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RADON IS REAL p7

2013 Liaison Report | 10

The Word: Aluminum Wiring | 12

Handling Complaints—Part 2 | 16

ASHI Officers for 2014 | 20

Postcards from the Field | 34



Radon Is Real and Causes Cancer—Part I

BY KURT SALOMON

This article is the first of two addressing the number-one environmental hazard in the home, radon gas. The first part addresses radon gas, the scientific evidence of radon as a known carcinogen and general background information. The second part discusses radon testing, radon mitigation and the business case for radon testing as an ancillary home inspection service.

ALTHOUGH ENVIRONMENTAL TESTING IS EXCLUDED FROM THE ASHI

Standard of Practice, home inspectors should take a closer look at adding radon testing as an ancillary offering to provide better service to clients. Whether you choose to offer radon testing or not, this article provides a basic understanding of radon, testing and mitigation solutions. Should you decide to test for radon, you should become certified by one of the national certification bodies: the American Association of Radon Scientists and Technologists (AARST), the National Radon Proficiency Program (NRPP) or the National Radon Safety Board (NRSB).

Radon is a colorless, odorless, naturally occurring gas that comes from the decay of uranium in the ground. It is a known carcinogen and is the second-leading cause of lung cancer, second only to smoking. About 1 in 15 houses in the United States has elevated levels of radon (Rn).

If a house is tested for radon and the average is 4 picocuries/Liter (pCi/L) or greater, the EPA recommends a radon mitigation system be installed to reduce the radon level to below 4. The World Health Organization (WHO) now recommends an action level of 2.7pCi/L. There is some debate amongst radon experts as to what should be the action level. A high radon test result probably won't kill the deal, but long-term exposure to radon might kill a person.

Is Radon Real?

According to the United States Surgeon General: "Indoor radon is the second-leading cause of lung cancer in the United States and breathing it over prolonged periods can present a significant health risk to families all over the country. It's important to know that this threat is completely preventable. Radon can be detected with a simple test and fixed through well-established venting techniques."¹ *The EPA Home Buyers' and Sellers' Guide to Radon* suggests that all houses be tested for radon. Dr. Wallace Akerley, Senior Director of Community Oncology Research (Lung Cancer) at the Huntsman Cancer Institute conveyed at a radon conference in 2013 that various cancers have different colored ribbons for awareness. Lung cancer's ribbon is invisible and radon is the invisible cloud behind the invisible ribbon. Lung cancer



Zone 1 Zone 2 Zone 3

Iowa - EPA Map of Radon Zones

Map Source: <http://www.epa.gov/radon/states/iowa.html>

occurs in both smokers and non-smokers alike and is the number one cause of cancer mortality; more than breast, prostate, pancreas and colon **combined**.² Lung cancer lacks advocacy because of the guilt, judgment and stigma of smoking. Following is the approximate distribution of lung cancer deaths: smoking 87%, radon 11% and other pollutants 2%.

Iowa has the highest percentage of homes with radon levels above 4 pCi/L in the county. William Field, PhD at the University of Iowa Department of Occupational and Environmental Health, Department of Epidemiology, studied the correlation between county radon levels and the lung-cancer deaths of farm wives. The underlying premise was in the 1960s and 1970s farm

wives spent most of their time in the home rather than working outside the home. Dr. Field found a correlation between the radon levels by county and the incidents of lung cancer in both smokers and non-smokers.³

Radon History

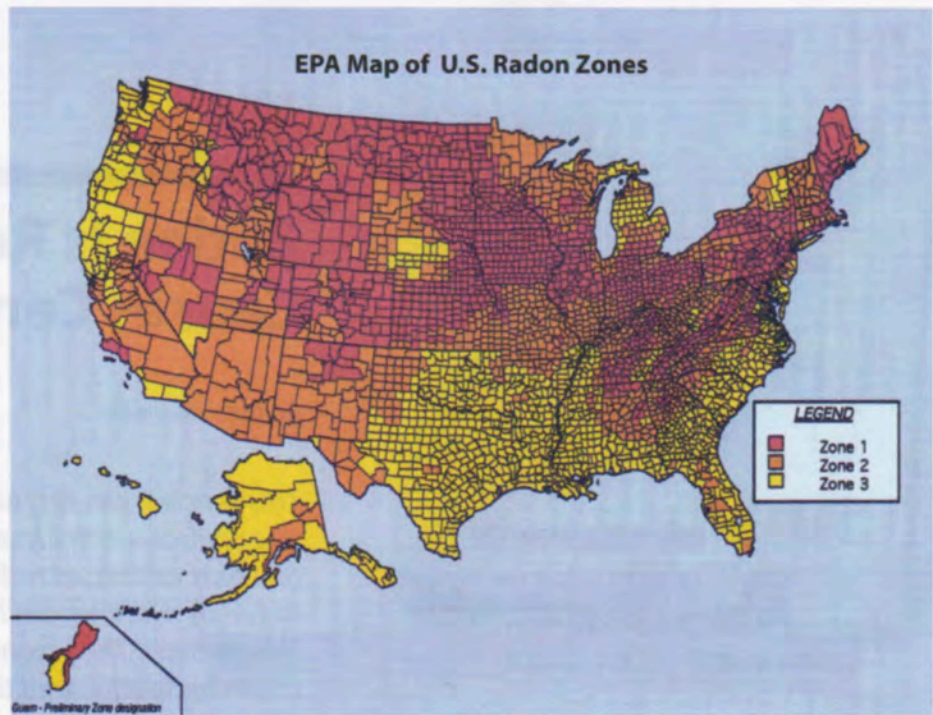
Radon (Rn-222) was discovered in 1900 in Germany. The United States became aware of the radon problem in homes in 1984 when a worker at the Limerick Nuclear Power Plant in Pennsylvania entered the exit (which had a radiation sensor) and set off the alarm because of the radon in his clothes that were contaminated in his home. His house tested at over 2,000 pCi/L.

The **1988 - Indoor Radon Abatement Act (IRAA)** established a long-term goal that indoor air be as free from radon as the ambient air outside buildings. The law authorized funds for radon-related activities at the state and federal levels:

- establishing state programs and providing technical assistance
- establishing training centers and a proficiency program for firms offering radon services
- conducting radon surveys of schools and federal buildings
- developing a citizen's guide to radon
- developing model construction standards.⁴

Radon Health Effects

Radon gas decays into particulates referred to as radon progeny or radon decay products that can get trapped in your lungs when you breathe. As they break down further, these particles release high-impacting alpha particles. These alpha particles can damage lung tissue and lead to lung cancer over the course of your lifetime. Not everyone exposed to elevated levels of radon decay products will develop lung cancer and the onset of the disease may occur after many years.



Map Source: <http://www.epa.gov/radon/zonemap.html>



Like other environmental pollutants, there is some uncertainty about the magnitude of radon health risks. However, we know more about radon risks than risks from most other cancer-causing substances. Three factors affect your chances of getting cancer from radon: 1) the average radon level, 2) how much time you spend in your house, and 3) whether you have smoked or are a current smoker.

Radon Map of United States

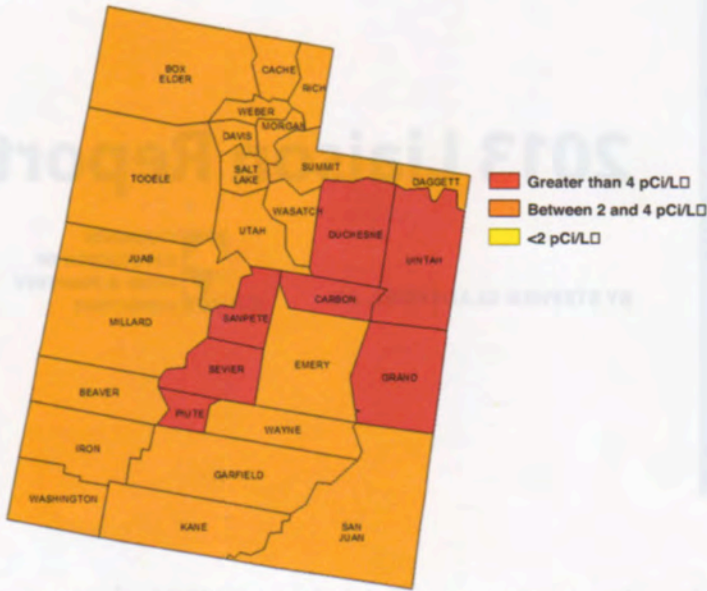
In order for there to be radon in a house, three things need to be present: 1) uranium in the ground, 2) a pathway for the radon to get into the home, and 3) a driving force that causes radon to be drawn in—typically

through the foundation. The formation of the earth and subsequent geological development determines where there are deposits of naturally occurring uranium. Above is a radon potential map of the United States by county. The maps use terminology of Zones 1, 2 and 3 (Zone 1 is greater than 4pCi/L, Zone 2 is between 2 and 4 pCi/L, Zone 3 is less than 2 pCi/L). This website also has a drop-down menu to show state maps by county radon potential.

Iowa is the state with the highest overall concentration of radon is the county. **Every county in Iowa has a projected average radon level greater than 4 pCi/L based upon the EPA geology map.** This is due, at least in part, to the unusually high amounts of uranium that were deposited in Iowa's rolling hills by prehistoric glaciers.

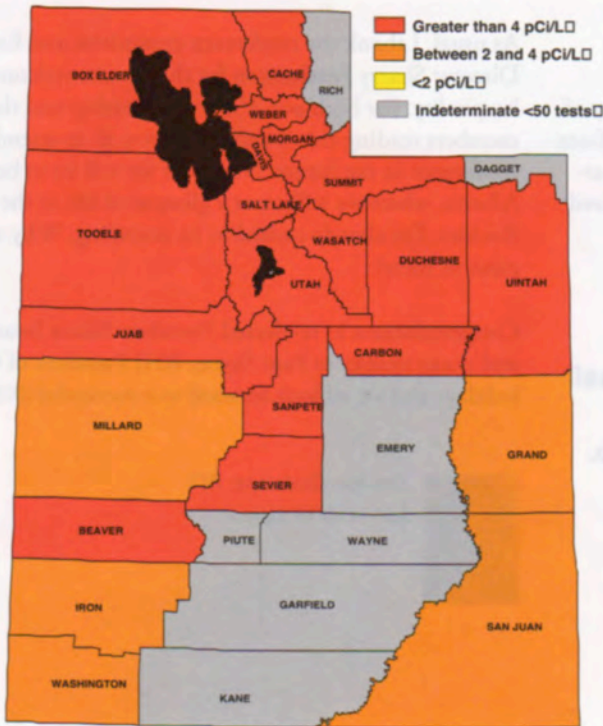
However, these are just estimates. The radon levels can range greatly within a county and even within a city or neighborhood. For example, within Sandy, Utah, two zip codes have widely varying levels. Thousands of radon tests show zip code 84070 had 10% of the houses in excess of 4.0 pCi/L, whereas zip code 84093 was six times that at 60%.⁵ Even within the same zip code there can be three houses in a row with two on the outside having elevated

Utah EPA Radon Potential Map



Map Source: <http://www.epa.gov/radon/zonemap.htm>

Utah Test Result Map



Map Source: <http://www.epa.gov/radon/states/utah.html>

levels and the one in the middle not. The only way to know if a house has elevated radon levels is to test the house; and that is where the home inspector can offer a professional radon service.

When it comes to predicting the presence of radon, theory and reality often differ. Take my home state of Utah. Following are three maps: the EPA Geological Potential Map, the EPA Radon Potential Map by County and Utah Test Result by County. The Test Result map is based upon 30,000 radon tests in Utah. The actual test results are remarkably different from the potentials shown in the EPA maps. In the populous area of Utah, the Wasatch front, the map shows 2-4 pCi/L while the tests showed actual high and elevated levels above 4 pCi/L. Likewise, Beaver County shows moderate and the county average is 42.6 based upon 349 tests. In making a decision about radon levels, the only way to know is to test the house.

Next month we will discuss the various types of radon testing available and mitigation solutions. ■

REFERENCES

1. Surgeon General Press Release 2005
2. American Cancer Society - Facts and Figures 2012
3. Iowa Study
4. epa.gov/radon/realestate.html
5. Radon.utah.gov



Kurt Saloman was 2011 ASHI President, founded the Utah ASHI Chapter, has been a home inspector since 1992 and has a BS in Mechanical Engineering from the University of Illinois. He serves on two American Association on Radon Scientists and Technologists (AARST) Standard Committees, Radon Resistance New Construction and Radon Testing.