

# **Mitigating Radon**

## Module 2

### The focus

Here is what this module will focus on:

- Radon-resistant features for new building/home construction
- Techniques of a proper home inspection for radon gas
- Radon-resistant features and explaining them to clients
- A deeper understanding of mitigation features and their benefits

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# Before you put down money

Before you put down a lot of money for that wonderful new home, it's important to take a close look at this checklist of radon-resistant features, set out by the EPA.



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### Apply a layer of gravel

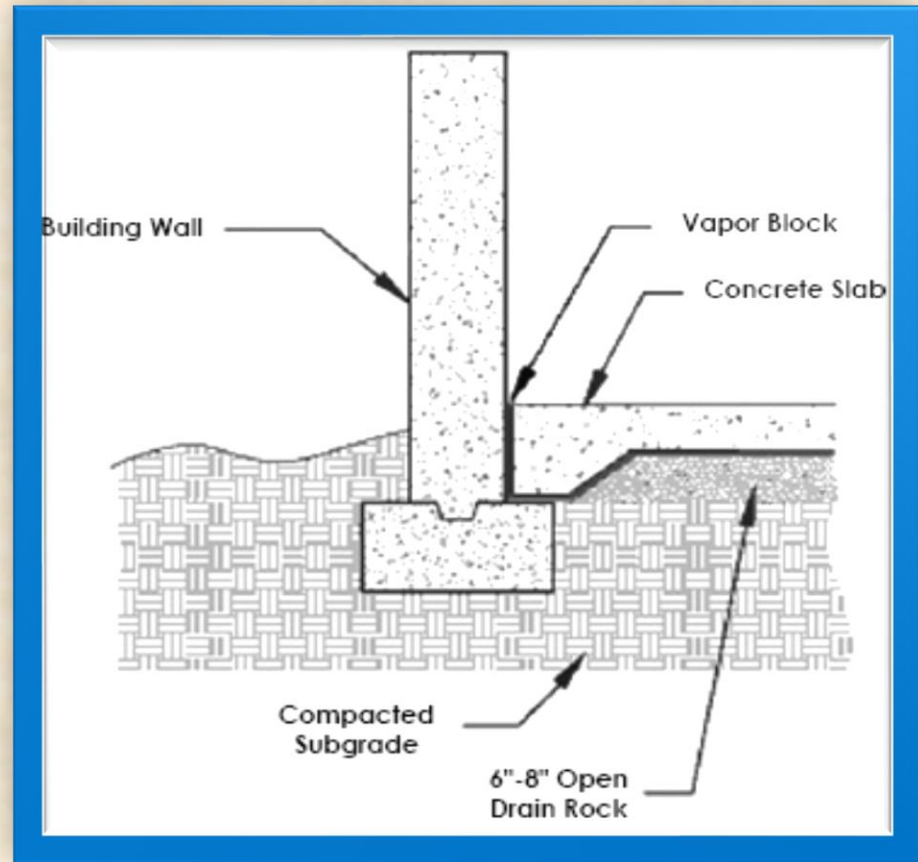
Apply a layer of clean, coarse gravel below the foundation or used an alternative, such as a perforated pipe or a collection mat.



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# Plastic sheeting or Vapor retardant

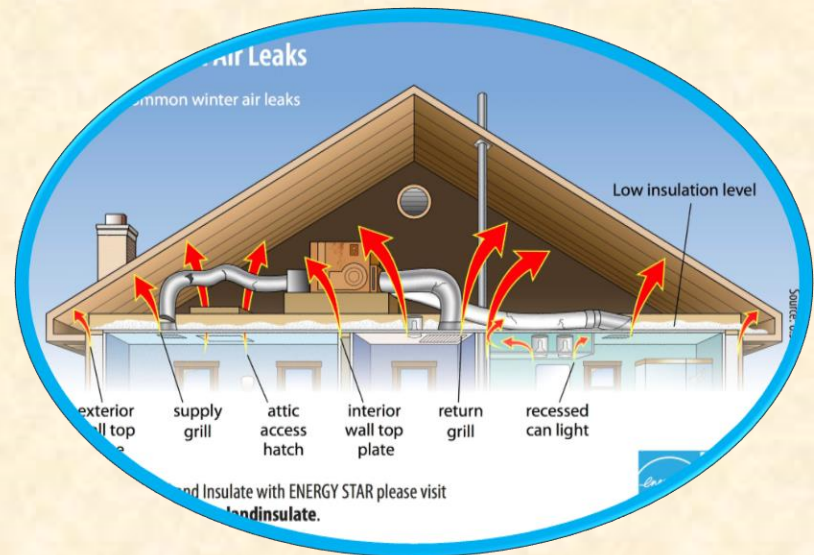
Place heavy-duty plastic sheeting or a vapor retarder over the gravel to inhibit radon and other soil gases from entering the house.



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### Install a vent pipe

Install a vent pipe vertically from the gravel layer through the house's conditioned space and roof. This safely vents radon and other soil gases outside the house.



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### *Sealing and caulking*

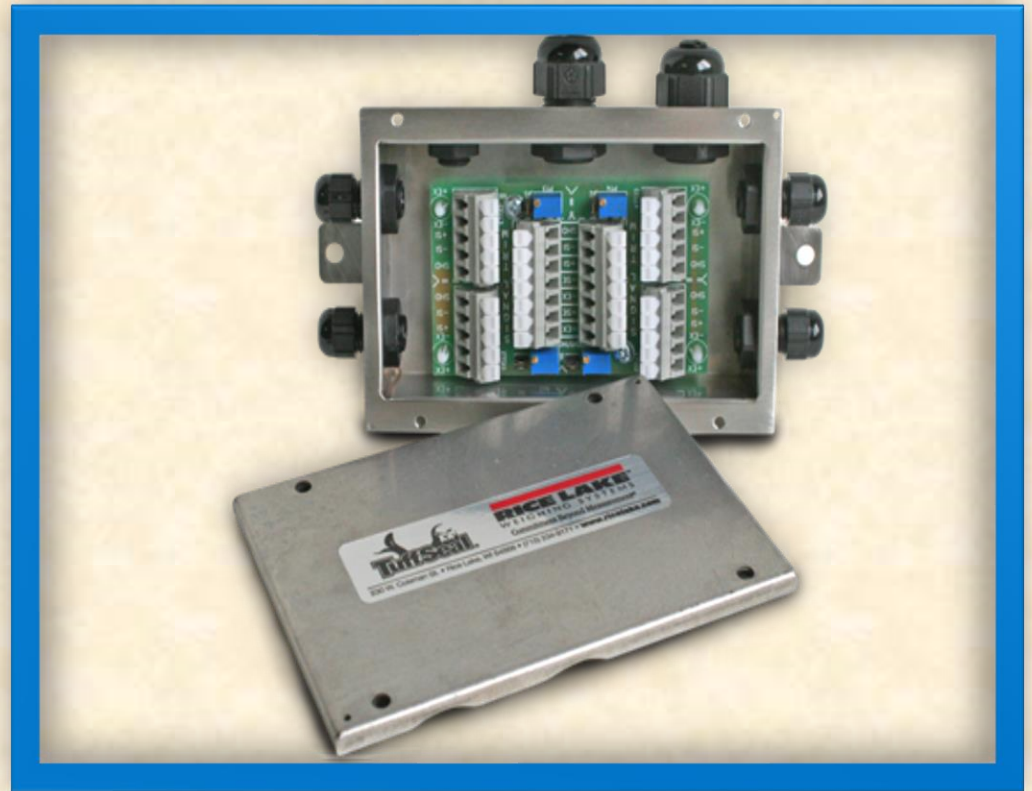
Seal all openings, cracks, and crevices in the concrete foundation and walls with polyurethane caulk to prevent radon and other soil gases from entering the home.



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### Junction boxes

Install an electrical junction box (outlet) in the attic for use with a vent fan, should, after testing for radon, a more robust system be needed.

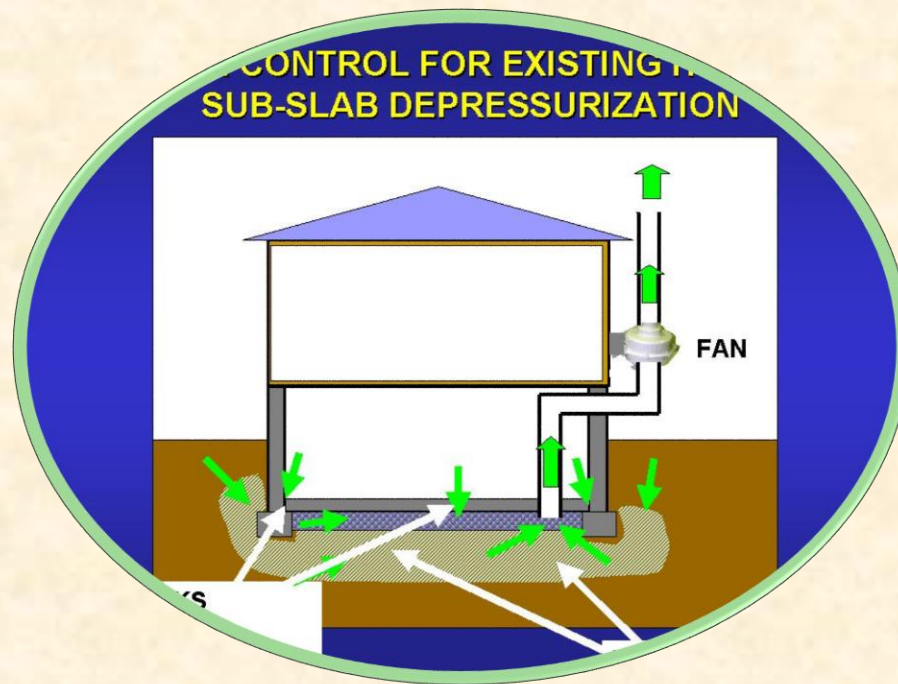




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# Mitigation works

Simple and inexpensive techniques reduce radon levels on average by 50%. The techniques may also lower levels of other soil gases and decrease moisture problems.



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# Save money

- The techniques you have just read about make a home more energy efficient and can provide the home owner an average of \$65 savings per year in your energy costs.
- Upgrading is easy. If high levels of radon are found, a fan can easily be installed as part of the system for further radon reduction.



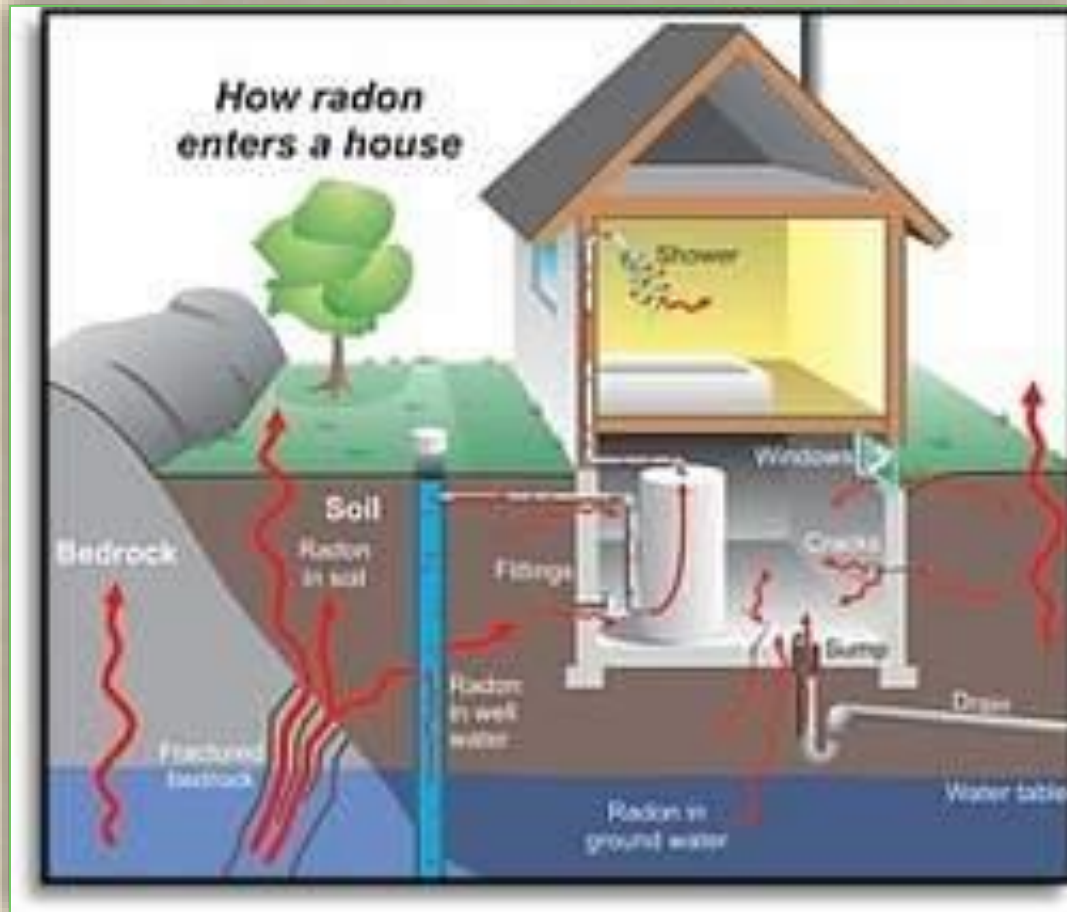
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### Before the inspection

- As a home inspector, you have a responsibility to do a few things before the home inspection. Here is the process:
- Notify the occupants of the importance of proper testing conditions.
- Give the occupants written instructions or a copy of this Guide.
- Explain the directions carefully.

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# Get ready - Inspect!

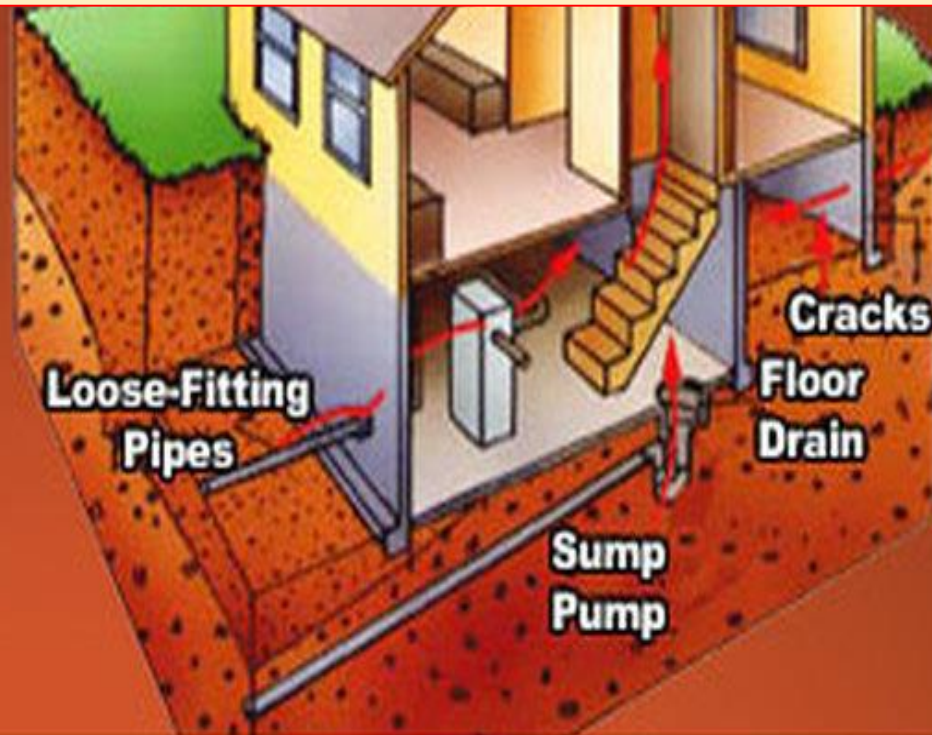


Now, you're ready to inspect a home. The following steps must be used for short, or long-term inspections, and mitigation efforts.

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### Short-term inspections

Conduct the radon test for a minimum of 48 hours, while keeping in mind that some test devices have a minimum exposure time greater than 48 hours.



# Radon Testing

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### Short-term testing protocols

- Two – four days: When doing a short-term test ranging from two to four days, it is important to maintain closed-house conditions for at least 12 hours before the beginning of the test and during the entire test period.
- Four – seven days: When doing a short-term test ranging from four to seven days, the EPA recommends that closed-house conditions be maintained.

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### More on protocols

- The test should include method(s) to prevent or detect interference with testing conditions, or with the testing device itself.
- If the house has an active radon-reduction system, make sure the vent fan is operating properly. If the fan is not operating properly, have it (or ask to have it) repaired and then test it.



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# “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 machines which bring in air from outside.
- Fans that are part of a radon-reduction system or small exhaust fans operating for only short periods of time may run during the test.

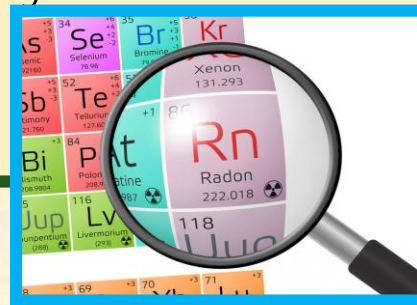




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### During the test

- Maintain closed-house conditions during the entire time of a short-term test, especially for tests shorter than one week.
- Operate the home's heating and cooling systems normally during the test. For tests lasting less than one week, operate only air-conditioning units which re-circulate interior air.
- Do not disturb the test device at any time during the test.
- If a radon-reduction system is in place, make sure the system is working properly and will be in operation during the entire radon test.



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### Short vs. long-term testing

- Long Term Radon Testing is a radon test which is of duration of 91 days or longer. Typical devices for Long Term Radon Test are alpha track and electret ion.
- Short Term Radon Testing is a radon test which is of duration of at least 48 hours but less than 3 months. Typical devices for short term radon tests are continuous radon monitors (CRM), Electret Ion (ES), or alpha track.



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### When people want to self-test

- If a person insists on conducting the test themselves, the best advice one can give is to inform them of their options.
- One should always use a qualified radon measurement device and follow the laboratory's instructions.
- Your state may be able to provide you with a list of do-it-yourself test devices available from qualified laboratories.
- The test should include method(s) to prevent or detect interference with testing conditions, or with the testing device itself.

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# EPA Protocol Guidelines

The EPA lays out its guidelines for protocols on radon testing in this excellent document:

[https://www.epa.gov/sites/production/files/2014-08/documents/homes\\_protocols.pdf](https://www.epa.gov/sites/production/files/2014-08/documents/homes_protocols.pdf)

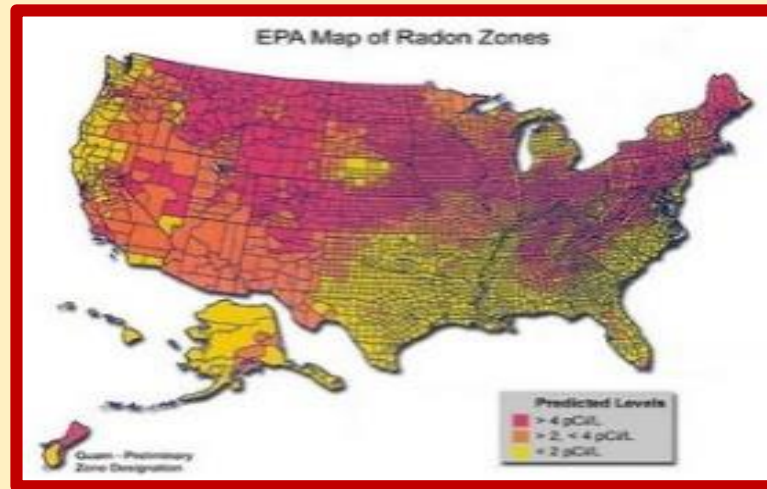


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# Radon hot spots

There are numerous spots across the USA that are designated as “hot spots”, where there is a high concentration of radon. Download a larger version of this map to learn more.

<https://www.epa.gov/sites/production/files/2015-07/documents/zonemapcolor.pdf>



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# A Consumer's Guide to Radon

In 2013, the EPA published a Consumer's Guide to Radon. This would be a great start for a home inspection. It both informs and empowers the client.

[https://www.epa.gov/sites/production/files/2016-02/documents/2013\\_consumers\\_guide\\_to\\_radon\\_reduction.pdf](https://www.epa.gov/sites/production/files/2016-02/documents/2013_consumers_guide_to_radon_reduction.pdf)



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# Radon measurement devices

Radon measurement inspection professionals use specific equipment. The next few slides will describe these in detail.



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# Alpha track detectors

These use a small piece of special plastic or film inside a container to provide an average of radon levels over the full duration of the testing period. The package is opened to start the test and when the test is completed it is sent to the laboratory for analysis. The radon exposure duration can be from 10 days to 12 months. Verify with the manufacturer the suggested duration for each device.





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# Continuous radon monitor

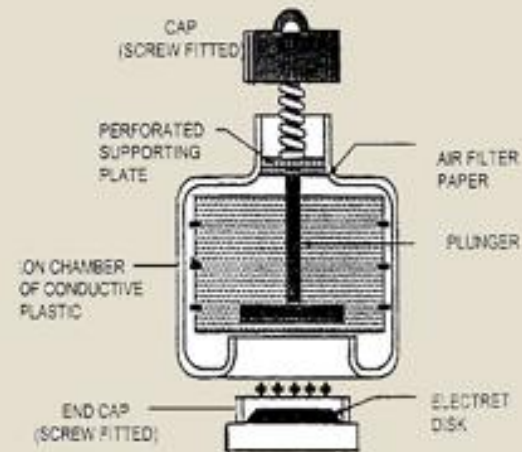
- These record real-time continuous measurements of radon gas over a series of minutes and reports the results, generally in hourly increments.
- These devices will have methods for storing, displaying, and retrieving the data logged by the device and may also have the ability to measure and track additional environmental parameters above and beyond the radon concentration such as temperature, barometric pressure, and relative humidity, and they often have onboard motion sensors.
- They must be annually calibrated by the manufacturer.

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# Electret ion chambers

These consist of a special plastic canister (ion chamber) containing an electrostatically charged disk detector (electret). This type of detector may be deployed for 48 hrs to 12 months.

ELECTRET ION CHAMBER



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# Activated charcoal

These detectors are airtight containers filled with activated charcoal and covered with a screen and filter. The detector is opened in the area to be sampled and exposed to the air for a specified period of time, and at the end of the sampling period, the container is sealed and then sent to a laboratory for analysis. It is important that the kits be mailed back to the lab with the least delay possible. These detectors are normally deployed for measurement periods of 2 to 7 days.



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# Charcoal liquid scintillation

This is a small vial of activated charcoal for sampling the radon. Following exposure, the vial is sealed and returned to a laboratory for analysis. It is important that the kits be mailed back to the lab with the least delay possible. These detectors are also normally deployed for periods of 2 to 7 days.



## Passive devices Charcoal liquid scintillation

### Advantages

- Same as for activated charcoal adsorption canister

### Disadvantages

- Same as for activated charcoal adsorption canister
- **Especially:** device must be analyzed by approved lab soon after test period

Slide 5-11

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# Summary of devices

To summarize this important information, here are the 5 devices used in radon mitigation:



- Alpha track detectors
- Continuous radon monitors
  - Electret ion chambers
  - Activated Charcoal
- Charcoal liquid scintillation



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# Mitigating Radon

*The End of Module 2*