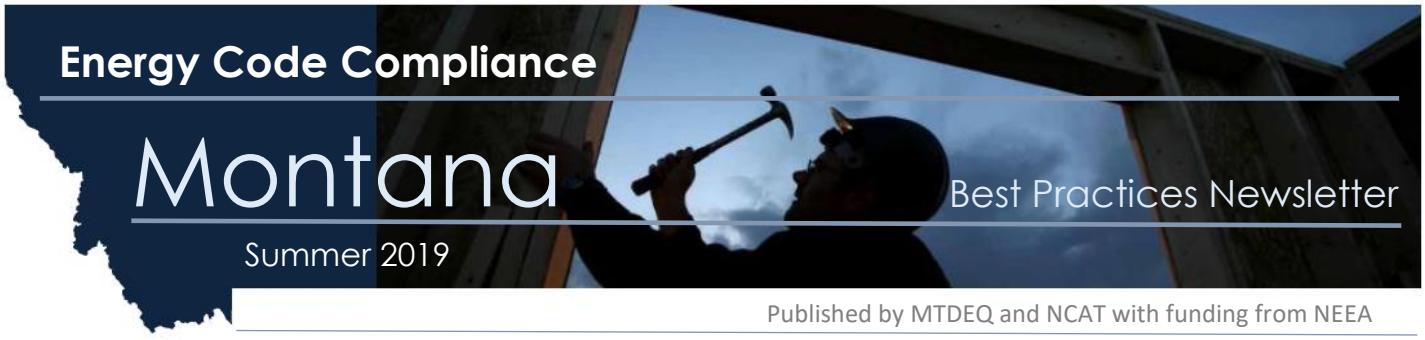

Energy Code Compliance Montana Best Practices Newsletter

Summer 2019

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Radon is classified as a Class A carcinogen (known to cause cancer in humans).
—USEPA

Contents

Radon and New Homes

Background

Some states and local jurisdictions have adopted Appendix F of the International Residential Code (IRC). Montana has not adopted Appendix F despite the high incidence of radon in Montana homes. In Montana, builders are not required to test a home, nor to guarantee that a home will meet a specified radon level. But by installing radon-resistant features, a builder is proactively offering features designed to reduce radon levels. According to the US Environmental Protection Agency (EPA), adopting radon-resistant building techniques should not increase builder liability risks as long as due care is exercised in following the proper construction techniques.

Radon is a colorless, odorless gas that can cause lung cancer. Radon is in the soil and air everywhere in varying amounts. It comes from uranium and radium in soils, which can be found everywhere in the world. Uranium is present in rocks such as granite, shale, and phosphate. Uranium breaks down to radium, which then decays into radon. This gas can easily move up through the soil into a home.

Home buyers rely on builders to construct a high quality, safe home. By using a handful of simple building practices and common materials, the radon level in the homes can be effectively reduced. People cannot see, taste, feel, or smell radon. There is no way to sense the presence of radon except by testing. Radon levels are commonly expressed in picocuries per liter of air (pCi/L), where a picocurie is a measure of radioactivity. The national average of indoor radon levels in homes is about 1.3 pCi/L. Radon levels outdoors, where radon is diluted, average about 0.4 pCi/L.

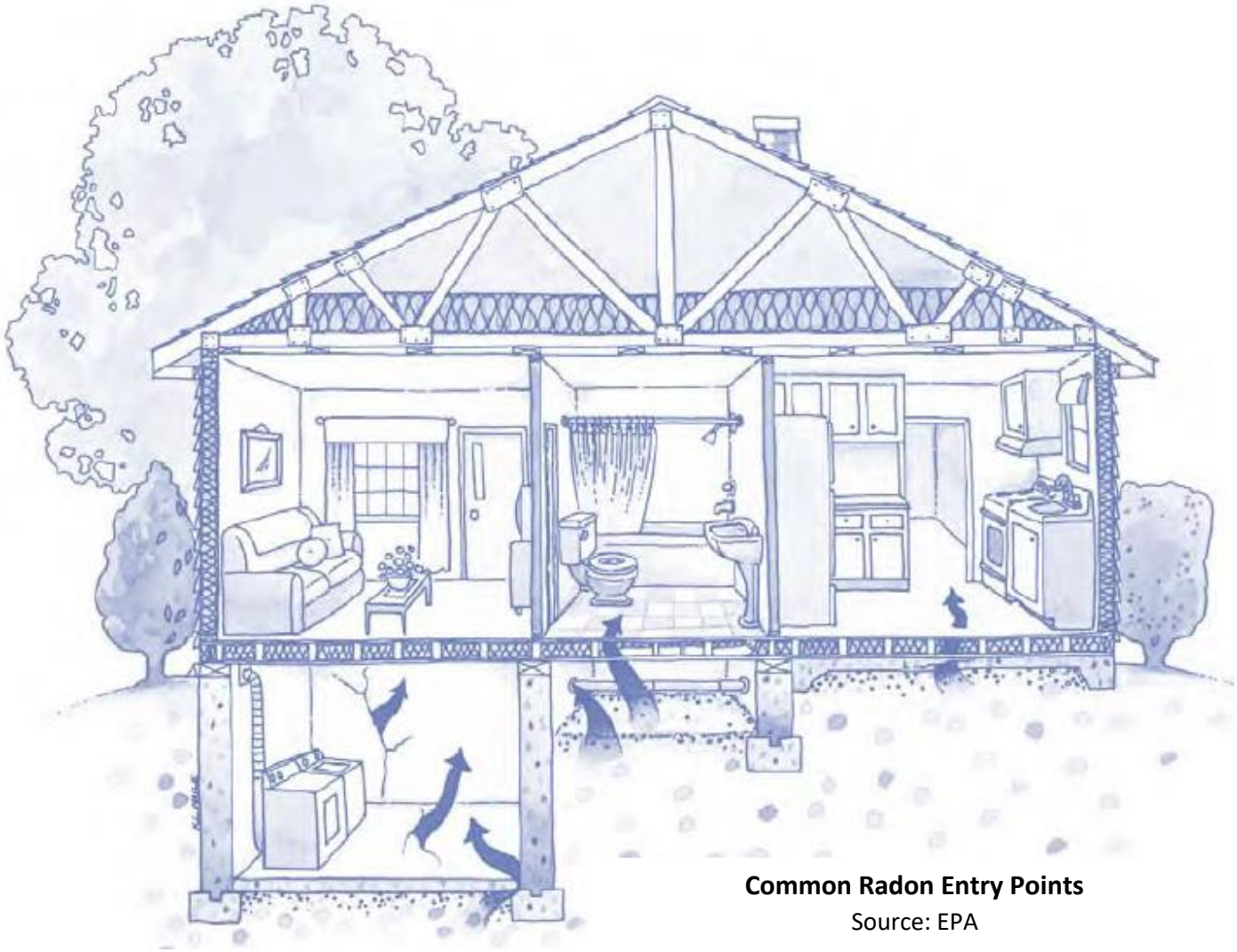
Energy Training Opportunity
Home Energy Rater Training

Based on RESNET HERS and ENERGY STAR

October 14-18, 2019 Missoula, MT

Reduced Registration Fee for NorthWestern Energy Residents

For more information contact Natasha Hansen (nhansen@ncat.org) 406-723-7580. To register go to www.ncat.org/events/.
For general information about HERS Ratings: www.resnet.us/professional/rater/what-is-a-hers.

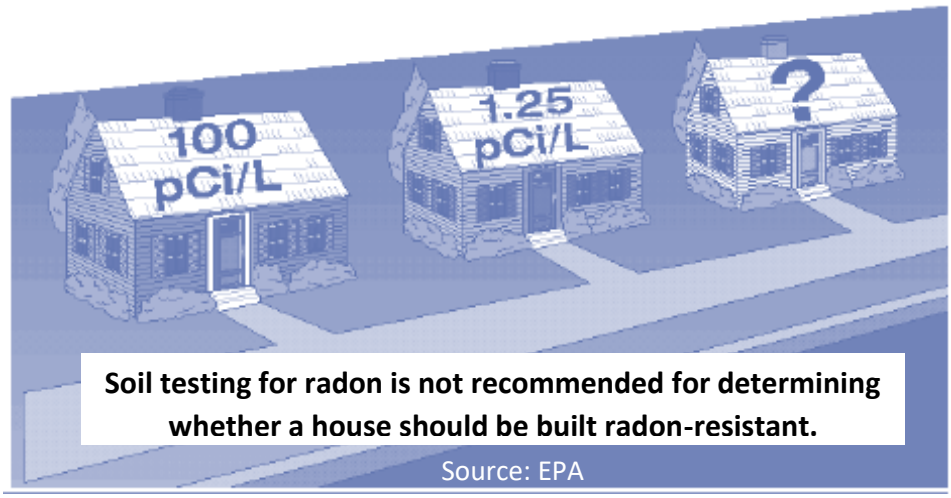


Common Radon Entry Points
Source: EPA

Radon in the soil can be drawn into a building and can accumulate to high levels. Every building or home has the potential for elevated levels of radon. All homes should be tested for radon, even those built with radon-resistant features. EPA recommends taking action to reduce indoor radon levels when levels are 4 pCi/L or higher.

Radon-reduction techniques are consistent with state-of-the-art energy-efficient construction. The features can also decrease moisture and other soil gases entering the home, reducing molds, mildews, methane, pesticide gases, volatile organic compounds, and other indoor air quality problems.

Radon-resistant techniques are considered best practice in residential construction. According to a recent study, incorporating radon resistance in new construction costs $300 to $500; whereas, mitigating an existing home costs $1250 to $2500.



Soil testing for radon is not recommended for determining whether a house should be built radon-resistant.
Source: EPA

Montana Radon Levels

Most of Montana is categorized as Zone 1 for radon levels, according to the EPA. This means most homes in Montana are at or above the radon action level of 4 picocuries of radon per liter of air (pCi/liter) where the EPA recommends homeowners take corrective measures to reduce exposure to radon gas including radon mitigation. According to the 2006 Montana Radon Study almost half the Montana homes tested for radon were at or exceeded the radon action level of 4pCi/liter of air.

Radon Risks to Health

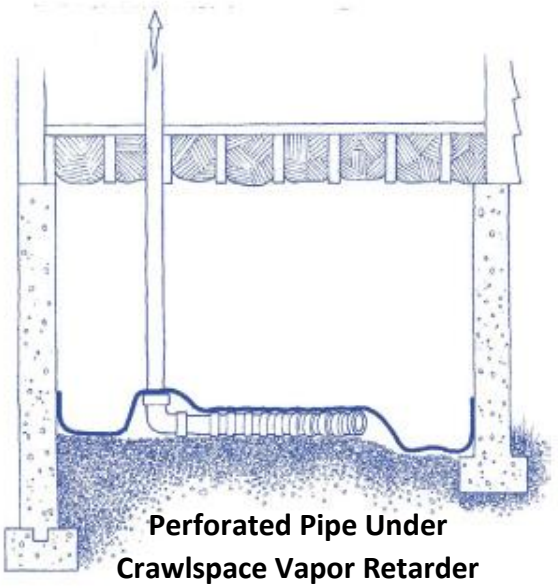
There is no safe exposure level to radon. The risk of lung cancer increases substantially with exposure to higher radon levels. Radon is the primary cause of lung cancer among people who have never smoked according to a 2009 study by the World Health Organization. Almost 21,000 radon-induced lung cancer deaths occur in the US each year. In Montana, roughly 7 out of 1000 non-smoking Montanans could get lung cancer at the radon action level of 4 pCi/liter. Sixty-two out of 1000 Montana smokers could get lung cancer at the radon action level of 4 pCi/liter.

How to Reduce Radon in Homes

All homes should be tested for radon after occupancy, even those built with radon-resistant features. Building sites can't be effectively tested for radon prior to construction. EPA recommends that all homes built in Zone 1 have radon reduction systems. NAHB also recommends using the passive system in homes in high radon potential areas (Zone 1). EPA recommends that homes with radon levels at or above 4 picocuries per liter of air (pCi/L) be treated with radon reduction measures until test results indicate levels less than 4 pCi/L.

Homes with a passive system can be upgraded to an active system with the simple installation of a special in-line exhaust fan to further reduce the radon level. Typically, the passive system includes an electrical box in the attic to make the future installation of the fan easy.

Radon reduction construction involves installation of a depressurization system below the concrete slab or the Class I vapor retarder on the floor of a crawlspace such as 6mil polyethylene sheeting. The objective of these systems is to create a vacuum beneath the foundation which is greater in strength than the vacuum applied to the soil by the house itself. The soil gases that are collected beneath the home are piped to a safe location to be vented directly outside above the roof. The basic components of radon reduction construction are summarized below:



Perforated Pipe Under Crawlspace Vapor Retarder
Source: EPA

Gas Permeable Layer. Typically a 4-inch layer of clean, coarse aggregate is installed beneath the concrete slab to allow the soil gas to move freely underneath the slab. Another option is to install a loop of perforated pipe around the interior of the perimeter foundation footing. Soil gas collection mats (also known as drainage mats or soil gas matting) may also be used.

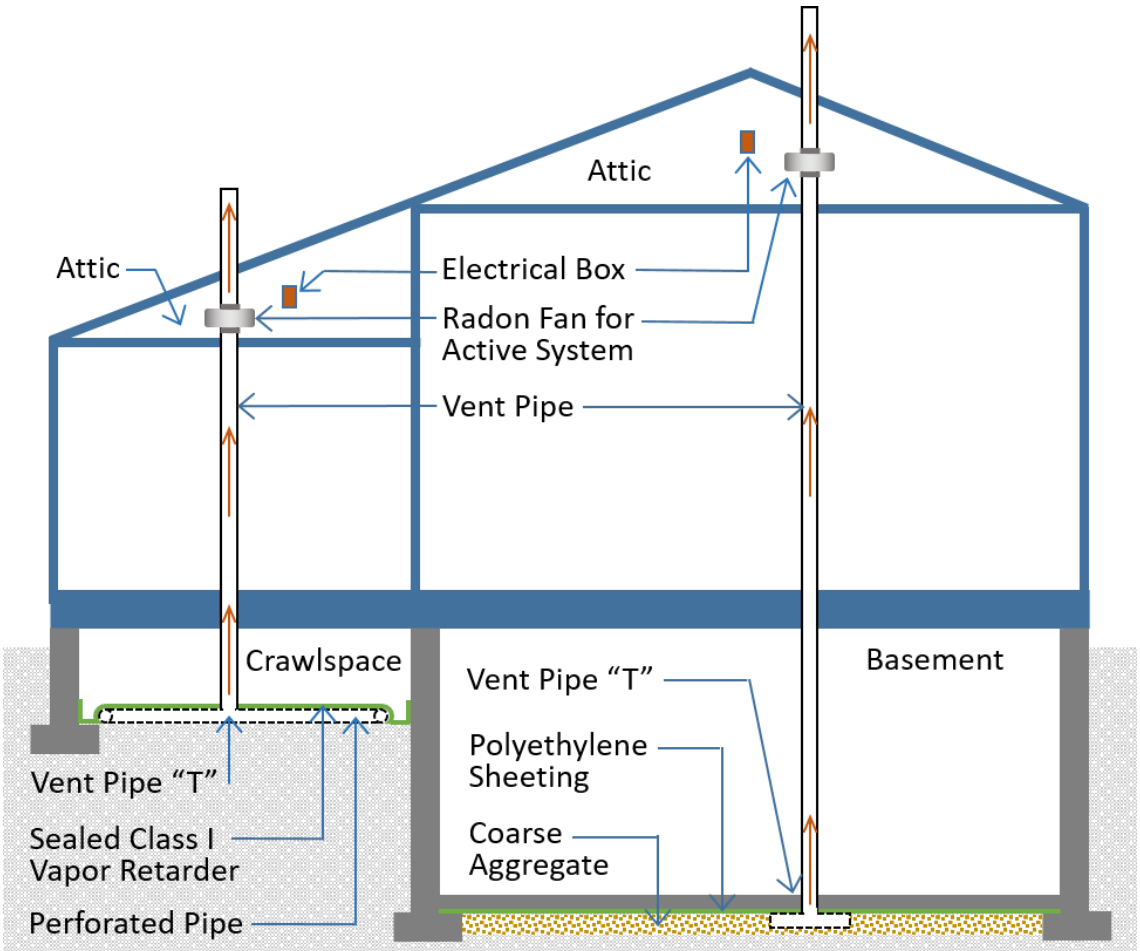
Polyethylene Sheeting. Polyethylene sheeting is placed on top of the gas permeable layer below the concrete slab to help prevent the soil gas from entering the home. The sheeting also keeps concrete from clogging the gas permeable layer when the slab is poured. The Energy Code requires that a sealed Class I vapor retarder, such as 6 mil polyethylene, be installed on the floor of a crawlspace. Perforated pipe is then installed below the sealed vapor barrier.

Vent Pipe. A 3-inch or 4-inch polyvinylchloride (PVC or other gas-tight pipe) is installed from the gas permeable layer through the house and roof to safely vent radon and other soil gases above the house. Although some builders have used 3-inch pipe, field results have indicated that passive systems tend to function better with 4-inch pipe. The vent pipe should terminate at least 12 inch above the surface of the roof and 10 feet from any opening into a living space.

Tie Into Sump. In areas of high ground water, the perforated pipe located below the vapor retarder or polyethylene sheeting can be tied into a sump. The sump must include a sealed cover specifically designed to accommodate a radon vent pipe as well as the water line from the sump pump. These sump covers are available commercially.

Electrical Box. An electrical box is installed above and outside any living space, such as in the attic or on the exterior of the building. The electrical box should be wired in case a radon exhaust fan is needed later to convert a passive radon reduction system to an active system with the fan operating continuously. The electrical box and fan should not be installed at the base of the vent pipe within the home since any leaks in the vent pipe will result in radon gas entering the living space.

Sealing and Caulking. All openings and joints in the concrete slab or crawlspace vapor retarder should be sealed to prevent soil gas from entering the home. Also, sealing and caulking the rest of the building envelope reduces the stack effect in the home. Air-handling units in basements and, especially, in crawlspaces should be sealed to prevent air, and radon, from being drawn into the system. Any seams or joints in ducts should be sealed. Sealing large cracks and openings in the foundation walls and floor is one of the key components of radon-resistant construction, but in most cases must be accompanied by the other radon reduction construction components discussed above.



Radon Resistant Construction for Crawlspace and Basement

Source: NCAT

Perforated Pipe Being Installed Below Slab

Source: MTDEQ

Basement Sump with Sealed Cover and Radon Vent Pipe

Source: MTDEQ

Energy Code Update Listening Sessions

The MT Department of Labor and Industry has scheduled energy code listening sessions for the last week of August. Below are the dates and a link to their web site that contains more information about the sessions including comments from the Montana Building Industries Association (MBIA) and the National Center for Appropriate Technology (NCAT) in Butte. The MBIA proposals include reverting to the 2009 IECC thermal envelope requirements and allowing more building envelope leakage.

Department of Labor and Industry Listening Session Information:
http://bsd.dli.mt.gov/building-codes-permits/meetings

Monday, August 26th, Helena – 1:00 p.m.
Montana Association of Counties – Basement Conference Room 2715 Skyway Drive, Helena, MT

Wednesday, August 28th, Billings – 10:00 a.m.
Billings Library - Community Room 510 N Broadway, Billings, MT

Thursday, August 29th, Missoula – 1:00 p.m.
Missoula Court House Annex -Sophie Moiese Room 151
200 West Broadway, Missoula, MT

References

Building Radon Out: A Step-by-Step Guide On How to Build Radon-Resistant Homes, USEPA, EPA/402-K-01-002, 2001

Montana Department of Environmental Quality (DEQ) Radon Web Site: http://deq.mt.gov/energy/radon#resistant

National Radon Program hosted by Kansas State University for the EPA: https://sosradon.org/

EPA Radon Web Site: https://www.epa.gov/radon

National Radon Proficiency Program: http://aarst-nrpp.com/wp/

National Radon Safety Board: http://www.nrsb.org/

If you have questions about radon in homes call the MT DEQ Radon Hotline 800-546-0483.

DEQ Montana Department of Environmental Quality

For questions, suggestions, or to be removed from the newsletter distribution list, email: daleh@ncat.org

NCAT

Energize Montana Energy Code Website:
http://deq.mt.gov/Energy/EnergizeMT/EnergyCode