

# Protocols for Radon and Radon Decay Product Measurements in Homes

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*This is an unauthorized condensed version prepared by Radon Removal Inc. Items in brackets [xxx] were added for clarity. Testing contractors should be familiar with the entire EPA document*

## Section 2: Discussion of Guidelines Presented in EPA's "A Citizen's Guide to Radon"

*For all tests*

### 2.2 Measurement Location

Short-term or long-term measurements should be made in the lowest lived-in level of the house.

- Test areas include family rooms, living rooms, dens, playrooms, and bedrooms.
- Measurements should not be made in kitchens, laundry rooms, [mechanical rooms] or bathrooms.
- The measurement should not be made near drafts caused by heating, ventilating and air conditioning vents, doors, fans, and windows [,stairways or heat and draft generating appliances like TVs] . Locations near heat, and areas of high humidity should be avoided.
- Fans should not be operated in the test area. Forced air heating or cooling systems should not have the fan operating continuously [the fan switch on the thermostat should be set to “automatic”] unless it is a permanent setting.
- The measurement location should not be within three feet of the doors and windows. The measurement should not be within one foot of the exterior wall.
- The detector should be at least 20 inches from the floor, and at least four inches from other objects.

Measurements made in closets, cupboards, sumps, crawl spaces, or nooks within the foundation should not be used.

### 2.3 Initial Measurements

#### 2.3.2 Closed – Building Conditions

Short-term measurements lasting between two and 90 days should be made under closed-building conditions. Windows on all levels and external doors should be kept closed (except during normal entry and exit) during the measurement period. High-volume, whole-house and window fans should not be operating. Attic fans intended to control attic temperature or humidity should continue to operate. Combustion or makeup air supplies must not be closed.

Closed-building conditions for 12 hours prior to the initiation of the measurement are required for measurements lasting less than four days.

Normal operation of permanently installed energy recovery ventilators (also known as heat recovery ventilators or air-to-air heat exchangers) may also continue during closed-building conditions. [personal opinion: HRVs *shall* be in their normal operating mode unless a change is requested by the client]

Permanent radon mitigation systems should be functioning during the measurement period.

Short-term tests lasting just two or three days should not be conducted during unusually severe storms or periods of unusually high winds.

### **2.3.3 Interpretation of Initial Measurement Results**

If the initial measurement result is less than 4 pCi/L, follow-up measurements are probably not needed.

If the result of the short-term measurement is equal to or greater than 4 pCi/L, the occupant should conduct a follow-up measurement using a short-term or long-term test.

## **2.4 Follow-Up Measurements**

### **2.4.2 Short-Term and Long-Term Follow-Up Testing**

Follow-up testing should be conducted in the same location as the first measurement.

A follow-up test can be conducted with either a short-term or long-term measurement device. Long-term tests (> 90 days) will produce a reading that is more likely to represent the home's year-round average radon level.

If the long-term follow-up test result is 4 pCi/L or higher, then EPA recommends remedial action. Likewise, if the average of the initial and second short-term results is equal to or greater than 4 pCi/L radon mitigation is recommended.

## **Section 3: Discussion of Guidelines Presented in The Home Buyer's and Seller's Guide to Radon**

### *Tests when buying or selling a home*

#### **3.1 Introduction**

The radon testing guidelines in the Home Buyer's and Seller's Guide to Radon have been developed specifically to deal with the time-sensitive nature of home purchases and sales. These guidelines are somewhat different from the guidelines in other EPA publications.

Three options were determined to be satisfactory and are described here.

Both Options 1 and 2 require the use of two measurements made for similar durations.

#### **3.2 Options for Real Estate Testing**

##### **3.2.1 Option 1: Sequential Testing**

Sequential tests should be conducted under conditions that are as similar as possible, in the same location, and using similar devices and durations. In addition, the results of the first test should not be reported prior to making the second measurement in order to discourage tampering. The results of both measurements should be reported, and the average of the two results should be used to determine the need for mitigation

##### **3.2.2 Option 2: Simultaneous Testing**

This option involves the use of two tests, conducted simultaneously and side-by-side, made for similar durations. The two test results should be averaged to determine the need for remedial action. The collocated devices should be placed four inches apart.

The results of the simultaneous measurements will fall into one of the three categories discussed below.

##### **3.2.2.1 Both Measurement Results Equal To or Greater Than 4 pCi/L**

Mitigation is recommended. The tester should report both measurement results as well as the average of the two results.

##### **3.2.2.2 Both Measurement Results Less Than 4 pCi/L**

Both measurement results and the average result should be reported to the client.

##### **3.2.2.3 One Measurement Result Greater Than 4 pCi/L and One Measurement Result Less Than 4 pCi/L**

If the higher result is twice or more the lower result a retest should be conducted. If the higher result is less than twice the lower result, the results of both measurements and the average of the two results should be reported to the client.

##### **3.2.3 Option 3: Single Test Option**

This option requires a continuous monitor that has the capability to integrate and record a new result at least hourly. The minimum measurement period is 48 hours. The first four hours of data from a continuous monitor may be discarded. There must be at least 44 contiguous hours of usable data.

### 3.3 Measurement Location

EPA recommends that measurements made for a real estate transaction be performed in the lowest level of the home which a buyer could use for living space without renovations. [This has been interpreted as the lowest level with a concrete floor] Measurements should be made in a room that is used regularly, such as a living room, playroom, den, or bedroom. This includes a basement that can be used as a recreation room, bedroom, or playroom. [In an unfinished basement, this includes the part of the basement that could be finished as a rec room, bedroom or playroom, but not the mechanical area.]

### 3.4 Measurement Checklist

#### Before the radon test:

- Notify occupants of the importance of proper testing conditions.
- The test should include method(s) to prevent or detect interference.
- Exhaust fans that typically operate for short periods (e.g., bathroom fan) may be used during the test.

#### During the radon test:

- Maintain closed-building conditions during the entire time of a short-term test.
- Operate the home's heating and cooling systems normally during the test. Only operate air conditioning units that recirculate interior air.
- If a radon reduction system is in place, make sure the system will be in operation during the entire radon test.

### 3.5 Interference-Resistant Testing

#### 3.5.3 Preventing Interference

EPA recommends that a radon measurement conducted for a real estate transaction be performed using tamper-resistant testing techniques. Preventing interference can best be accomplished by:

- Educating the parties about the necessary test conditions.
- An agreement signed by the parties listing the necessary test conditions and their agreement not to interfere with the conditions.
- Informing the client that interference with the test conditions may increase the radon levels.
- Informing the client that the tester is using interference-detecting techniques.

#### 3.5.4 Interference-Resistant Detectors

The following is a partial list of common equipment and measures that can serve to prevent and/or detect test interference.

- Continuous (active) monitors that provide frequent measurements can indicate unusual radon concentration changes.
  - A motion indicator can indicate when the detector was approached or moved.
  - Measurement of CO<sub>2</sub> levels.
  - Frequent temperature readings.
  - Humidity recordings.
  - Placement indicators can indicate if a detector has been tampered with or moved.
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- Seals should be placed on the lowest operable windows and non-primary exterior doors, as well as between the detector and its support. There are seals manufactured specifically for radon testing.