Protect Your Nest!
What You Need To Know About Radon!

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Michigan Indoor Radon Program

Michigan Environmental Compliance Conference
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Test Your Nest

for radon.

Fix Your Nest,

if needed

Save a Life!

Radon Basics

We'll talk about:

- What it is!
- What it does to us!
- How it gets into our homes!
- How to measure it!
- How to fix it!

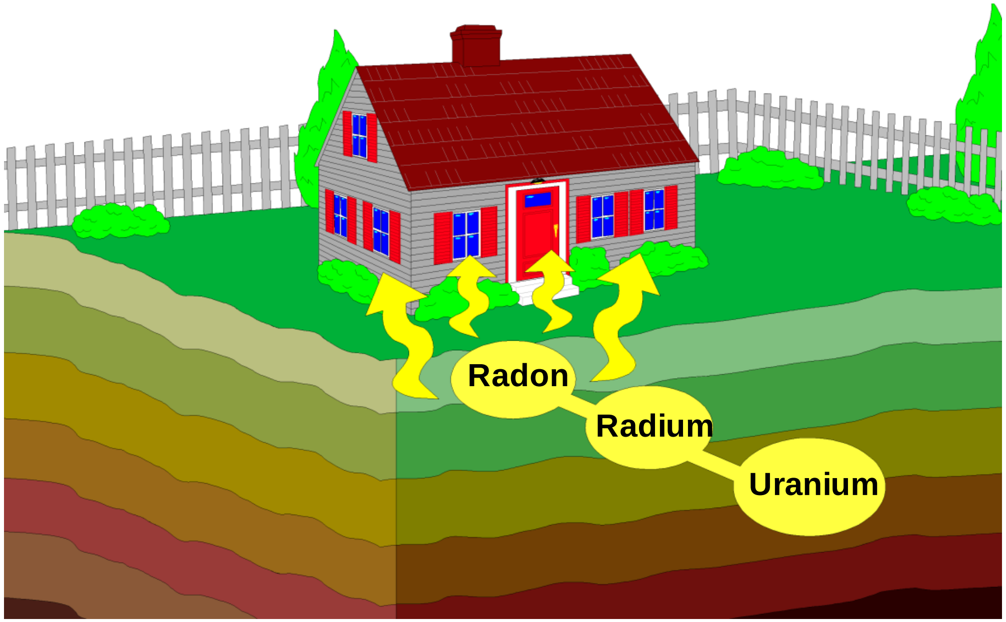
What's Radon?

Radon is a tasteless, odorless, colorless, radioactive gas.

It is naturally occurring in soil and rock; comes from breakdown of uranium and radium.

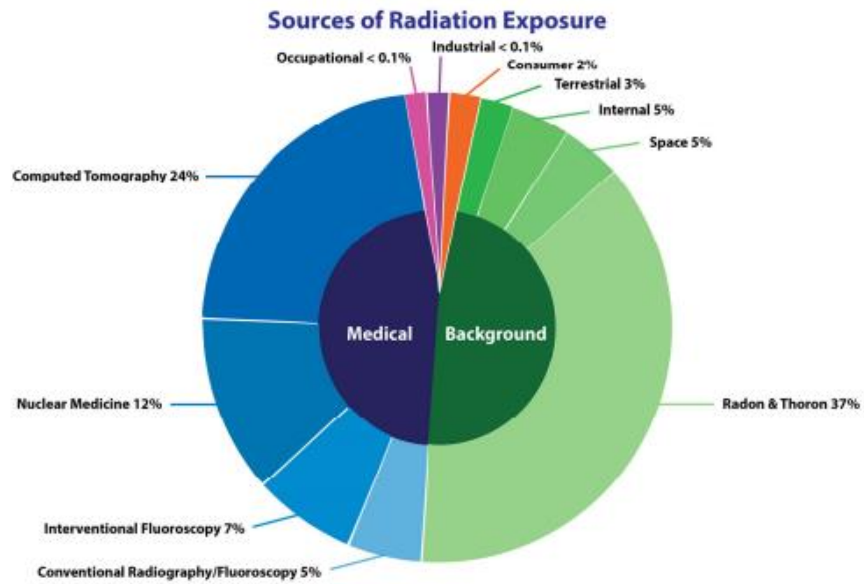
It enters buildings from the soil beneath them.

Elevated radon is found in all 83 Michigan counties.



Radiation Sources

NCRP Sources of Radiation Exposure – 2009



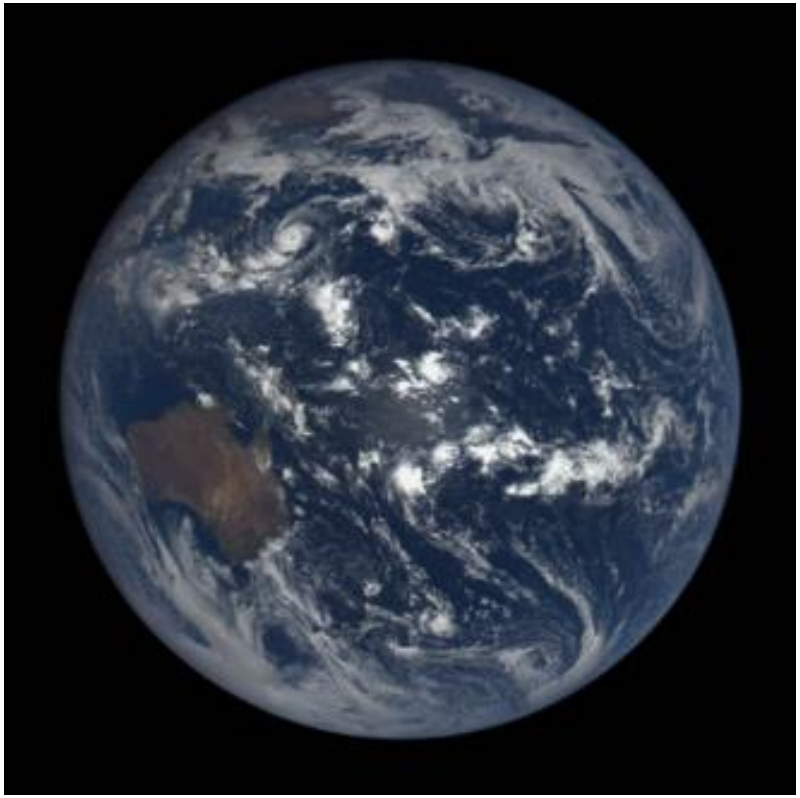
Average Annual Radiation Dose

Sources	Radon & Thoron	Computed Tomography	Nuclear Medicine	Interventional Fluoroscopy	Space	Conventional Radiography/ Fluoroscopy	Internal	Terrestrial	Consumer	Occupational	Industrial
Units mrem (United States) mSv (International)	228 mrem 2.28 mSv	147 mrem 1.47 mSv	77 mrem 0.77 mSv	43 mrem 0.43 mSv	33 mrem 0.33 mSv	33 mrem 0.33mSv	29 mrem 0.29 mSv	21 mrem 0.21 mSv	13 mrem 0.13 mSv	0.5 mrem 0.005 mSv	0.3 mrem 0.003 mSv

(Source: National Council on Radiation Protection & Measurements, Report No. 160)

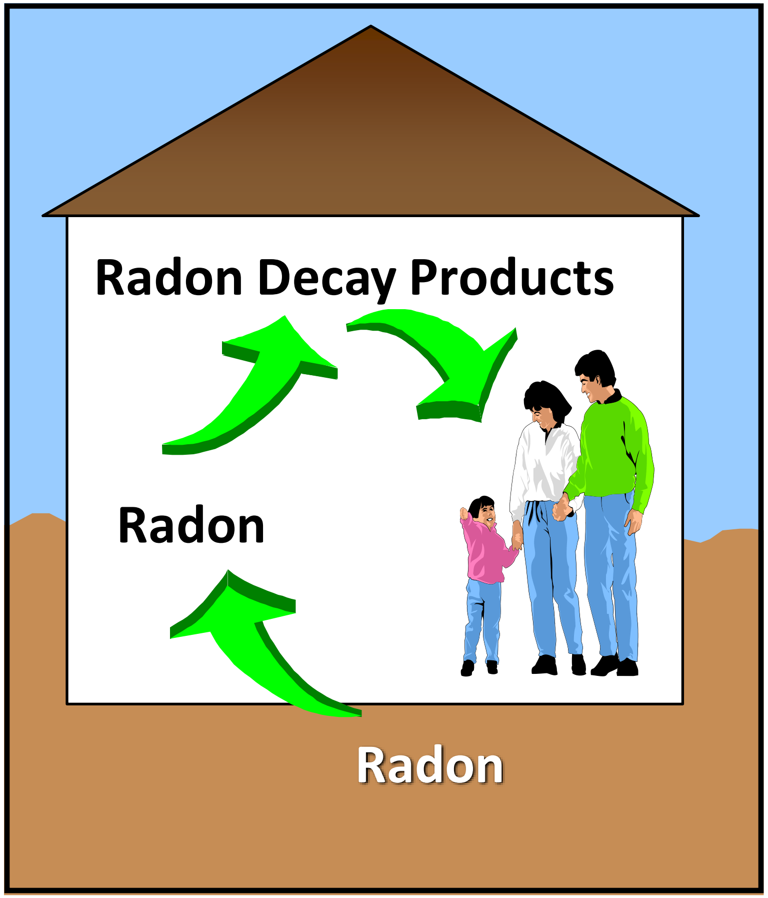
EPA Dose Calculator

Radon "Source Materials"



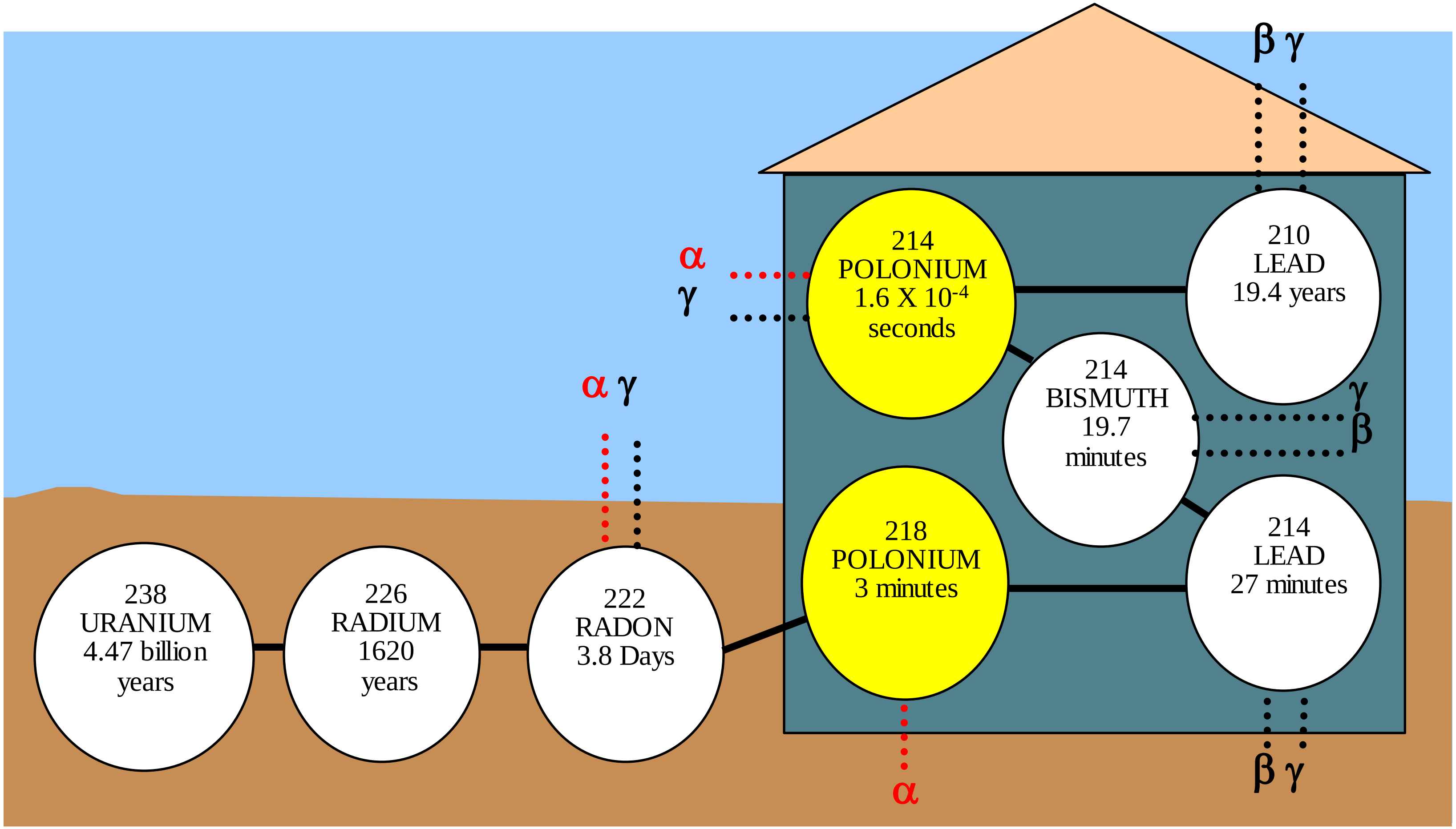
- light colored Vulcanic rock,
- granites,
- dark shales,
- sedimentary rocks containing phosphate,
- metamorphic rocks

Why is Radon a Concern?

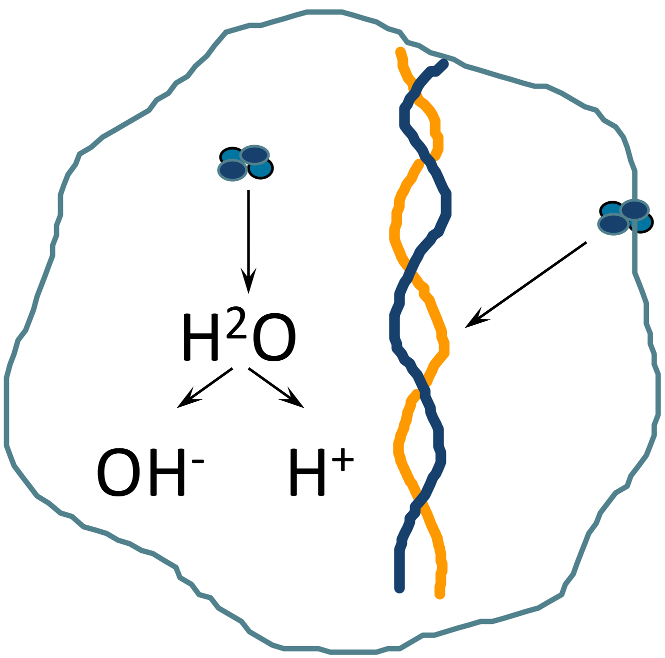


- Radon decays into radioactive particles known as radon decay products.
- These particles are easily inhaled and deposited in the lungs where they can damage sensitive lung tissue.

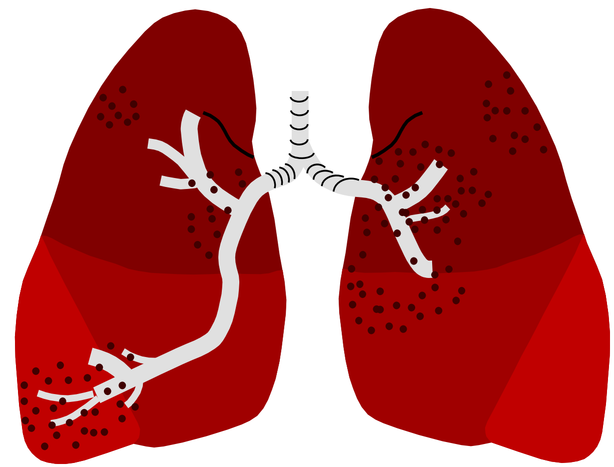
Radon Decay Products



Radon Particles Damage Lung Cells



Double strand DNA split by alpha energy



Lung cell will:

- Die
- Heal Itself
- Or Become Cancerous

Impact on Public Health

- Radon has no physical signs or warning symptoms
- Exposure to radon increases our lifetime risk of developing lung cancer
- Radon is considered a leading environmental cause of cancer mortality in the United States
- Approximately 21,000 deaths in U.S. per year

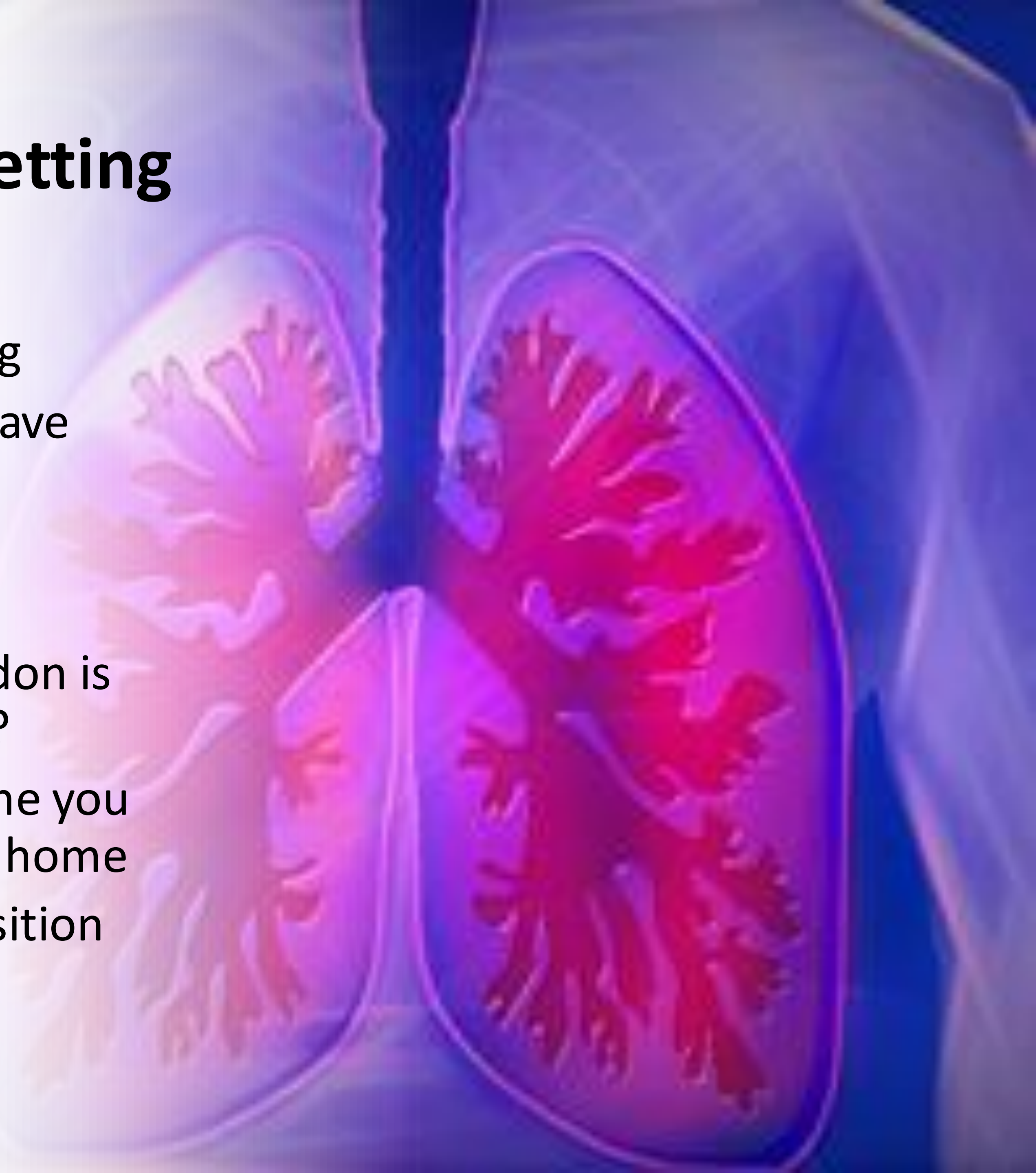
These deaths are preventable!

EPA and Surgeon General Recommend That People Not Have Exposures Above 4 pCi/L On A Long-Term Basis

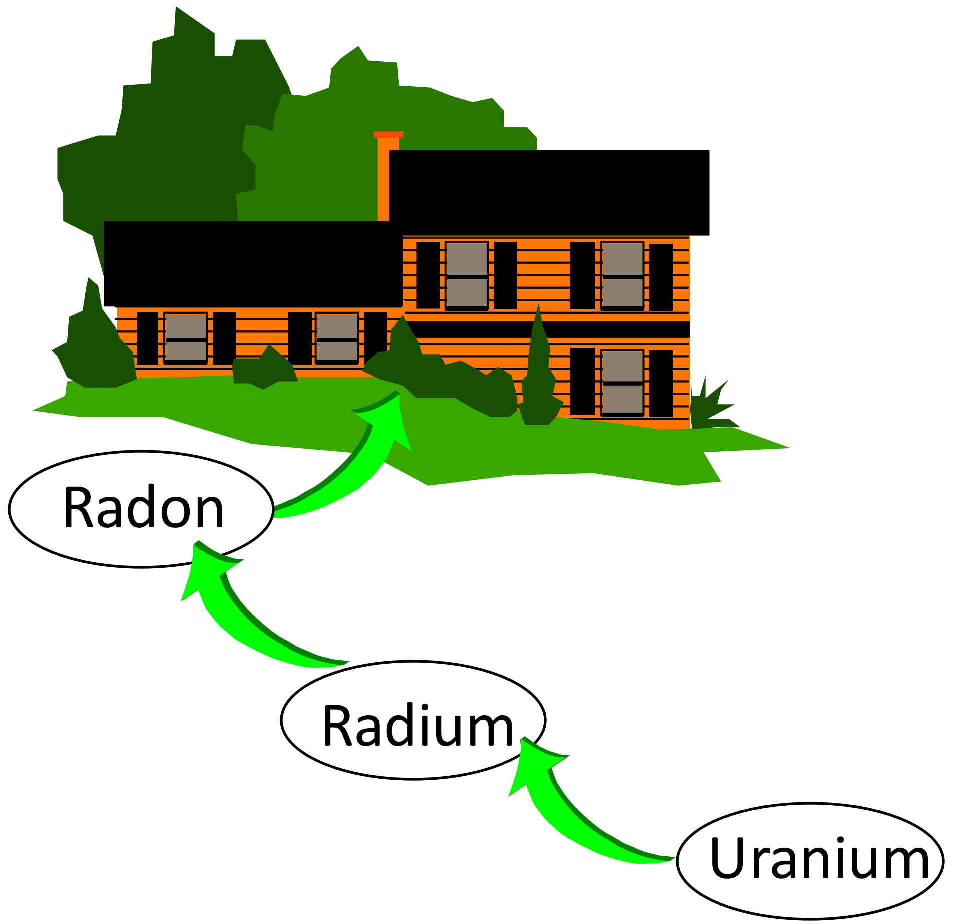
- Every home has some measureable level of radon
- There is no known “safe” level
- 4 pCi/L is considered a “reasonably achievable” level
- Many homes can be reduced to below 2 pCi/L

Chances of Getting Lung Cancer?

- History of smoking
  - A smoker or have ever smoked?
- History of radon exposure
  - How much radon is in your home?
  - How much time you spend in your home
- Genetic predisposition to cancer



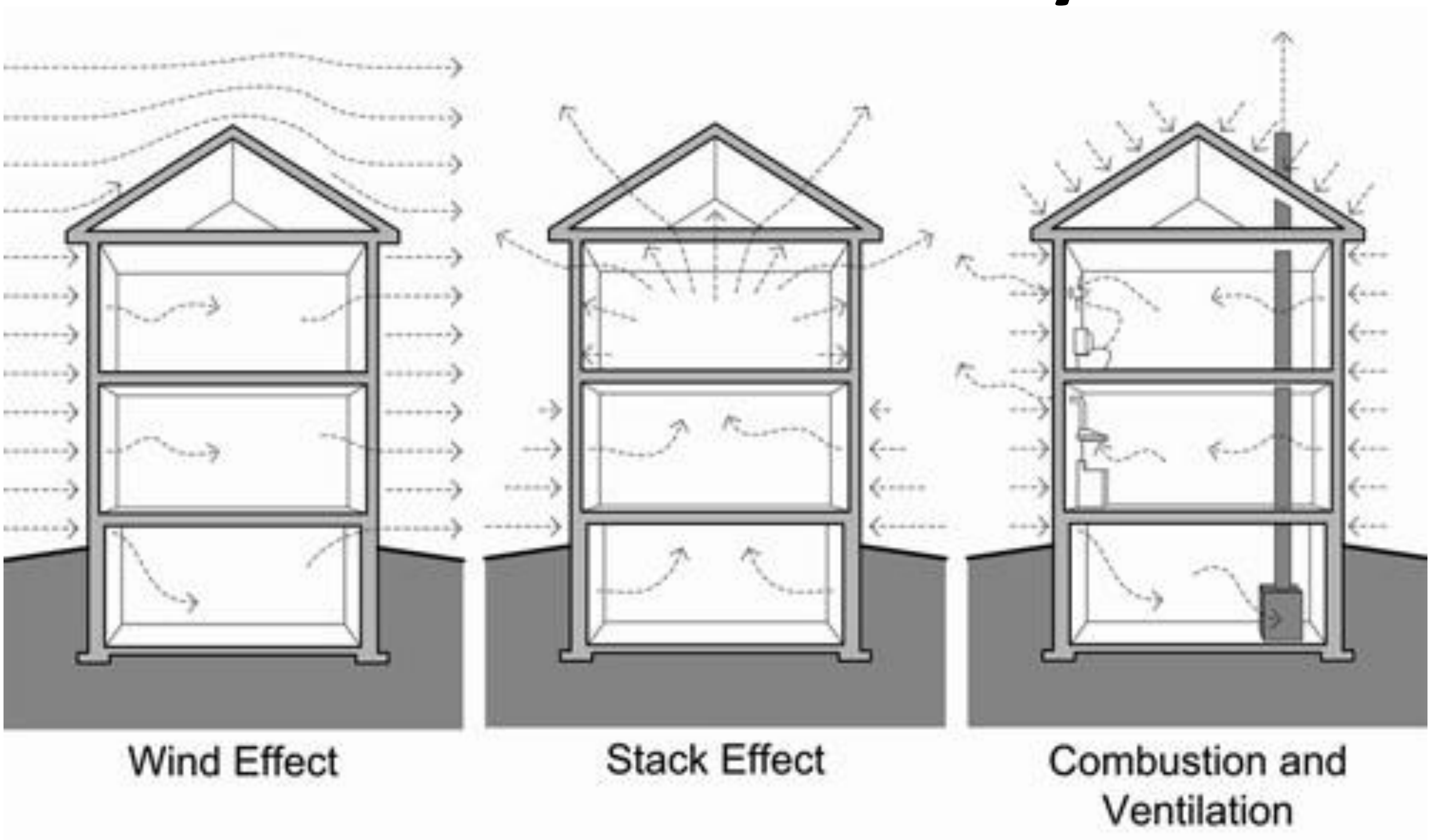
Radon Entry and Behavior



Indoor Radon Levels Depend On:

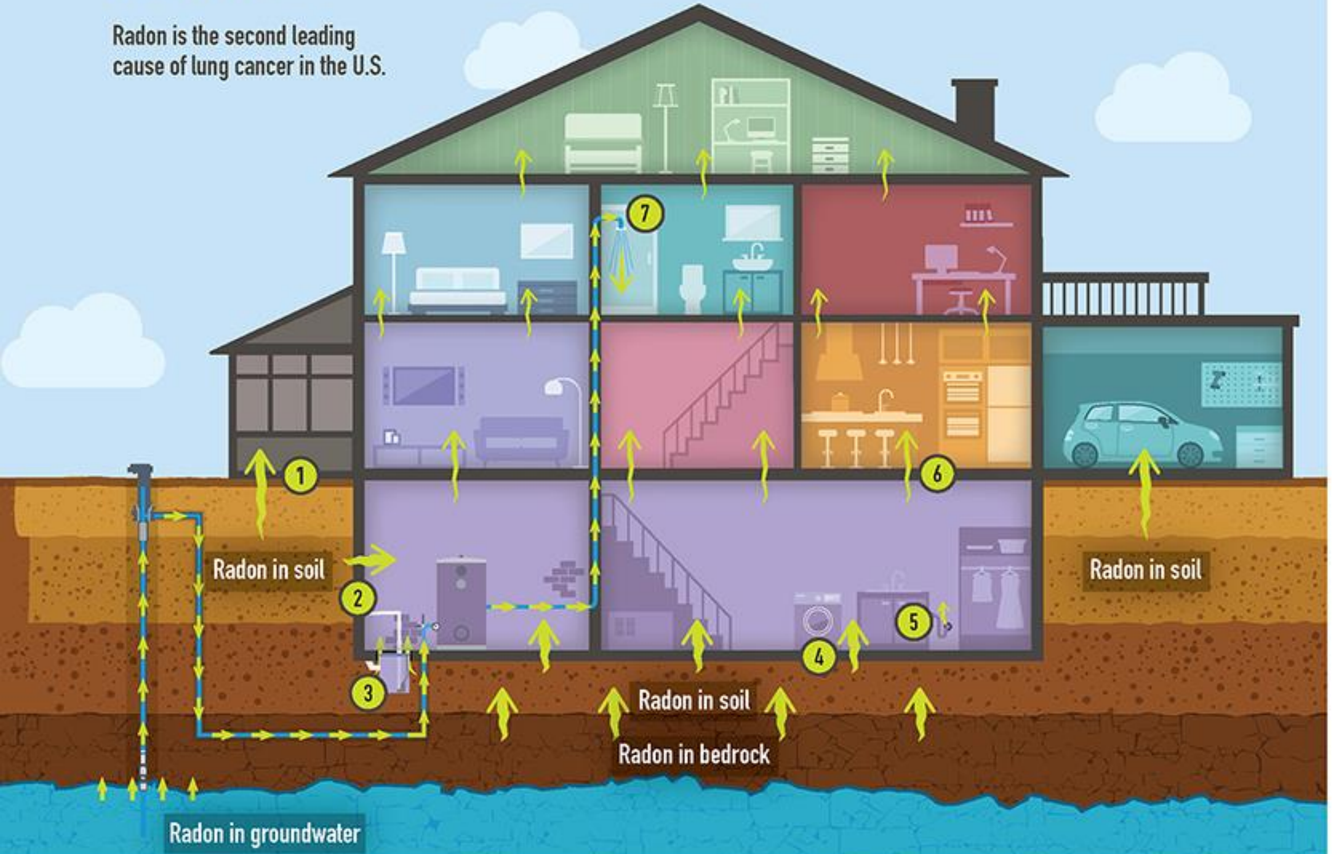
1. Radon Strength in the Soil
2. Soil Porosity
3. Building-to-Soil Pressure Difference
4. Building Ventilation Rate
5. Openings into the Soil (entry points)

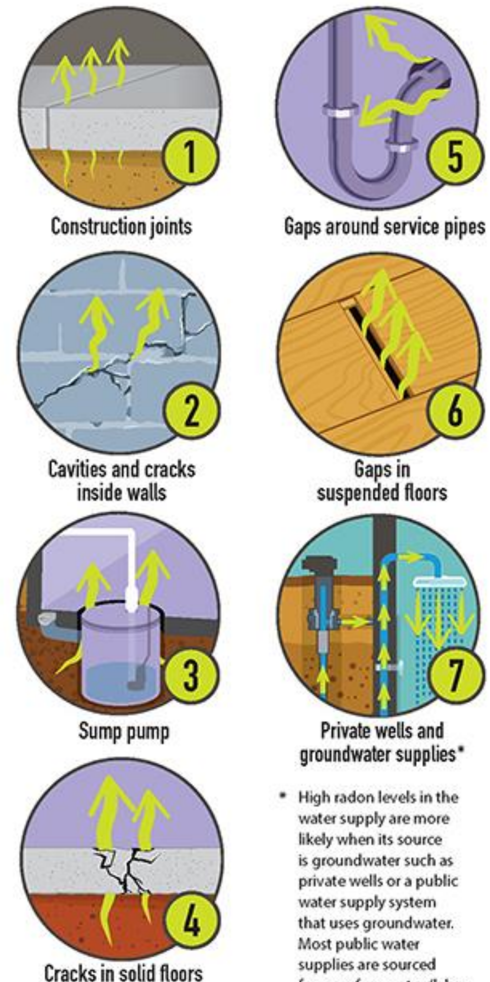
Negative Pressures in Buildings Effect on Radon Entry



How Radon Gets into Your Home

Radon is the second leading cause of lung cancer in the U.S.





* High radon levels in the water supply are more likely when its source is groundwater such as private wells or a public water supply system that uses groundwater. Most public water supplies are sourced from surface water (lakes, rivers, and reservoirs).

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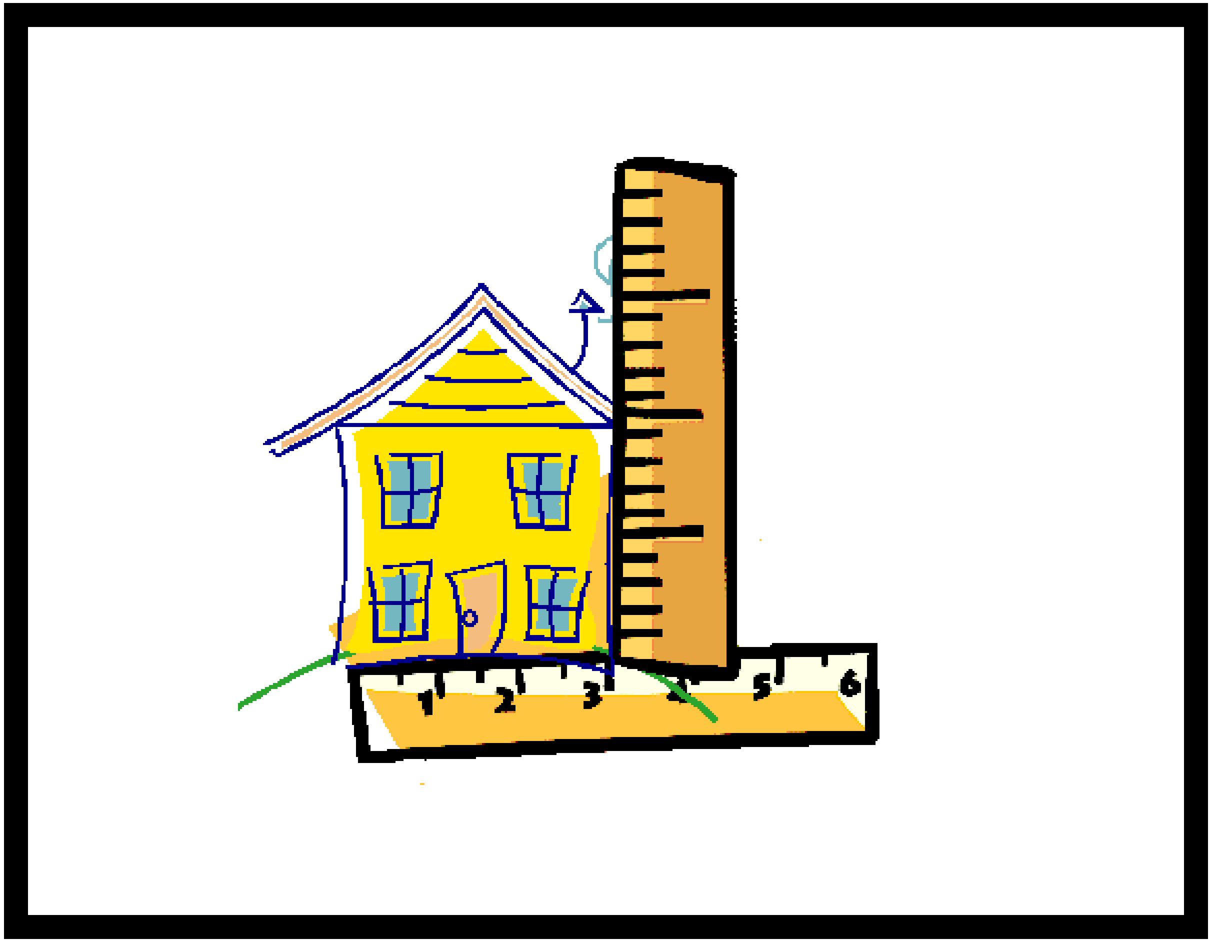
Test your home | Make repairs | Learn more: www.cdc.gov/radon/index.html

Measuring Radon



What If My House Has...?

You cannot predict radon levels based on:

- Age of Structure
- Heating System
- Foundation Type
- Air-tightness
- Style of House
- Presence of Sumps, Cracks or Other Features

The Only Way To Know Is to TEST!

Radon Measurement Units

Radon is measured in picocuries per liter of air - pCi/L

The picocurie is named for French (Polish) physicist Marie Curie

- A curie is a measure of radioactive decay
- Pico is trillionth
- Picocurie is a trillionth of a curie

Short Term Tests (2-7 Days)

Charcoal canisters, vials, and bags

- Do-it-yourself screening measurement kits generally $10 or less from local health departments (a few charge more)
- $15 and up from hardware stores/home improvement centers ($25 is typical)
- Professional testers charge $100-$200

Other Testing Devices

Alpha Track Detectors

(for long-term testing – 90-365 days)

Electret Ion Chambers

(Electret Passive Environmental Radon Monitor – E-PERM – for short or long tests; available to individuals but generally used by professional testers)

Continuous Radon Monitor

(generally used for short-term tests; used by professionals and **most often for real estate transactions**)

Interpreting Test Results

Initial short-term test

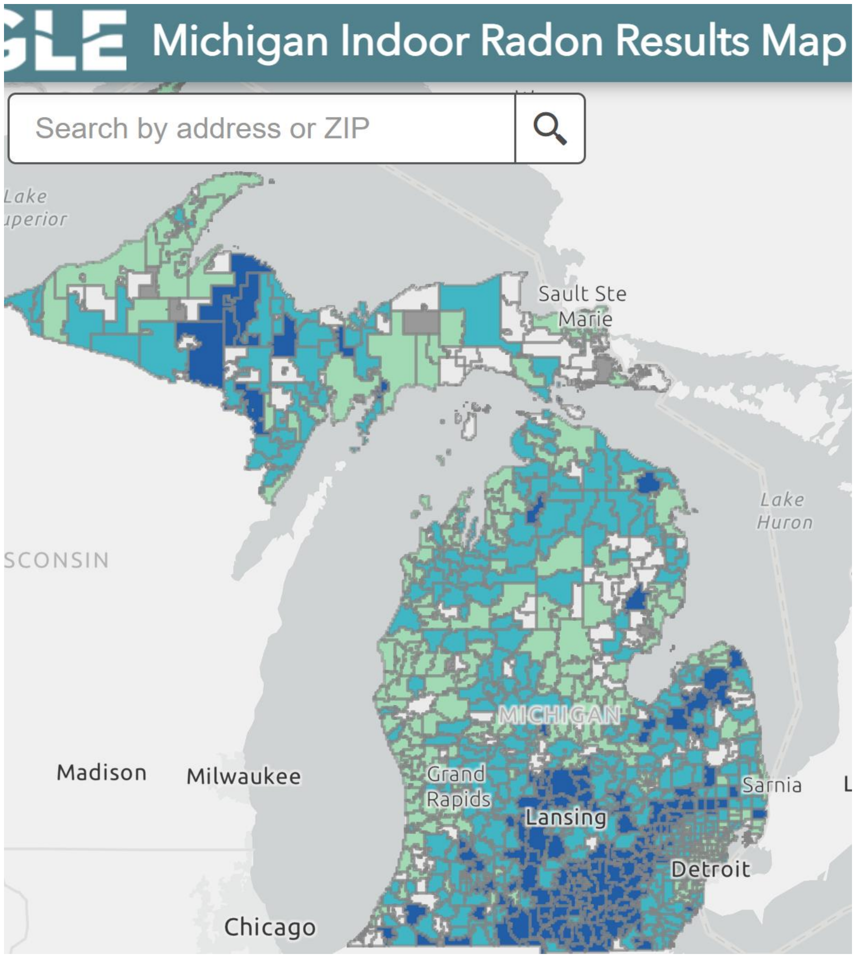
Result (pCi/L)	Action
0 – 1.9	Retest every 2 to 5 years with a short-term test
2 – 7.9	Perform a follow-up long-term test
8 or above	Perform a follow-up short-term test

Interpreting Test Results

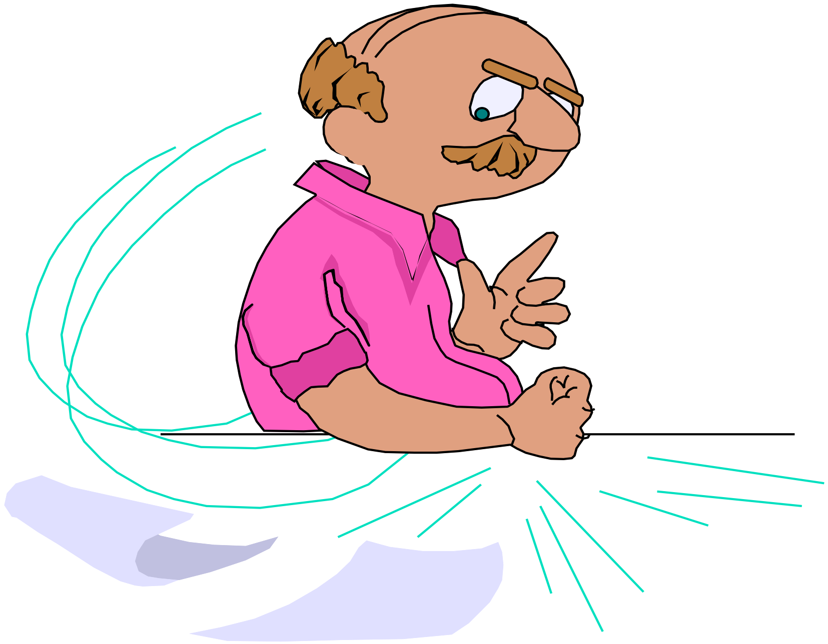
Second test (either short- or long-term test)

Result (pCi/L)	Action
0 – 1.9	Retest every 2 to 5 years*
2 – 3.9	Consider a radon mitigation system
4 or above	Highly recommend a radon mitigation system

New Interactive RADON Map!



Radon Mitigation Overview



So, the home has an elevated radon level.

Now What?

Radon Mitigation Systems

- Radon mitigation is any process or system used to reduce radon concentrations in buildings. The goal of the radon mitigation system is to reduce the indoor radon level as low as reasonably achievable.

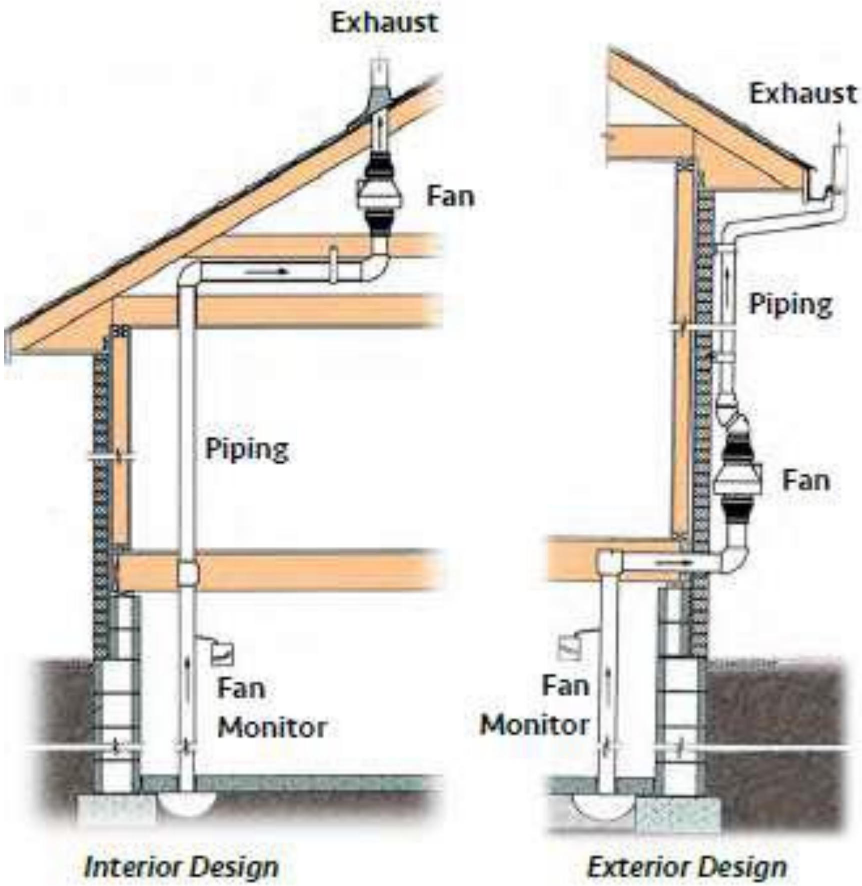
- All systems should reduce radon below the EPA action level of 4 pCi/L. A quality radon mitigation system may reduce year-round levels to below 2 pCi/L.

Radon Mitigation Systems

Active Soil Depressurization (ASD) is the most common approach.

- Employs a method of using a fan for creating a vacuum beneath the foundation greater in strength than the vacuum applied to the soil by the building.
- Caulking and sealing is not a stand-alone mitigation technique but can enhance system performance.
- Ventilation approaches have proven to be more costly and less effective.

Radon Mitigation System Diagram



- Lowest indoor radon concentrations
  - Active Soil Depressurization = up to 99% reduction
  - Expect less than 2 pCi/L ~ U.S. EPA's Citizens Guide
- Safe and does not create other problems
- Durable
- Able to perform system monitoring
- Economical to install and operate
- Quiet and unobtrusive

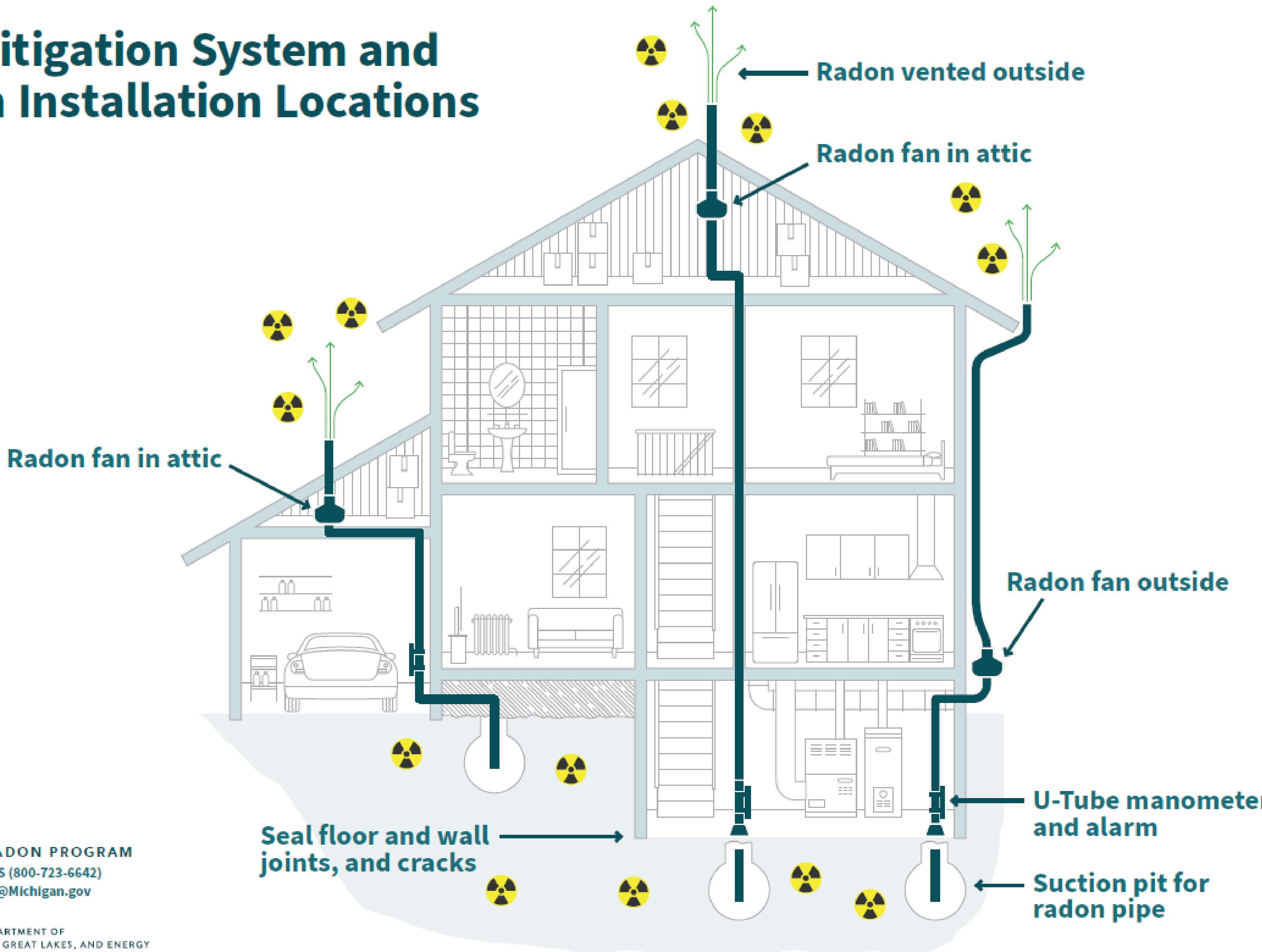
Three of the Most Common Types of Radon Mitigation Systems

- **Sub-slab suction:** This radon mitigation system pulls radon directly beneath the home's foundation and vents it outside.

- **Drain tile suction:** This radon mitigation system's pipe penetrates into the drain tile and vents the soil gases outside. Covers are placed on the sump basins.

- **Sub-membrane:** Used in crawl spaces, a plastic sheet covers exposed dirt on the floor, extends up onto the wall and is sealed. A radon pipe penetrates the plastic sheeting, pulls the soil gas from below the plastic sheet in the crawl space, and vents it outside.

Radon Mitigation System and Common Installation Locations



MICHIGAN INDOOR RADON PROGRAM
Radon Hotline: 800-RADONGAS (800-723-6642)
Michigan.gov/Radon | Radon@Michigan.gov

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Suction System Pipe

Depressurization Fan

- Installed in attic, garage, or on homes exterior. (not in or beneath habitable spaces)
- Quiet.
- Less than 90 watts.
- Expected life: 11 years.

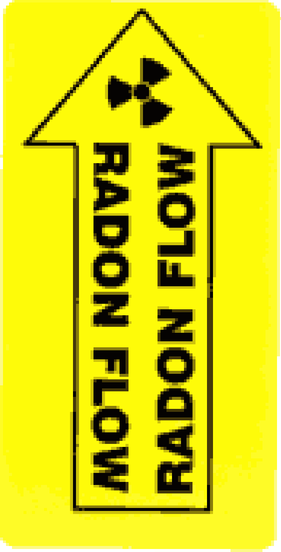
System Performance Indicator
U-Tube Manometer

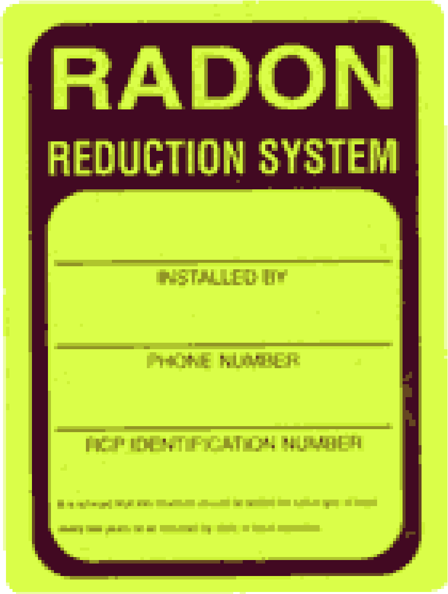
"J" shape shows fan is **working**

"U" shape shows fan is **not working**

Radon System Labeling

Other Radon System Labels*





* Labels are needed on each floor where the system is visible.

Cost of a Radon Mitigation System

The cost can depend on many factors including:

- the type of radon system to be installed and,
- how your home was built.

In general, costs can range from $800 to $1,500*.

Financial assistance may be available to help pay for a radon mitigation system and depends on household income, geographic location, and funding availability.

Post-Mitigation Testing

- Almost all systems can be installed in less than a day
- Must wait at least 24 hours before starting a post mitigation radon test
- A short-term test must be placed in the same location as the first test
- Must test system within 30 days
- A year-long measurement is also a good idea
- **Must conduct radon testing every 2 years**

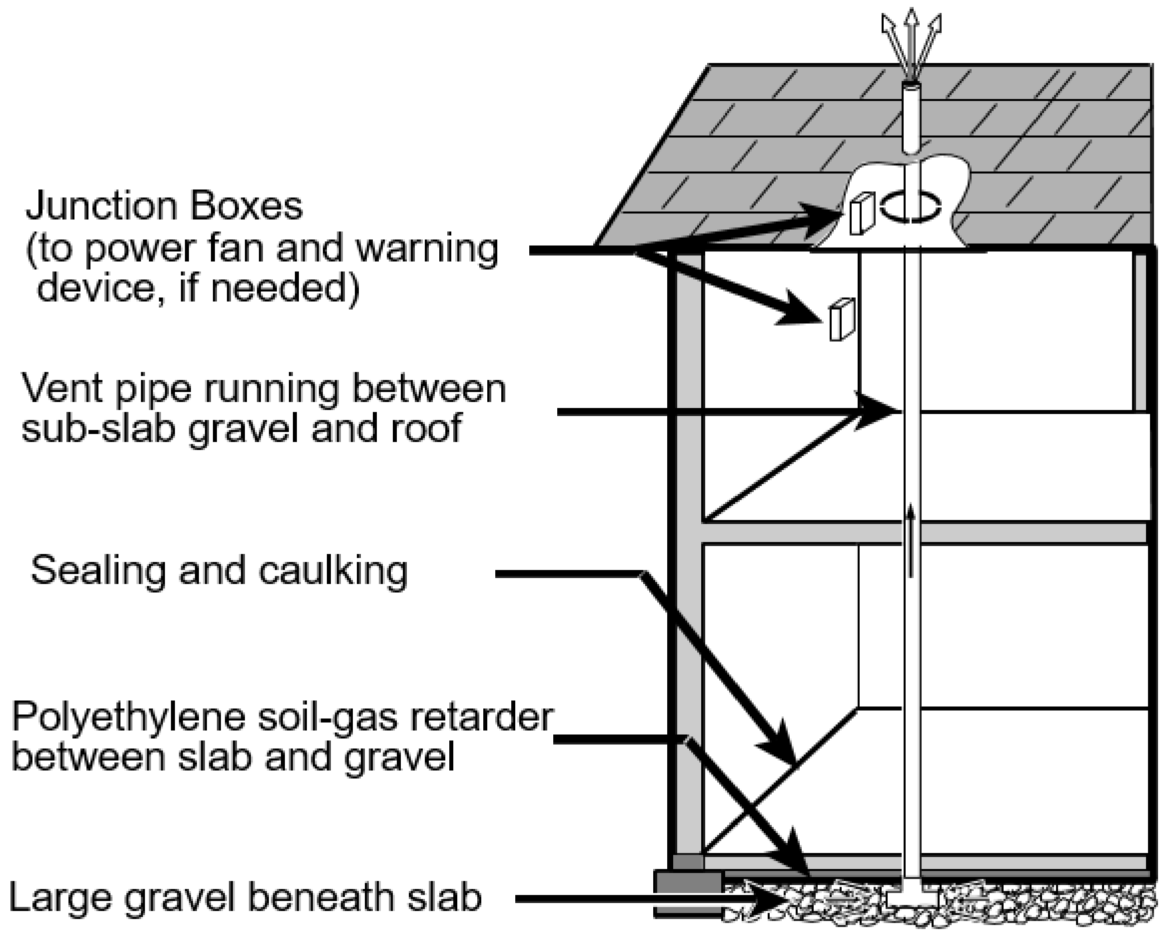
Building Radon-Resistant Homes

Radon Resistant New Construction

- As of July 2001, all new homes built in Branch, Calhoun, Cass, Hillsdale, Jackson, Kalamazoo, Lenawee, St. Joseph, and Washtenaw counties are required to be built radon-resistant. Home builders must use materials and techniques to help prevent radon from entering the home.

- This includes sealing radon entry points and installing a pipe but does not include a fan. Instead, this "passive" radon system relies on the natural upward flow of air to exhaust radon through the pipe.

Basic Components of a Passive System



Why Build Using RRNC Techniques?

Passive Mitigation System

- Lower cost
- Uses common building materials
- Reduces radon levels 50%
- Build a better product
  - Other IAQ issues
  - Moisture

Other Benefits of a Passive System

- Moisture control
- Reduce entry of other soil gases
- Aesthetics
- Lower cost than a retrofit

Need More Information?

- Outreach materials include general information, measurement, mitigation, real estate, and new construction
- More information:

  EGLE – 1-800-723-6646

  www.michigan.gov/radon

  EPA – 1-800-767-7236

  www.epa.gov/radon

  National Radon Program Services

  www.sosradon.org

Questions

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