Radon – Fix is Sometimes Simple and Inexpensive

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Radon is a difficult issue for homebuyers and sellers, real estate agents and home inspectors. The Surgeon General says that radon is the second leading cause of lung cancer. The EPA sets an average level as the recommended maximum allowed in residences. HUD and FHA have regulations about warnings that must be issued to homebuyers and mortgagees. We must adhere to these guidelines.

There is no doubt that decaying radon will damage lung cells. The exact levels and circumstances that are required to cause lung cancer are not known. Currently, scientific studies have not been performed to accurately establish danger levels. Existing studies have not had access to accurate, long-term data and are sometimes contradictory. Accurate data on health effects of radon exposure at normal household levels may not be established for many years.

The practical reality is that several of our government agencies have accepted an arbitrary maximum radon level that we must respect. These government regulations make it a liability issue. This level, 4 pCi/l (pico curies per liter) is what we have learned to fixate on, but what matters to real people is how to prevent radon from harming us.

We live with radon. It's a fact. The EPA estimates that as many as a third of all Colorado homes have radon that exceeds their recommended maximum. Environmental radon is relatively high in the whole state. The first step is to decrease exposure as much as possible.

Sealing gas entry points always makes sense. The places that leak gases into your home are a source of energy loss. Moisture can also enter through these routes around pipes and other things that penetrate the foundation, as well as expansion joints, sumps and cracks. If leaks above ground are sealed and leaks through the floor are ignored, a chimney effect may be created and radon levels can increase.

The tighter you seal your house the more important ventilation becomes. The air inside our homes can be more "polluted" than the air outside. Besides gases, like radon, that are drawn into a house, everyday living creates indoor air pollution from activities like cooking, cleaning and using gas, or wood, burning appliances. Natural ventilation, like opening a window, is easiest but may not be feasible because of heat loss. The tighter the house is sealed, the less passive ventilation exists from leaking doors and windows, etc.

Passive ventilation for crawlspaces and/or foundation slabs can sufficiently reduce radon. This may be ventilation grating at the ends of a crawlspace relying on natural air movement. Ventilation pipes inserted under, or through, the foundation ending above roof level may also provide sufficient reduction. A wind turbine is sometimes used to draw air from under foundation or crawlspace.

The most popular method of controlling radon may not always be the best. There are inexpensive ways to control radon that we never hear about. According to Industrial Hygienist Caoimhin Connell, even burning a candle can provide airborne particles that unattached radon daughters may attach to, reducing radon risk.

Radon decays into a long series of molecules; and with each successive decay, various kinds of entities are released. Alpha particles are the largest and can cause damage to lungs cells when they collide. These particles are unattached radon daughters. They carries an energy charge that can damage lung tissue. When that energy charge is released it is called, plate-out.

One of the most effective systems for reducing the concentration of unattached radon daughters is a ceiling fan, or air circulating fan; sometimes coupled with an ion generator. Positive ion generators work best. The fan increases the "plate-out" of the radon decay molecules (progeny or daughters) that harm the lungs. The ion generator can increased the static charges of airborne particles increasing further the rate of "plate-out."

The fan mixes the air, and the charged particles are attracted to the surfaces of walls, furniture and floors, and other airborne particles where they are deposited, thus removing them from the breathable air, insuring they are not deposited in our lungs.

A Casablanca type ceiling fan can reduce radon by up to 95%. If a ceiling fan is used for radon reduction, the switch should be labeled to identify it as controlling a radon system. It should be labeled "Do not turn off". The fan should be in the middle of the room and large enough to keep air moving.

If a 50% reduction of radon levels is sought a ceiling fan, or circulation fan, can be used alone. If a reduction of 80% + is desired a fan with a positive ion generator can be used. This combination has been tested world wide with consistent radon reduction of up to 95%. This can be an inexpensive radon system costing far less than the most accepted remediation today – sub slab depressurization, or suction.

Radon is not a problem in most commercial buildings. There is no EPA recommendation for commercial buildings. The air pressure inside is kept slightly higher than outside. Radon usually enters a building when the air pressure inside is less than outside. A vacuum is created that literally sucks the gases out of the soil underneath and around the building. If the pressure inside is the same, or greater than outside, gases cannot enter.

Radon is released from the soil. There can also be other gases, naturally occurring, or resulting from man made pollutants. The place where I grew up is a gigantic toxic waste site. The soil is very sandy. The water table is close to the surface and pollutants have traveled throughout the area in the ground water. There are dry cleaner solvents, metal cleaning solvents, insecticides, herbicides and biological warfare agents that release gases that migrate to the surface. I doubt that people who live there ever give a thought to the gases migrating into their homes, but it seems like gases besides radon could have

negative health affects. This is an argument for positive pressure in our homes. Here are two arguments against this technique: 1 , 2

Arguments against include: systems are noisy and have the potential for extinguishing pilot lights. Expense is also mentioned as a reason for not using this method. The possibility of moisture intrusion is cited. The result of my crude, home testing makes me think these factors may not be such a deterrent.

My office is in a walk out basement. It is consistently colder than the upper level that tends to be too hot year round from passive solar. The summer time radon level with windows open is 4-5 pCi/l. It goes to 9 – 22 pCi/l with the windows closed.

I removed a ceiling vent for the furnace and taped a 4" computer-cooling fan in its place. The radon level immediately dropped to 3 pCi/l. This level has remained steady through winds and rainstorms that usually elevate levels. It is true that it is a little noisy. I will replace it with a vent with a built-in booster fan that is made to be quiet and operate at various speeds.

The computer fan was $12. The booster vents I found run from $35-50. This little computer fan has also helped equalize the temperature between the two levels. A fan designed for this purpose should increase comfort even more, allowing higher speeds to move more air. From my subjective point of view, it seems like I have more energy and tire less quickly since installing the fan.

Other ways to improve the air quality in our particular situation would include providing a fresh air source for the clothes dryer. Clothes dryers move a tremendous amount of air. This air is pulled from inside the house if no fresh air source is available. We currently open a window in the laundry room, but a source of outside air brought to the dryer should dry clothes more efficiently.

A fresh air supply for furnace and water heater combustion also makes them more efficient. Current International Residential Building Code requires a fresh air source for exceptionally tightly sealed houses. A source of outside air is routinely added to new construction and when furnaces are replaced in older houses. In older poorly sealed houses water pipes may freeze, or other problems may result if the house is not sealed.

Consider your individual circumstances when making any change in your indoor air environment. A circulation fan seems like a viable solution in my situation. It won't be right for everyone.

Sub Slab Depressurization (SSD) is the most common and accepted method for radon reduction. It provides about the same percentage reduction of radon as a fan/ ion generator, but cost significantly more. EPA estimates systems cost from $800-2500. Operating costs are from $50-200/year.

This method uses a vacuum fan to suck air from beneath the concrete floor. A variation is power vents for crawlspaces. In some cases, a vapor barrier will be applied to the crawlspaces with a vacuum fan that sucks air from beneath the center of the plastic barrier. A fan may also be used to suck air from cement block foundation.

This method may not work as well where the soil has heavy clay content preventing air from flowing. Defects and expansion joints may interfere with proper function. Improperly installed systems may increase concentrations of radon gas. Pumps may become noisy. System costs, operating and maintenance costs are relatively high.

Another technique that increases comfort while decreasing radon is the fresh air heat exchanger, also called Heat Recovery Ventilation (HRV). This device pulls fresh air from outside through a heat exchanger that is warmed by inside air as it passes through the exchanger to be vented. These devices lose about 15% of the heat used to warm the fresh air. As houses are being sealed tighter for energy savings, it becomes more important to bring in a constant supply of fresh air to maintain a healthy indoor air quality.

Making the house even more airtight might make up the heat loss without the indoor air pollution that occurs when a house is sealed too tight without ventilation. The EPA estimates installation costs of $1200-2500 with an annual operating cost including heat loss of $75-500.

Homeowners living with high radon levels for fear of the cost of remediation may be able to decrease radon without expense. Testing is inexpensive. Free test kits can be obtained from the EPA and some health departments. The danger of radon exposure at levels present in our homes has not been adequately established, but the benefits of a cleaner indoor air quality are hard to dispute. Do-it-yourself radon systems are also available.

Costs and pro/cons vary between different systems. Home sellers might save money, and delays in closing, by testing for radon before listing. A low cost reduction system may be implemented if time allows. Time restraints after a contract has been signed will usually require the expense of installing a SSD system if high radon levels are discovered. High radon levels can cause fears for family safety that may discourage buyers. High radon levels will at least mean a reduction in price.

Regardless of any real, or perceived, threat from radon in our homes, improving our indoor living environment will probably have health benefits, as well as energy savings. I get calls almost daily from people across the country who believe their homes are making them sick. In most cases, radon remediation efforts will result in cleaner, healthier indoor air. Improvements in indoor air quality need not always be expensive Healthier homes equal healthier, happier people.