Illinois Emergency Management Agency

Radon in Construction

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What is Radon?

- **Radon is an indoor air pollutant.**
- **Radon is a colorless, odorless radioactive gas that comes from naturally occurring uranium in the soil.**
- **The only way to tell how much radon a home has is to TEST.**

Surgeon General's Warning

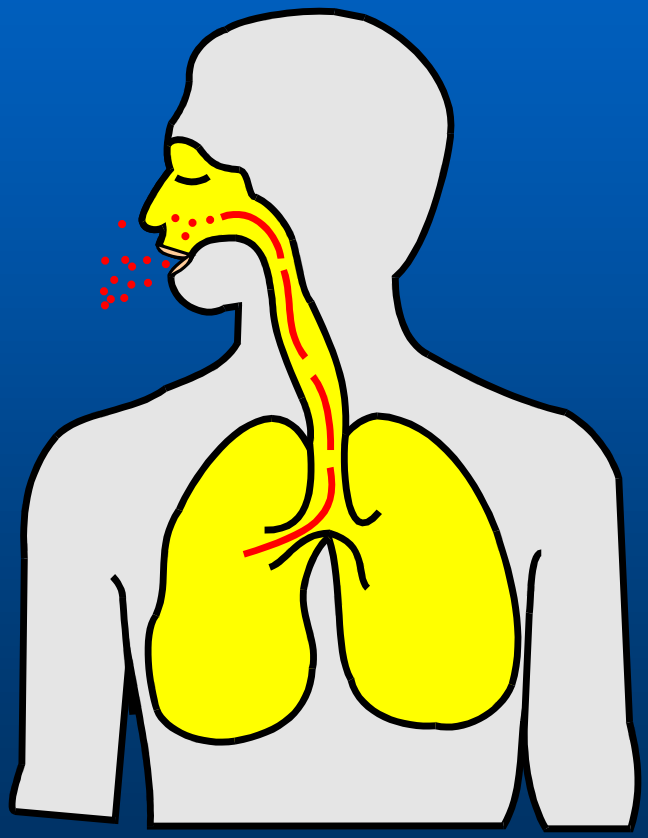
- **"Indoor radon is the second-leading cause of lung cancer in the United States and breathing it over prolonged periods can present a significant health risk to families all over the country."**

Radon is a Class A Human Carcinogen

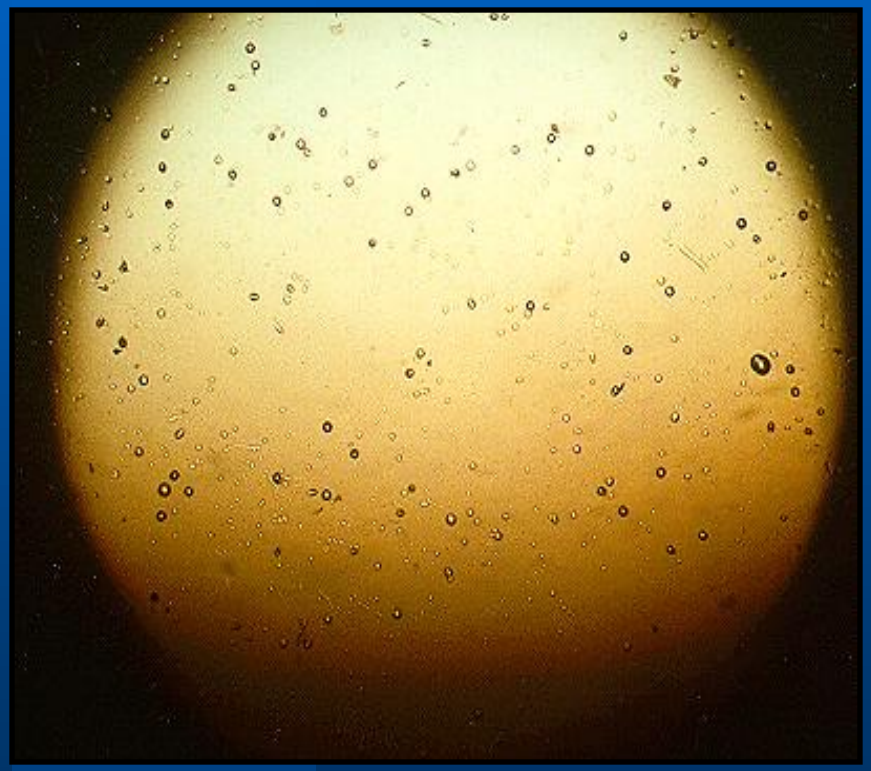
- **Environmental Protection Agency**
- **US Surgeon General**
- **National Academy of Sciences**
- **American Medical Association**
- **American Cancer Society and**
- **American Lung Association**

Radon Exposure

- **Radon and Radon Decay Products (RDPs) are breathed in and the Radon is exhaled.**
- **RDPs remain in lung tissue and are trapped in the bronchial epithelium and emit alpha particles which strike individual lung cells and may cause physical and/or chemical damage to DNA.**



Alpha Particle Damage



The damage that radon decay products can do. Alpha Particles are strong enough to pit plastic.

Radon Risk Estimates

- **USEPA's 2003 Assessment of Risks from Radon in Homes estimates radon causes about 21,000 lung cancer deaths per year.**

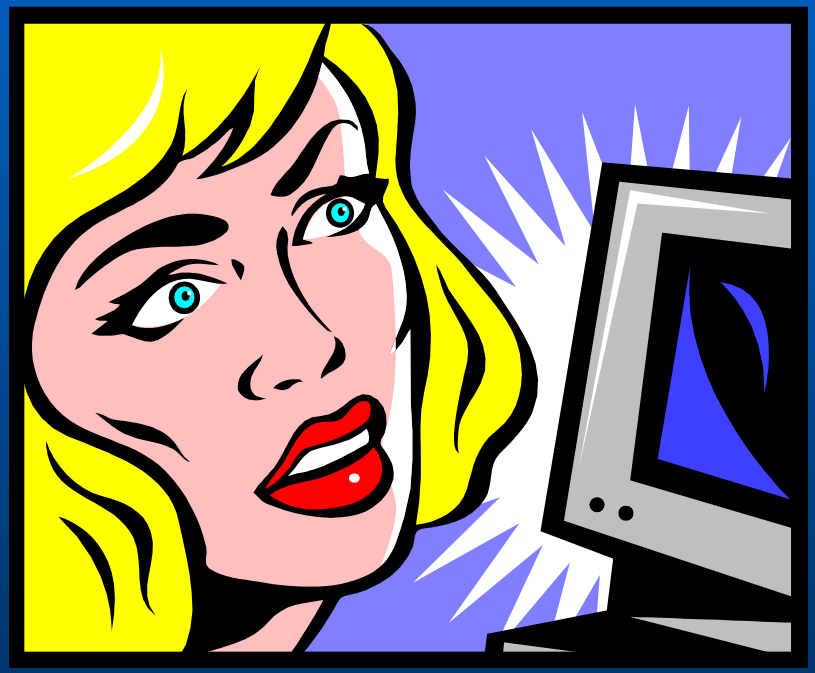
- **The Illinois Emergency Management Agency and the USEPA estimate that as many as 1,160 Illinois citizens are at risk of developing radon related lung cancer each year.**

R. William Field, PhD. College of Public Health

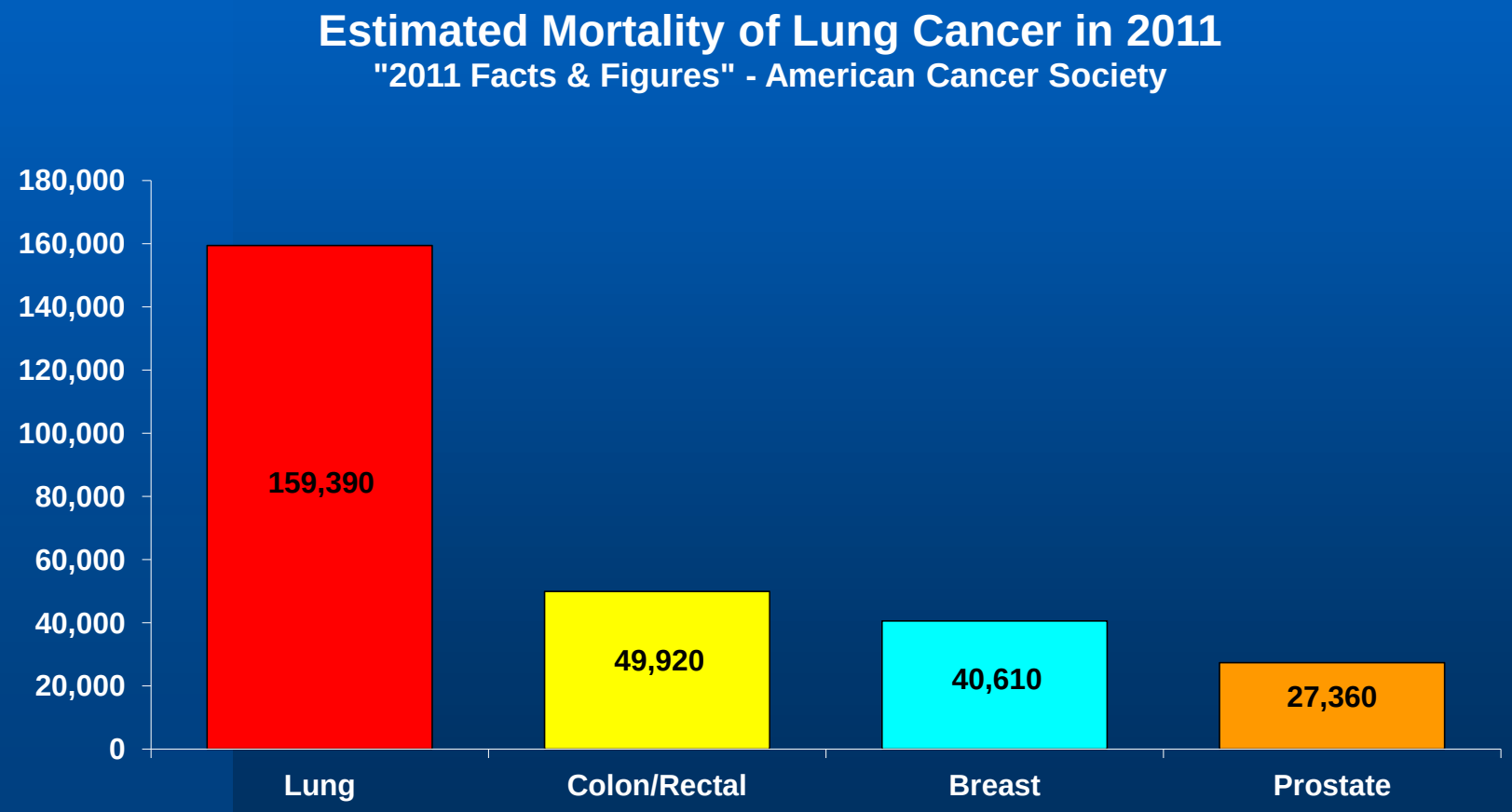
- **Radon is our leading environmental cause of cancer mortality in the United States and seventh leading cause of cancer mortality overall.**

Did you know?

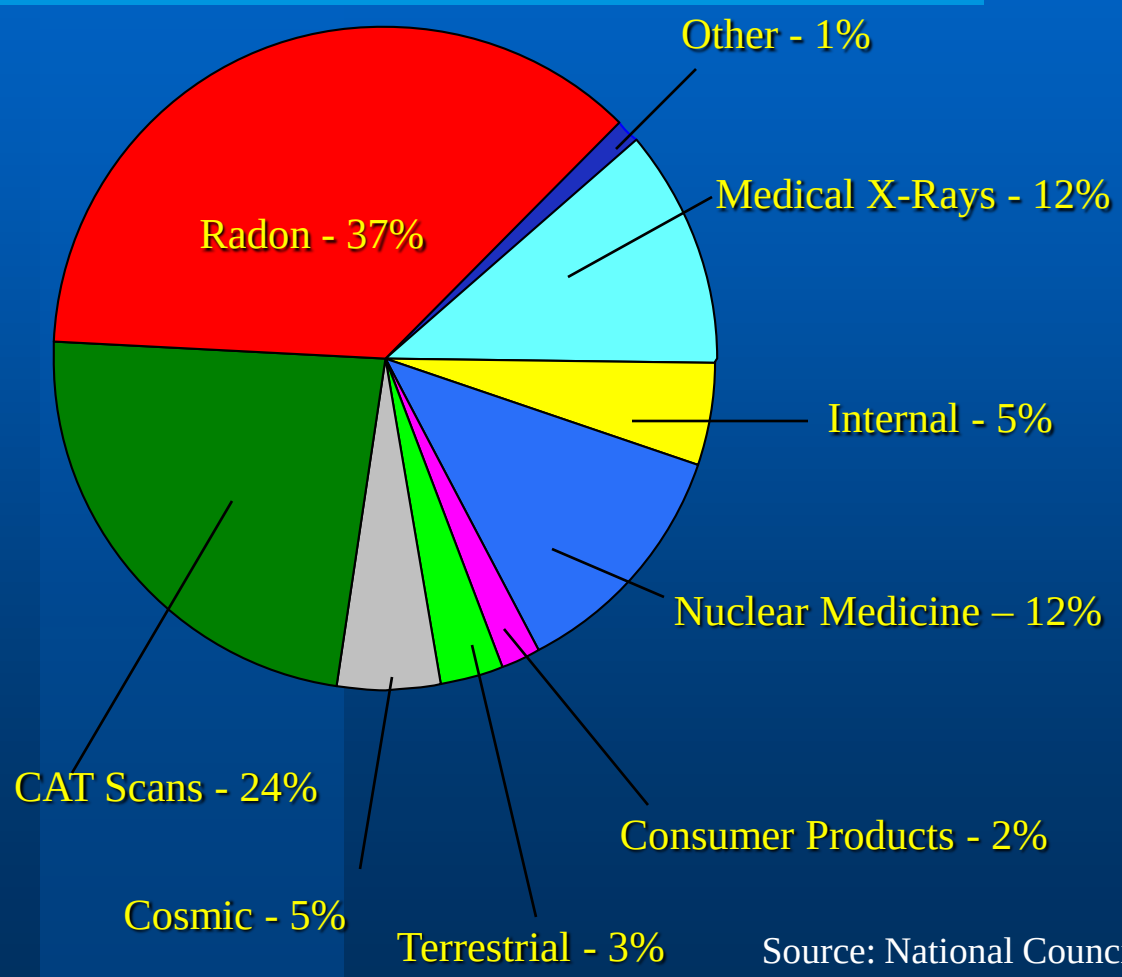
- More Americans die each year from lung cancer than from breast, prostate, and colorectal cancers combined.



Lung Cancer Mortality Rates



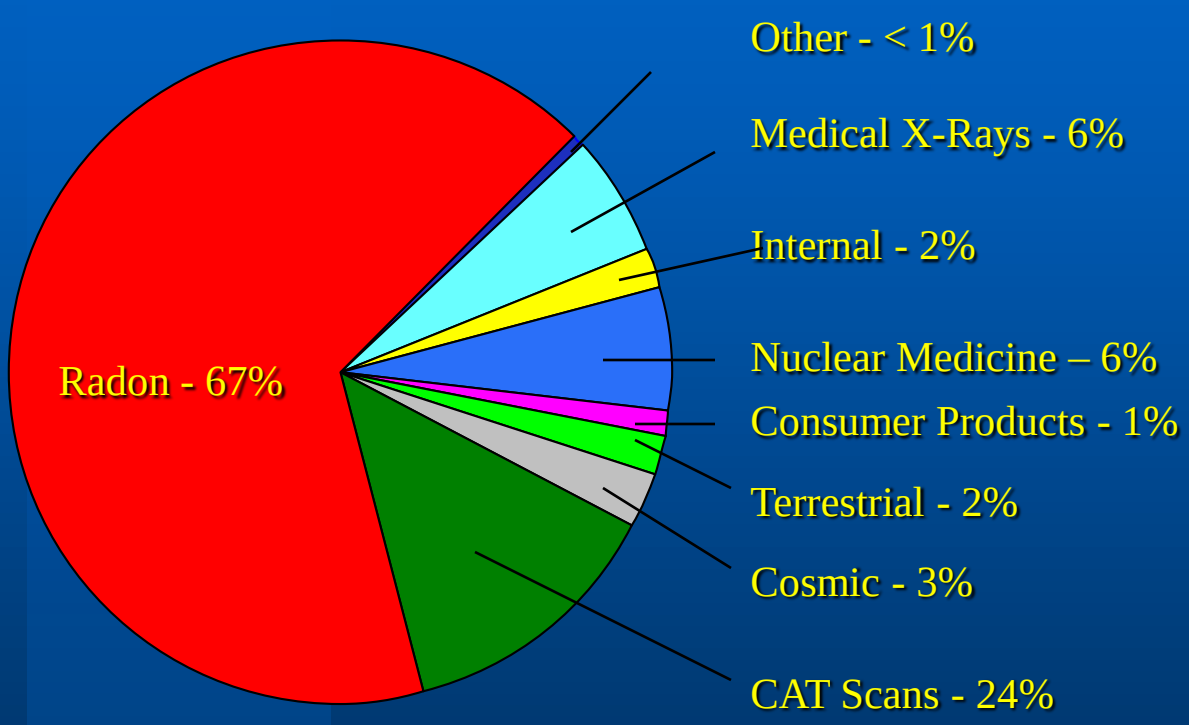
Sources of Radiation Exposure to US public 2009



- **Average Exposure 620 mrem**
- **Assumes average indoor radon concentration of 1.3 pCi/L.**
- **Radon is by far the greatest single source of radiation exposure to the general public.**

Source: National Council on Radiation Protection (NCRP Report 160)

Sources of Radiation Exposure in Illinois



- **Average Exposure 1,170 mrem**
- **Assumes average Illinois indoor radon concentration of 4.9 pCi/L.**
- **Radon is by far the greatest single source of radiation exposure to the general public in Illinois.**

Radon Risk in Perspective

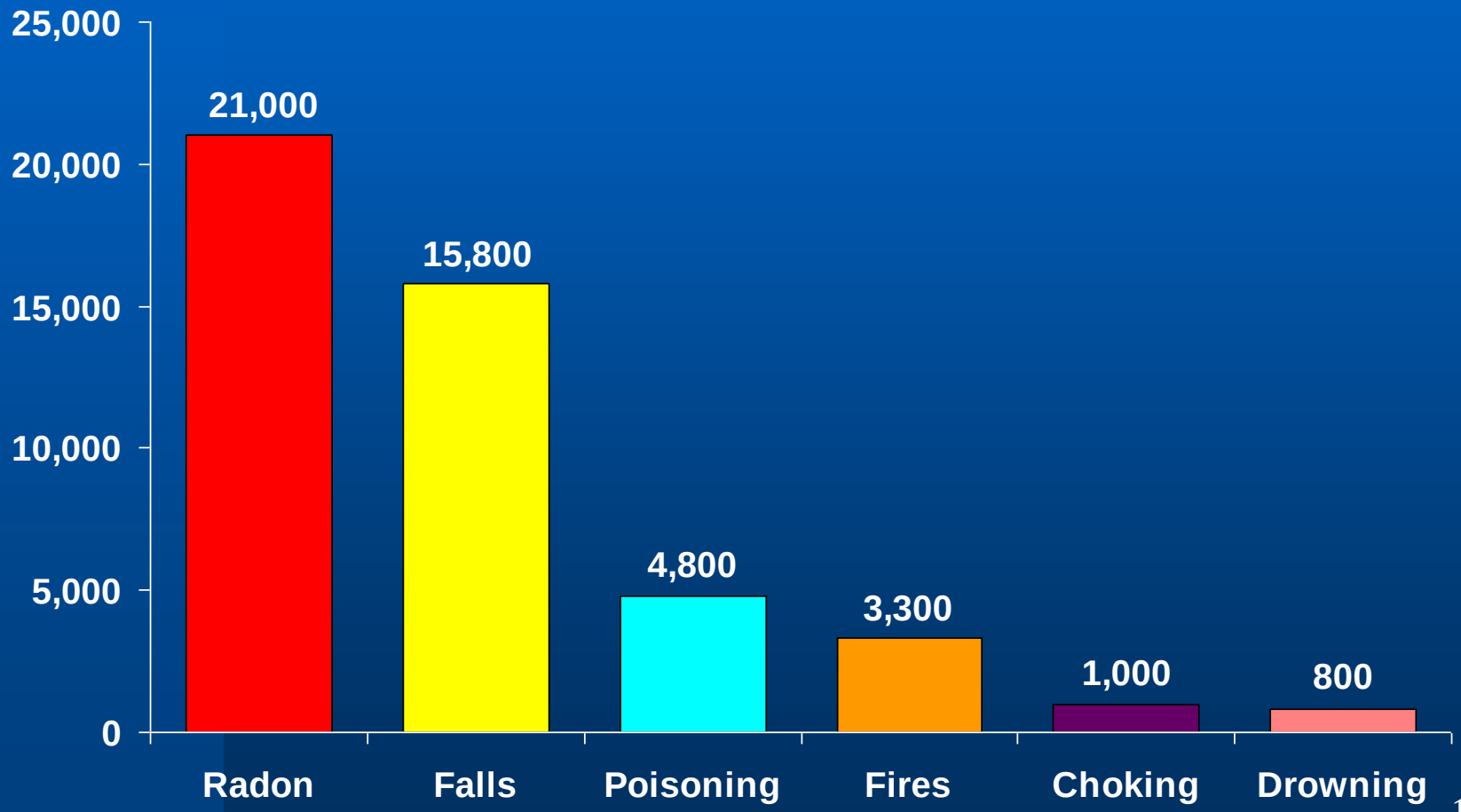
- Comparative Risk Assessments by EPA and its Science Advisory Board have consistently ranked Radon among the top four Environmental risks to the Public

- In 1998 Harvard Risk in Perspective, by John Graham, ranked Radon the #1 risk in the Home

Did You Know?

- Top five causes of accidental home injury deaths:
  - Falls
  - Poisoning
  - Fires
  - Choking
  - Drowning
- Deaths due to radon induced lung cancer is greater than all of these

Home Safety Council Risks



IEMA

Statewide Results from IEMA Professional Licensee Measurements

118,447 Homes Tested

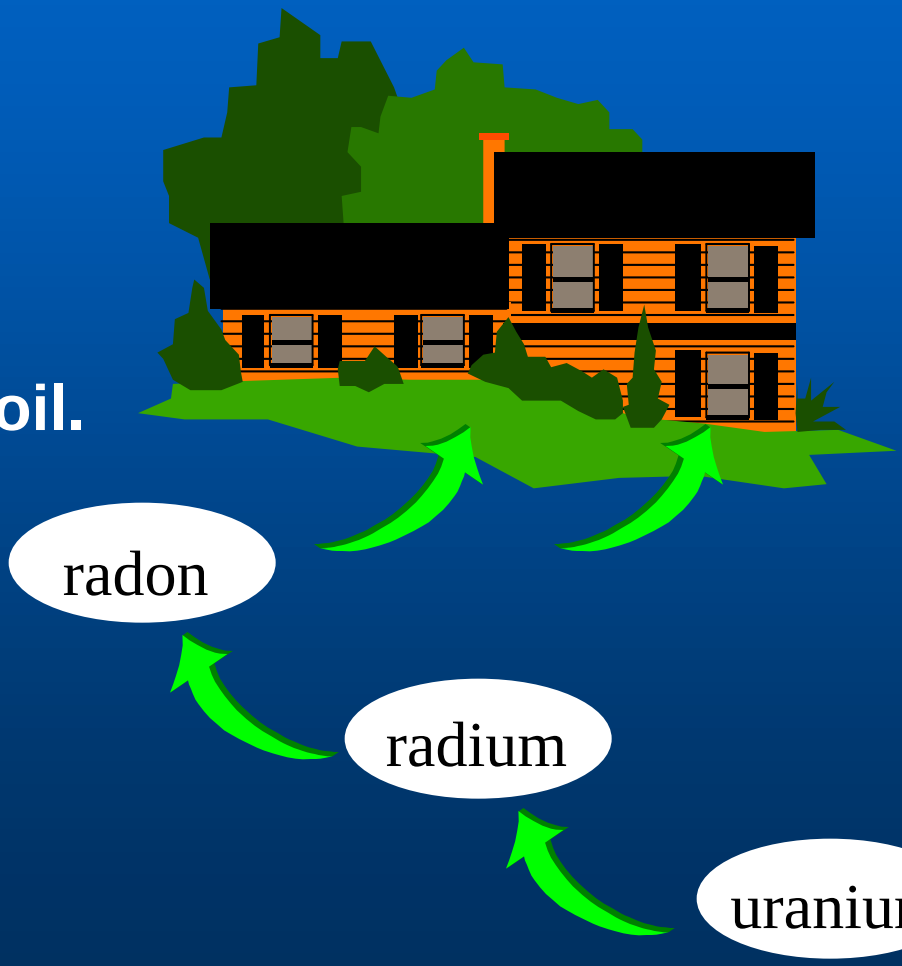
48,978 of the homes tested were > 4.0 pCi/L

41% of the homes tests were > 4.0 pCi/L

Average Radon Concentration 4.9 pCi/L

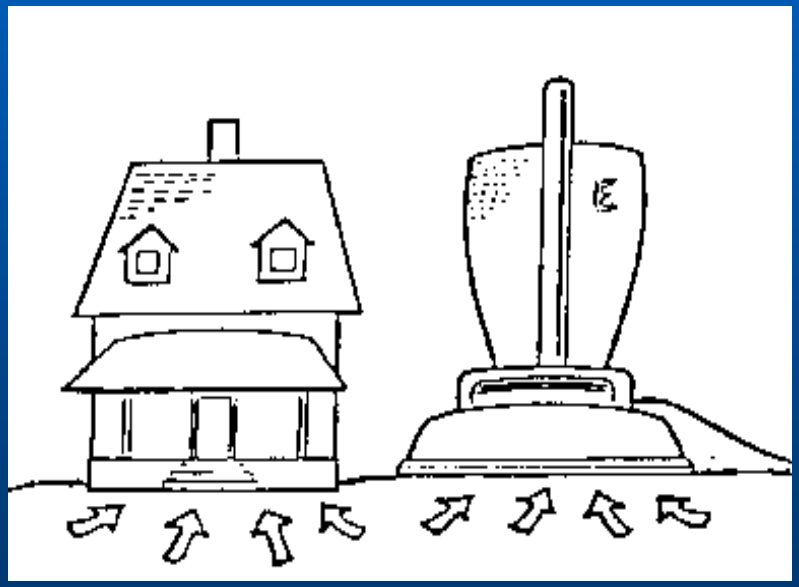
Radon Entry

- **Radon enters through any opening between the building and the soil.**



Pressure Differentials and Radon Entry

- **Air pressure differentials between the building and outside air.**



Common Entry Points

- Foundation Wall Joint
- Crawlspace
- Sump Pits
- Cracks in Floors
- Utility Penetrations

Stopping Radon at the Beginning

Radon Resistant New Construction (RRNC)

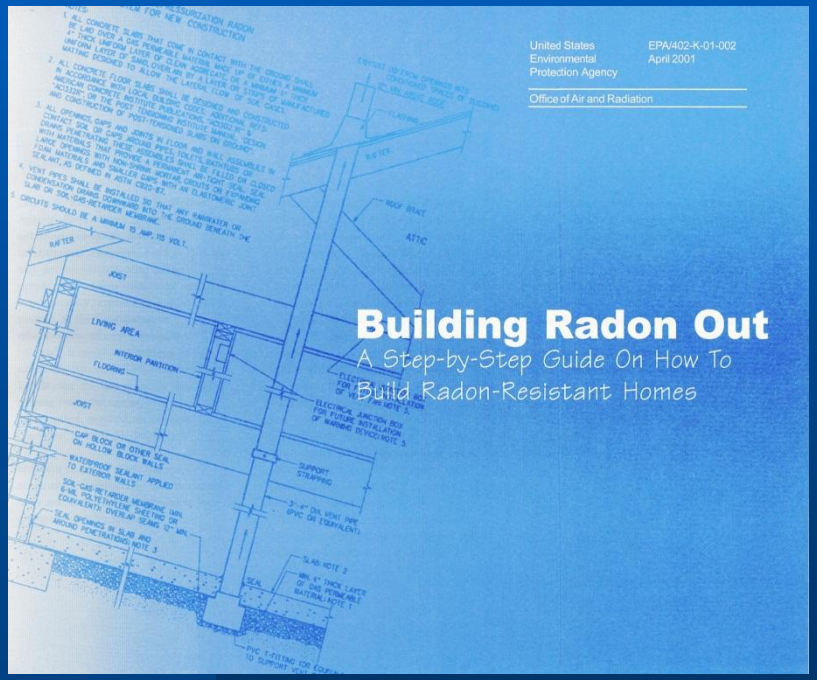
Radon Resistant Construction Act

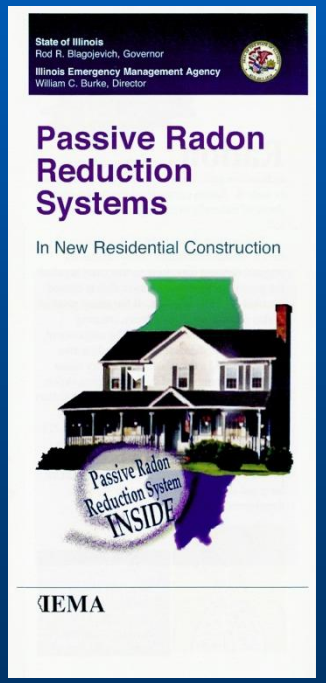
- (PA 97-981) 420 ILCS 52
- Effective June 1, 2013, all new residential construction throughout Illinois must include passive radon resistant construction.
- Requires the Task Force on Radon-Resistant Building Codes to make recommendations to the Agency by December 31, 2012.

Task Force on Radon-Resistant Building Codes

- IEMA / Task Force Chair
- Home Builders Association of Illinois
- National Association of Certified Home Inspectors, Illinois Chapter
- South Suburban Building Officials Association
- Illinois Association of Realtors
- American Lung Association of Illinois
- Respiratory Health Association of Chicago
- American Cancer Society of Illinois
- Illinois Municipal League
- Speaker of the House Appointee
- Minority Leader of the House Appointee
- President of the Senate Appointee
- Minority Leader of the Senate Appointee

Radon Resistant New Construction Guidance





Radon Resistant New Construction is Effective

- **According to the USEPA, Radon Resistant New Construction effectively reduces radon levels by an average of about 50% and, in most cases, to levels below the the 4.0 pCi/L action level.**

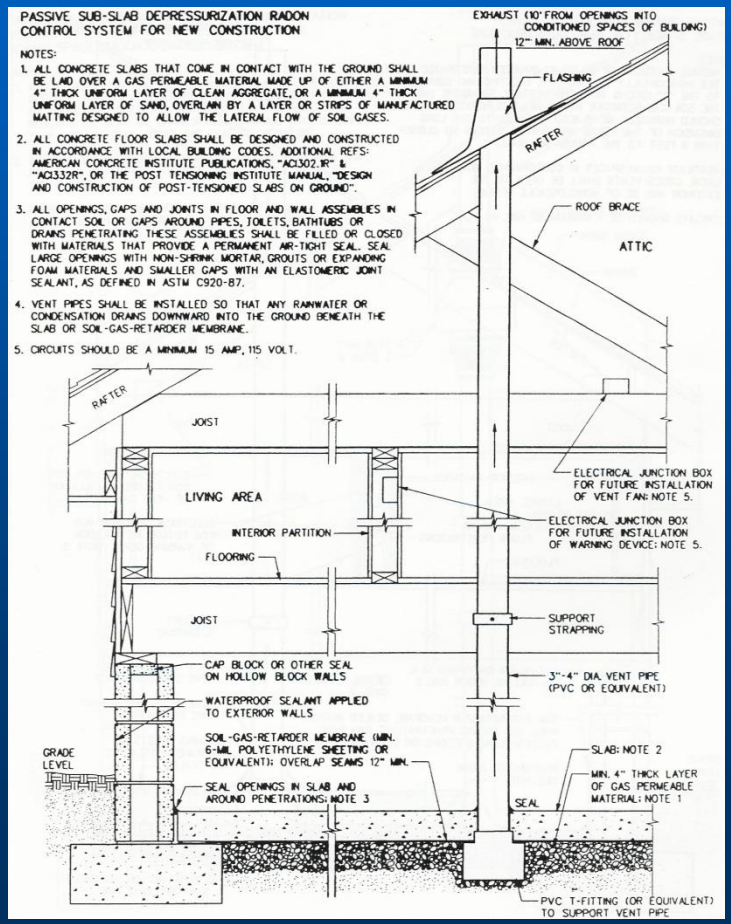
Who can Install a RRNC?

- **The installation of an active mitigation system shall only be performed by a radon contractor.**

- **The installation of radon resistant construction may be performed by a residential building contractor or his or her subcontractors or a radon contractor.**

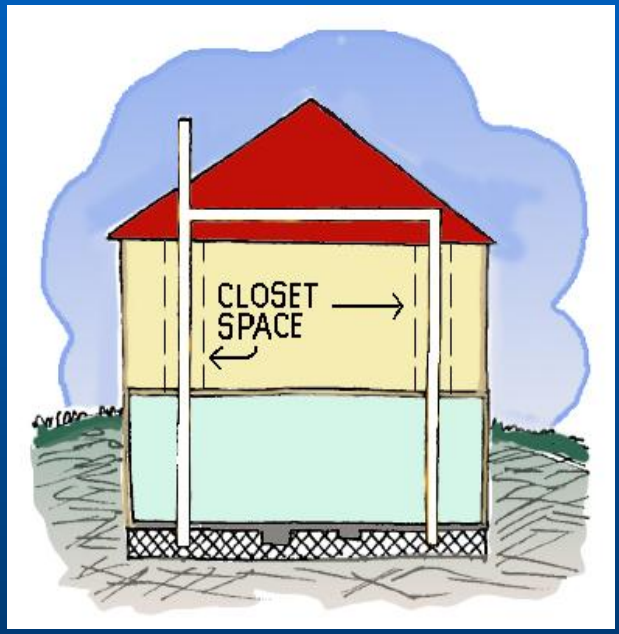
RRNC System Components

- A passive new construction system consists of a vent pipe for a Sub-Slab Depressurization system.
- This system does not use a fan but relies on the convective flow (natural draft) of air upward in the vent pipe.

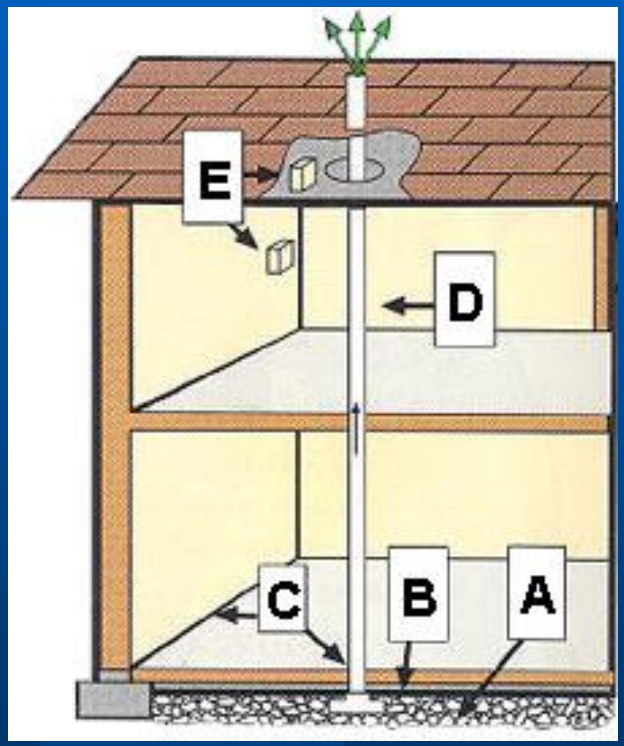


Radon Resistant New Construction

- **May consist of multiple vent pipes that may be joined to a single termination above the roof or may terminate separately above the roof.**
- **May require installation of a vent fan after construction.**



RRNC Techniques



A. **Gas Permeable Layer** - This layer is placed beneath the slab or flooring system to allow the soil gas to move freely underneath the house. In many cases, the material used is a 4-inch layer of clean gravel.

B. **Plastic Sheeting** - Plastic sheeting is placed on top of the gas permeable layer and under the slab to help prevent the soil gas from entering the home. In crawlspaces, the sheeting is placed over the crawlspace floor.

C. **Sealing and Caulking** - All openings in the concrete foundation floor are sealed to reduce soil gas entry into the home.

D. **Vent Pipe** - A 3 or 4-inch Schedule 40 PVC pipe runs from the gas permeable layer through the house to the roof to safely vent radon and other soil gases above the house.

E. **Junction Box** - An electrical junction box is installed in case an electric venting fan is needed later.

Passive System Components

- 6 Mil Polyethylene Sheeting

Passive System Components

- Seal and Caulk All Openings in the Foundation Floor.

Ensure Cost Savings at Activation

- **Allow space for future fan installation in attic or outside habitable space.**
- **On each floor and in the attic label the radon vent piping…..**

Radon Reduction System

Vent Stack Discharge Point Requirements

- **Above the highest eave (at least 12 inches above the roof) and as close to the roof ridge line as possible.**
- **10 feet from any window, door or other opening (into the building) that is less than 2 feet below the exhaust point.**
- **10 feet or more from any opening into an adjacent building.**

Radon Systems Must Be Able to Drain

- **All radon piping must be sloped to allow drainage.**
- **Water in radon system is primarily from condensation inside piping.**

Upgrading is Easy

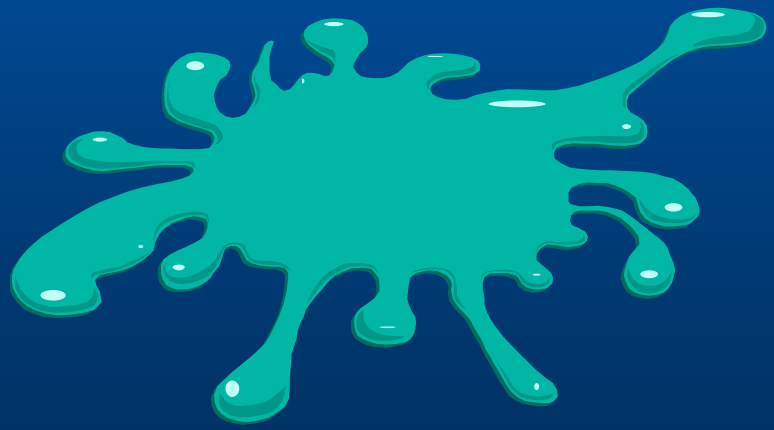
- **If, after construction is completed, radon levels are at or above 4.0 pCi/L, contact a Licensed Mitigator and simply activate the system.**
- **Homes with a passive system can be upgraded to an active system with the simple installation of an in-line fan.**

Interested in being a licensed mitigation professional?

- **Take the state approved qualification course and pass the state licensing exam.**
- **Complete a Quality Assurance Plan and a Worker Protection Plan**

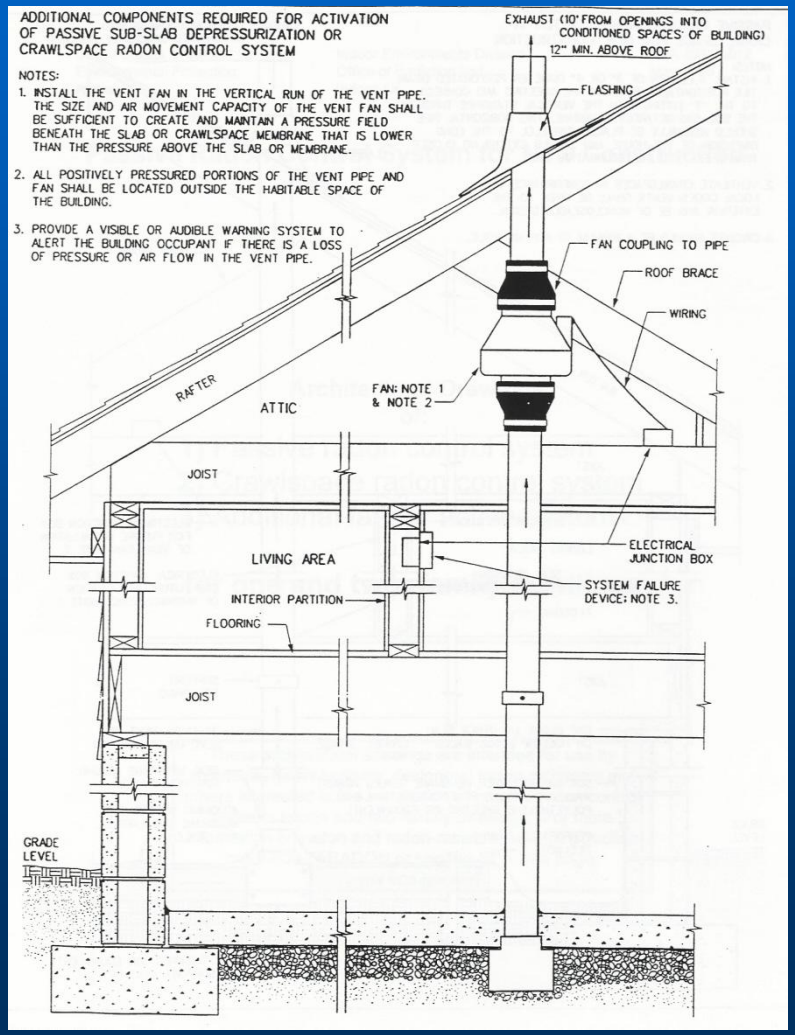
Can Radon Mitigation System Cause a Water Problem?

A properly installed radon mitigation system should not cause a water problem nor will it typically fix a wet basement.



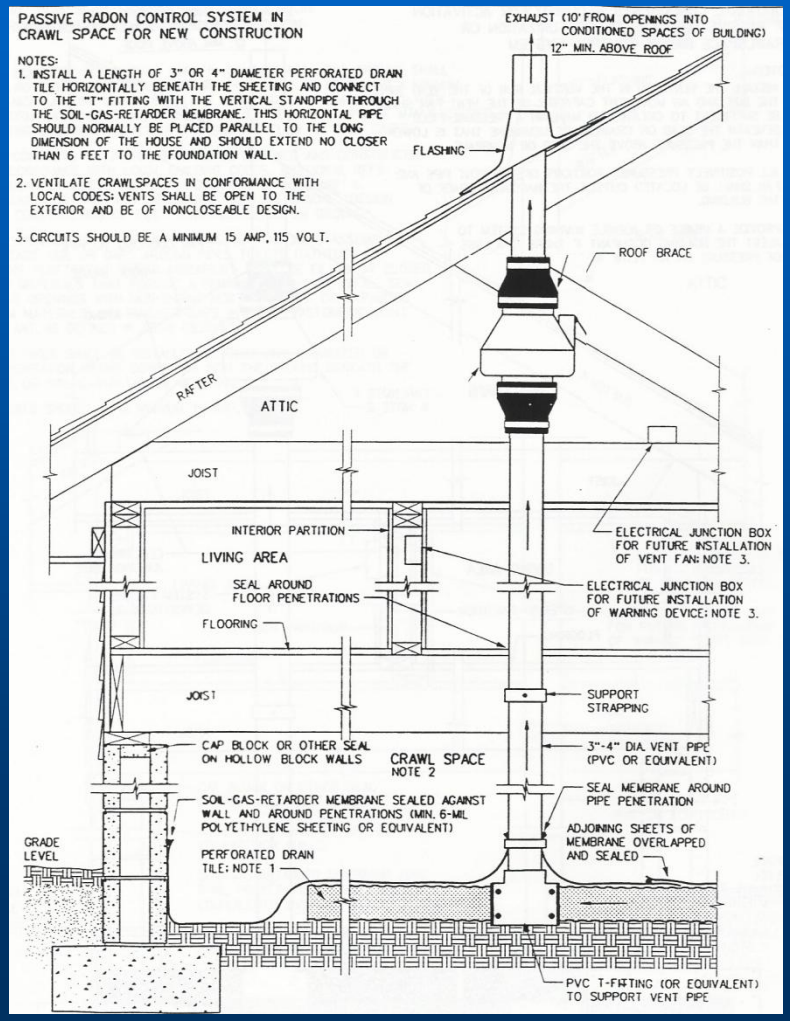
Sub-Slab Depressurization

- **Sub-Slab Depressurization means a radon control technique designed to achieve lower sub-slab pressure relative to indoor air pressure by use of a fan-powered vent drawing air from beneath the concrete slab.**



Sub-Membrane Depressurization

- **Sub-Membrane Depressurization means a radon control technique designed to achieve lower air pressure in the space under a soil gas retarder membrane laid on the crawlspace floor and sealed, relative to air pressure in the crawlspace, by use of a fan-powered vent drawing air from beneath the membrane.**



Systems on Existing Housing

All Homes Should Be Tested

- **All homes should be tested for radon, even those built with radon resistant features.**
- **Radon resistant homes do not guarantee radon reduction below the action level, only reduce cost and assist with aesthetics.**

Upgrading is Easy

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- **Homes with a passive system can be upgraded to an active system with the simple installation of an in-line fan.**

Contact Information

Radon Hotline	**(800) 325-1245**
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