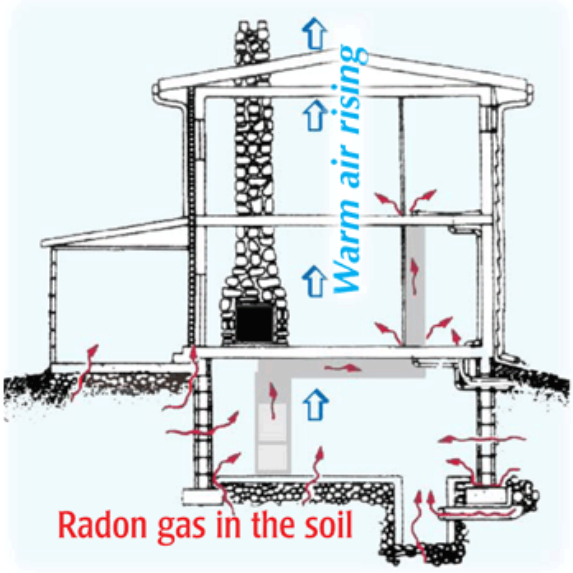
# Radon Fact Sheet

Radon is the second leading cause of lung cancer in humans, and the number one cause among non-smokers. In total, radon causes about 21,000 lung cancer deaths each year. The lung cancer risk is magnified when radon exposure is combined with smoking. The U.S. Surgeon General, the World Health Organization, the United States Environmental Protection Agency, the National Academy of Sciences and the American Lung Association have all identified indoor radon exposure as a serious public health problem.

## What is Radon ?

Radon is a decay product of naturally occurring radioactive elements in the soil, and is a colorless, odorless gas. The radon gas can enter surface soils and become part of the "soil gas" environment, which then can enter the air, including air inside of buildings. When radon enters a building, radon and its decay products are either directly inhaled or inhaled after becoming attached to dust. The risk of contracting lung cancer from radon increases with an increase in the concentration of radon in the air.




Radon generally poses the greatest risk to occupants living at or below ground level. Occupants on the lower levels of structures are at risk of excess exposure if radon levels are elevated and these structures are not appropriately mitigated. It is also possible for units above the ground floor to have elevated radon levels. Radon levels in soil can vary greatly from one location to another, and no part of the country can be assumed to be free of radon, but some locations are at a much higher risk. EPA has divided states and counties into three radon risk zones : http://www.epa.gov/radon/find-information-about-local-radon-zones-and-radon-programs.
Elevated levels of radon can be found in any of the three zones, but buildings in Zone 1 are at particularly high risk for having elevated levels, and the need for addressing radon in those locations is of greatest importance.

# HUD Policy on Toxic Contamination and Radon

HUD regulations at 24 CFR 50.3(i) and 58.5(i)(2) require all property to be free of contamination where a hazard could affect the health and safety of occupants or conflict with the intended use of the property. Section 50.3(i) states that "It is HUD policy that all property proposed for use in HUD programs be free of hazardous materials, contamination, toxic chemicals and gasses, and radioactive substances, where a hazard could affect the health and safety of occupants or conflict with the intended utilization of the property"

By far the most frequently occurring radioactive substance that threatens HUD-assisted development is radon gas. Therefore, HUD regulations generally require HUD and other entities responsible for complying with HUD's environmental review regulations at 24 CFR Part 50 and Part 58 to consider the need for radon testing and mitigation in their HUD-assisted activities.

Apart from this general requirement, some program offices within HUD have developed more specific radon guidance, which is discussed in the final section below.

# What can be done to address radon risk?

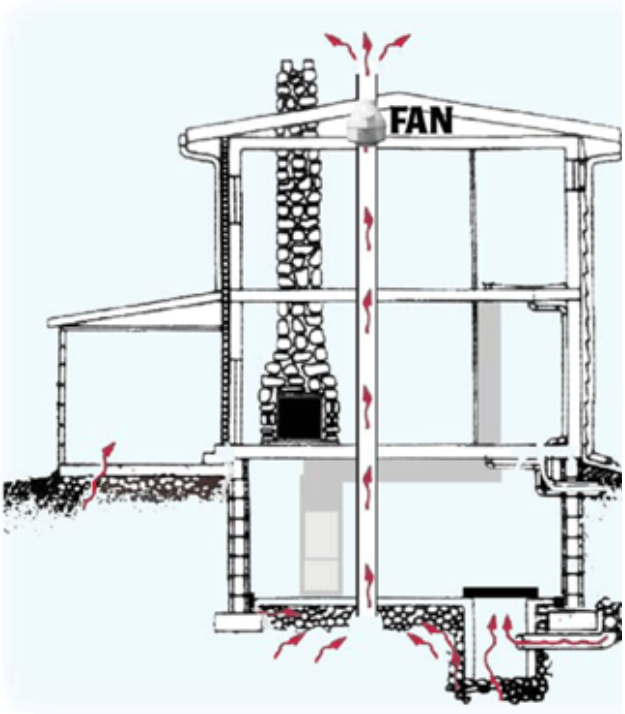

A. Cracks in concrete slabs
B. Spaces behind brick veneer walls that rest on uncapped hollow-brick foundation
C. Pores and cracks in concrete blocks
D. Floor-wall joints
E. Exposed soil, as in a sump
F. Weeping (drain) tile, if drained to open sump
G. Mortar joints
H. Loose fitting pipe penetrations
I. Open tops of block walls
J. Building materials such as some rocks
K. Water

The US Surgeon General recommends that all homes be tested for radon. For existing homes, radon safety involves first testing to determine if there is a radon problem, and then "fixing" the home by capturing and exhausting radon before it enters the home. Radon testing and mitigation can also be completed for existing multifamily properties.

For new construction, it is not possible to test the land prior to building in order to determine whether there will be a radon problem. The difference in pressure between the air inside a building and the soil gas below means that a building can act like a giant vacuum, drawing soil gas through any openings, even very small ones, wherever the building makes contact with the ground. Until the building is constructed and its unique footprint and foundation are in place, it is not possible to know how much radon intrusion will occur.

Fortunately, there are radon-resistant construction techniques that can be used to protect the new building from radon. For multifamily buildings especially, it is much more cost effective to incorporate radon resistance into the design of the structure than to mitigate elevated radon levels after construction is complete.

# Existing Homes - Testing for and Mitigating Radon




- Systems extend a slight vacuum under the home to pull this air away from living spaces and direct it towards the outside.
- When installed carefully, concentrations are typically reduced by 80-99%.

## *Single Family Homes*

For single family homes, basic screening for radon can be accomplished simply and affordably using a radon testing kit. The kits range from $25 - $50 and are available at most hardware stores. They come with instructions for use. Usually, kits are placed in a central room on the lowest floor of the home (or in the basement if there is one) for a period of 48 to 96 hours. To the extent possible, windows and doors should not be opened for prolonged periods during the test, in order to simulate indoor air conditions during the time of year with the most extreme

outdoor temperatures. After the test period, the kit must be carefully packaged according to instructions and mailed to a laboratory for testing.

Find more information on obtaining a radon test kit on the EPA website at http://www.free-radon-test-kits.com/

EPA-recommended radon test kits may be ordered by phone at (800) SOS-RADON or on the web at www.sosradon.org.

# Mitigating Radon in Existing Buildings

After testing, how do you know if you have a radon problem? There is no minimum level of radon that has been determined completely safe; however, the EPA has developed an action level for radon of 4 picocuries per liter of air (pCi/L). A picocurie is a measure of radioactivity. If a building's indoor radon concentration is at or above 4 pCi/L, mitigation is recommended. If the concentration is between 2-4 pCi/L, mitigation should be considered.

## *Single Family Homes*

Mitigating radon in single family homes is relatively inexpensive, with the cost generally ranging from $800.00 to $3000.00. Mitigation strategies vary depending on the home's foundation type. The most prevalent mitigation consists in the access to the source of the radon gas from the foundation dwelling, getting the radon gases through a special seal in contact with the soil under the dwelling and route the gases using pvc piping with a vacuum pump away from the dwelling foundation and frame. All mitigation strategies have a simple goal, which is to reduce the overall concentration of radon inside the home. You can learn more about these mitigation approaches in the EPA publication, "Consumer's Guide to Radon: How To Fix Your Home," available at : http://www.epa.gov/sites/production/files/2015-05/documents/consguid.pdf.

## *Multifamily*

Radon professionals designing a mitigation strategy for a multifamily property will reference ASTM E2121-09, "Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings," and may also utilize the recommendations of ANSI-AARST's recently published RMS-MF 2014, "Radon Mitigation Standards for Multifamily Buildings." Multifamily buildings are more complex than single family homes, which can increase the cost of mitigation.

# Finding a Radon Professional to Carry Out Testing or Mitigation

Cosmetic options available are dictated by the home's design.
(i.e. available pipe routes and aesthetic considerations such as location of unfinished areas, visibility from streets, etc.)


In order to find a certified radon professional in your community EPA recommends contacting one of the two national organizations who provide radon certification and training:

*National Radon Proficiency Program (NRPP)*
Toll Free: (800) 269-4174 or (828) 890-4117
Website: www.nrpp.info
Email: info@nrpp.info

*National Radon Safety Board (NRSB)*
Toll Free: (866) 329-3474
Website: www.nrsb.org
Email: info@NRSB.org

# Radon Resistant Construction

Building foundations that are constructed today are less permeable than ever before. The construction industry generally recognizes the importance of preventing the intrusion of soil gases (e.g., radon,petroleum, solvent or other contaminant gases) into the interior. Therefore, radon resistant construction methods are similar to standard construction practices, but with specification of materials and techniques that are most effective not only for sealing the foundation, but also for reducing soil gas intrusion by venting captured gases to the outside. These techniques are specified in ASTM E1465-08a, "Standard Practice for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings." Systems that have been demonstrated to be effective are "active systems" which facilitate soil gas venting by means of a fan system.

The following section and additional valuable information on building codes with respect to radon resistant construction is available on the EPA's wesbite at: URL from EPA provides valuable information on building codes with respect to radon resistant construction: http://www.epa.gov/radon/building-codes-radon-resistant-new-construction-rrnc

## Building Codes Overview

- Building codes are intended to protect the health, safety and welfare of homeowners and residents by establishing minimum construction standards.
- Building codes also provide uniformity in the construction industry.
- Building codes embrace all aspects of construction. They set minimum standards for materials, structural elements, fire prevention, plumbing and sanitation, radon reduction and the electrical and mechanical systems in a home.
- Building codes are adopted by a legislative body, then enacted to regulate building construction within a particular jurisdiction, such as a township, city, county, or state.
- Find out what building codes/regulations exist in your state (if applicable)

# Additional Radon Policies in Specific HUD Programs

All FHA single family mortgage lenders are required to provide mortgagors with the revised HUD form 92564-CN, "For Your Protection: Get a Home Inspection," available on HUDCLIPS. This form is a lender disclosure advising the buyer of the need to obtain an independent home inspection and describing the difference between a home inspection and an appraisal. The form also alerts the buyer to the potential hazards of radon gas and recommends radon testing as part of the inspection process. The form advises testing prior to signing the purchase contract, or conditioning the contract on acceptable radon test results if testing occurs after the contract is signed. The disclosure form is available in both English and Spanish.

Guidance from key HUD program offices lay out policies for testing and mitigating radon gas in HUD-assisted housing. HUD's Office of Public and Indian Housing (PIH) issued notice 2013-6, providing public housing agencies (PHAs) information about the dangers of radon gas and encouraging PHAs to test for and mitigate radon if possible. The Multifamily Accelerated Processing (MAP) Guide, issued on January 29, 2016 with an effective date of May 28, 2016, sets out a required process for identifying and mitigating radon in properties covered by FHA Multifamily insured mortgage applications. This version of the MAP Guide, when effective, will supersede Mortgagee Letter 2013-07, which was previously used to set out this process.

## *Multifamily*

Radon testing to screen multifamily properties requires the assistance of a certified radon professional. Radon professionals are certified by the American Association of Radon Scientists & Technologists (AARST), the National Radon Proficiency Program (NRPP) or the National Radon Safety Board (NRSB), and have received certification or licensure from the state in which testing is being done (if the state requires licensing).

Radon professionals test multifamily properties for radon according to industry best practices. Uniform protocols help to ensure consistent results. The current multifamily testing protocol is the ANSI-AARST "Standard Protocol for Conducting Radon and Radon Decay Product Measurements in Multifamily Buildings," ANSI/AARST MAMF-2012. (See also ANSI/AARST MALB 2014 and RMS-MF 2014.)