cases.

If a second short-term test is conducted in the same location, either at the same time or a later time, the average of the two tests will provide a slightly more accurate estimate of radon levels. Long-term tests of 3-12 months provide the best estimate of exposure, since radon levels fluctuate daily and seasonally.

"Closed house" conditions must be maintained during the test, meaning that windows and doors that could let in outside air must be kept closed, except for routine entrances and exits. For tests lasting less than 4 days, closed house conditions must be initiated 12 hours before the start of the test.