



## Guidelines for Radon Measurements in the Home


The Illinois Emergency Management Agency (IEMA)-Division of Nuclear Safety has developed protocols for homeowners who wish to test their homes for the presence of naturally occurring radon gas. These testing protocols are summarized in the table below. This protocol applies to both residents testing their own dwellings and to professional measurement licensees testing home environments. The testing options outlined are intended to be used by the homeowner to determine if steps should be taken to reduce the radon concentration in the home.

Because of the unique nature of real estate transactions, the IEMA-Division of Nuclear Safety has designed special protocols for radon testing in real estate transactions. If you expect to be selling your house in the near future, we recommend that you contact the IEMA-Division of Nuclear Safety Radon Program for a copy of our fact sheet, "Radon Testing Guidelines for Real Estate Transactions."

### Test

Conduct a short-term radon test in each of the lowest structural areas of the home. For example, if the house has one or more of the following foundation types (e.g., basement, crawlspace, slab-on-grade), test in accordance with the following protocol in each area.

#### Steps for Radon Testing in the Home

Test	Initial Test Results and Follow-up Tests	Test Results: Do You Take Action?
Conduct an initial short-term radon test in each of the lowest structural areas of the home.	If your initial short-term test result is: <ul style="list-style-type: none"><li>below 4 pCi/L, no further action is required.</li></ul>	<ul style="list-style-type: none"><li>You may re-test in two years or if any renovations or additions are made to the building.</li></ul>
	<ul style="list-style-type: none"><li>between 4 and 9.9 pCi/L. Follow up with another short-term or a long-term test.</li></ul>	<ul style="list-style-type: none"><li>If the average of the two tests is 4 pCi/L or greater, the IEMA-Division of Nuclear Safety recommends reducing the radon level.</li></ul>
	<ul style="list-style-type: none"><li>10 pCi/L or greater, follow up with another short-term test.</li></ul>	<ul style="list-style-type: none"><li>If the follow-up result is in agreement with the initial result, the IEMA-Division of Nuclear Safety recommends reducing the radon level.</li></ul>



Short-term tests may last between two and 90 days. Most last between two and seven days. Tests between seven and 90 days are usually impractical for real estate transactions, but are fine for homeowners assessing their own radon situation. Examples of short-term detectors include: activated charcoal canisters, charcoal liquid scintillation vials, electret chambers and continuous radon monitors.



Long-term tests last between 91 and 365 days, and are strongly recommended by the IEMA-Division of Nuclear Safety for all homeowners (that is, non-real estate transaction) testing. Long-term tests give a better estimate of the year-round radon concentration in the home. The closer the test duration is to a full year, the closer the test result will be to the actual average. An example of a long-term test is an alpha track detector.

### When do you average radon test results?

The only time radon test results can be averaged is when two test results are performed simultaneously or sequentially. Test results from different areas such as above the crawlspace and in the basement are considered two different tests. Results are each independent of the other and are reported independently (e.g., basement result of 4.2 pCi/L and family room over crawlspace result of 6.1 pCi/L). If there is an elevated radon level in any one of the lowest structural areas of the home, it is recommended that the radon level be reduced.

(cont. on back)

If your first and second short-term tests are not in agreement (or if you're not sure whether or not they agree), contact the IEMA-Division of Nuclear Safety Radon Program or your licensed radon measurement professional. You will probably want to conduct a long-term test, or have a radon professional conduct testing to confirm your radon levels. An example of radon measurements that are "in agreement" is a result of 11 pCi/L on the first test and 9 pCi/L on the second. An example of measurements not in agreement is 15 pCi/L on the first test and 2 pCi/L on the second. Radon levels do vary from day to day, but rarely by more than a few pCi/L.

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## **IEMA-Division of Nuclear Safety Recommendations for Radon Measurements in the Home**

- Hire a licensed radon measurement professional or, if you are the occupant, you may perform your own test.
- Be sure that IEMA-Division of Nuclear Safety Radon Program radon testing protocols are followed.
- Contact the IEMA-Division of Nuclear Safety Radon Program if you are uncertain about anything regarding radon testing. [www.state.il.us/iema](http://www.state.il.us/iema)

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### ***Where Test Kits Can Be Purchased***

Short-term and long-term test kits can be purchased at most hardware and department stores, and some other stores. The IEMA-Division of Nuclear Safety Radon Program can provide a list of licensed radon measurement professionals, and a list of businesses which offer testing kits through the mail.

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### ***When Testing***

Be aware that any tests lasting less than a week (that is, most short-term tests) require closed-house conditions. Closed-house conditions mean keeping all windows closed, keeping doors closed except for normal entry and exit, and not operating fans or other appliances which bring air in from outside (except for fans that are part of a radon reduction system, or small exhaust fans that operate for only short periods of time).

- Before Testing: Begin closed-house conditions at least 12 hours before the start of the short-term test.
  - During Testing: Maintain closed-house conditions during the entire duration of the short term test, especially for tests less than one week in duration. Operate home heating or cooling systems normally during the test.
- For tests lasting less than one week, only operate air conditioning units that recirculate interior air.

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### ***Where the Test Should Be Conducted***

Place the detector or detectors in each lowest area suitable for occupancy, such as:

- a family room, living room, den, playroom, bedroom, workshop, or exercise room; and/or
- in the lowest level suitable for occupancy, even if it isn't currently used but could be, without renovating.

For instance, if the house has one or more of the following foundation types: basement, crawlspace, or slab-on-grade, a test should be performed in the basement and in at least one room over the crawlspace and slab-on-grade area. If an elevated radon concentration is found and confirmed in one or more of these areas, the radon levels should be reduced.

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### **DO NOT MEASURE:**

- in kitchen, laundry room and bathroom (because fan systems and humidity may affect some detectors); or
- in crawl spaces, on floor or wall cracks, or right next to a sump pump, as this may cause a false high reading.

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### **The Detector Should Be Placed:**

- in an area where it will not be disturbed;
- at least three feet from doors and windows to the outside;
- at least one foot from exterior walls;
- 20 inches to 6 feet from the floor;
- at least four inches away from other objects horizontally and directly above the detector;
- away from drafts; and
- away from heat, fireplaces, furnaces, direct sunlight and areas of high humidity.

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### ***If the Test Results Show Radon Levels Above 4 pCi/L***

Contact the IEMA-Division of Nuclear Safety Radon Program. Staff can provide names and addresses of licensed mitigation professionals that are trained to reduce radon levels. We also recommend that you visit our website or contact the Radon Program for a copy of *IEMA-Division of Nuclear Safety Guide to Radon Mitigation*.

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### ***After a Radon Reduction System Is Installed***

Perform another short-term test to ensure that the radon reduction system is effective. Make sure the system is operating during the entire test.

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### ***The IEMA-Division of Nuclear Safety Radon Program Can Provide:***

- Information about radon and radon testing;
- Names of licensed radon measurement professionals; and
- Names of licensed radon mitigation professionals.

**Call the IEMA-Division of Nuclear Safety Radon Program at: 1 (800) 325-1245**  
**IEMA-Division of Nuclear Safety**  
**1035 Outer Park Drive • Springfield, IL 62704**  
**(217) 782-1325 • TDD: (217) 782-6023 • [www.state.il.us/iema](http://www.state.il.us/iema)**

# IEMA - Division of Nuclear Safety Radon Program

## Guide to Radon Mitigation

**Your radon concentration is at or above the USEPA action level of 4 picocuries per liter (pCi/L). What is next?**

- ◆ Contact a mitigation professional licensed by IEMA-Division of Nuclear Safety to reduce the radon levels in your home.
- ◆ Request two or three price estimates from licensed mitigation professionals. The cost of a radon reduction system generally ranges from \$800 to \$1200, depending on characteristics of the house and choice of radon reduction methods.
- ◆ Talk to your mitigator and be sure you understand the mitigation design.
- ◆ Residents of a dwelling may install a mitigation system in their own dwelling; however, without proper equipment or technical knowledge, you could actually increase your radon level or create other potential hazards.



### IEMA-Division of Nuclear Safety Assures Consumer Protection

- ◆ IEMA-Division of Nuclear Safety-licensed mitigation professionals have passed a radon qualification course and exam.
- ◆ IEMA-Division of Nuclear Safety-licensed radon professionals work to a Quality Assurance Program approved by the agency.
- ◆ IEMA-Division of Nuclear Safety performs performance audits on a regular basis to evaluate individual professional compliance.

### Mitigation Systems Reduce Radon By:

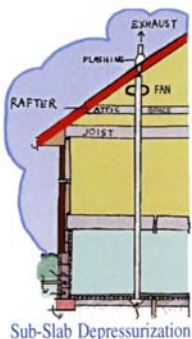
- ◆ Collecting radon prior to entry into the building and discharging it to a safe location.
- ◆ Modifying building pressure differentials.
- ◆ Diluting radon concentrations with increased ventilation.

### Mitigation Systems In Illinois Must Include:

- ◆ Effective radon reduction
- ◆ Unobtrusive and permanent installation
- ◆ Quiet operation
- ◆ Energy efficient operation and maintenance
- ◆ A system function indicator
- ◆ A primary suction point independent of the sump pit
- ◆ Sump covers with observation ports
- ◆ Exhaust above the highest eave

### Sub-Slab Depressurization (SSD)

Active Sub-slab depressurization uses a fan to draw radon from beneath the house. SSD systems collect radon prior to entry and exhaust it to a safe location above the highest eave.

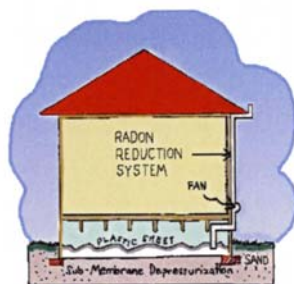


Sub-Slab  
Depressurization

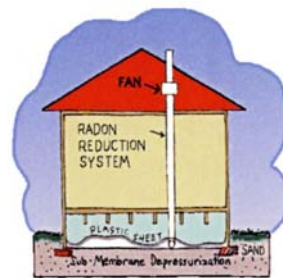
### Sub-Membrane Depressurization (SMD)

SMD is performed in crawl spaces and areas that are directly in contact with rock or soil. Suction is created:

- ◆ Under a specified polyethylene or equivalent flexible material (plastic sheet) permanently installed over exposed soil or rock.
- ◆ By a fan drawing radon from beneath the plastic sheet and exhausting the radon outdoors above the highest eave.



Sub-Membrane Depressurization  
Sub-Membrane  
Depressurization



Sub-Membrane Depressurization  
Sub-Membrane  
Depressurization



## Discharging Above The Highest Eave

Discharge above the highest eave ensures dilution of exhaust to the outdoor air and minimizes re-entry into the house and exposure to persons in the yard and neighboring areas. To ensure public health and safety, IEMA-Division of Nuclear Safety requires that the point of discharge be located:

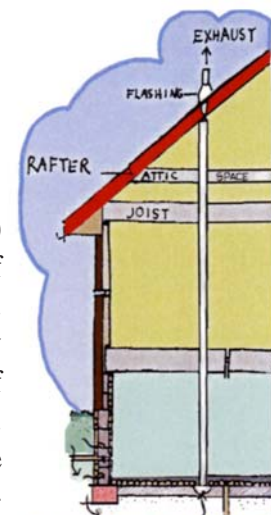
- ◆ Above the highest eave of the roof;
- ◆ As close to the roof ridge line as possible;
- ◆ 10 feet from any window, door or other opening (into the building) that is less than 2 feet below the exhaust point;
- ◆ 10 feet or more from any opening to an adjacent building

## Sealing

- ◆ Sealing enhances radon reduction techniques, because reducing the loss of conditioned air increases radon reduction system effectiveness and cost efficiency.
- ◆ IEMA-Division of Nuclear Safety does not recommend the use of sealing alone to reduce radon concentrations. Sealing alone has not been shown to lower radon levels significantly or consistently.

## New Construction Systems

Since 1995, radon control methods have been part of the International Code Council, Inc. (ICC) “One and Two Family Dwelling Code.” Several Illinois municipalities have adopted variations of the ICC code requiring the installation of radon control methods in newly constructed residences. These methods are known as *passive* and *skeletal new construction systems*. They may or may not reduce radon concentrations in homes to below the USEPA’s Action Level. IEMA-Division of Nuclear Safety encourages homeowners to test their home to determine the actual radon levels. With test results of 4pCi/L or more, *passive* and *skeletal new construction systems* should be converted to active soil depressurization systems by mitigation professionals licensed by IEMA-Division of Nuclear Safety.



Passive New Construction

## Passive New Construction

Passive new construction systems rely solely on the convective flow of air upward in the vent pipe for sub-slab depressurization. The system consists of a vertical vent pipe routed through conditioned space from the suction pit to at least 12 inches above the roof.

## Skeletal New Construction

A skeletal system is a system that is designed for the installation of a vent fan and may consist of multiple vent pipes. This includes vertical and angled runs that are not necessarily routed through living space that may be joined to a single termination above the roof or may terminate separately above the roof.



Skeletal New Construction



Skeletal New Construction

## Always Perform a Post-Mitigation Test!

Post-mitigation tests are important evaluators of actual system function.

**The IEMA-Division of Nuclear Safety Radon Program provides:** Information about radon and radon testing; names of licensed radon measurement professionals; and names of licensed mitigation professionals trained to reduce radon.

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