The University of Rhode Island has implemented a comprehensive radon testing program to measure radon levels in its facilities, including residence halls, administrative and academic buildings, and other University-owned buildings.

The University has adopted the EPA recommendation that radon levels in homes should not exceed 4 picoCuries/Liter (pCi/L) and to apply the 4 pCi/L guideline to all spaces regardless whether the use of the spaces was residential or occupational. URI is committed to a program of preventative maintenance of its mitigation systems, to a program of retesting following building renovations that could impact radon levels, and to a program of periodic retesting.

### Radon Testing Program: Frequently Asked Questions

#### What is radon?
Radon is a naturally occurring radioactive gas that comes from the natural breakdown in uranium in soil, rocks and water. Levels of radon are common in the air we breathe every day, and radon sometimes penetrates buildings through their foundations.

#### Why does the University test for radon?
Though radon is common in the everyday living environment, the U.S. Environmental Protection Agency has set guidelines that recommend limiting residential levels to 4 picoCuries per liter (pCi/L) because of health risks associated with long-term exposure to high radon levels. URI will maintain a schedule of radon assessment to ensure that University buildings remain within EPA guidelines. A large number of factors influence indoor radon concentrations:

- The amount of uranium in the geological structures underlying the soil and how close the underlying structures are to the soil surface;
- The concentration of radon in the soil and the permeability of the soil;
- Time of day (radon concentrations often reach a peak in late night because of temperature differences between inside and outside spaces) and the season;
- Weather conditions, such as temperature, wind speed and direction, and humidity;
- Structure and construction of the building (slab construction, presence of crawl spaces);
- Ventilation conditions (areas where doors and windows may not be opened regularly);
- Type, operation, and maintenance of the heating, ventilation, and air-conditioning (HVAC) system.

#### How does the University test for radon?
There are a variety of tests available to measure the level of radon present, and there are advantages and disadvantages to each type of test. One of the most widely used short-term testing methods available is a charcoal liquid scintillation device (LS). LS devices are typically placed for 2-7 days and then collected and analyzed. Charcoal testing is good for quick assessments of the radon present during the time the canisters were present, but it only presents a 'snapshot' of the conditions during those 3-5 days.
If radon levels were higher than usual because of weather conditions or because the building was more tightly closed than usual (closed windows and doors providing less ventilation, for example), then a false positive might be indicated. It is also possible for charcoal testing to indicate measured radon levels that are lower than average. The most reliable testing is long-term testing which involves the use of detectors such as alpha-track detectors. However, these detectors must be present in the space being sampled for 3-6 months. Over 3-6 months, the effects of weather conditions and building ventilation achieve more balance, and a better picture of the occupants’ long-term exposure to radon can be obtained. The Environmental Protection Agency has developed testing protocols that include a combination of short- and long-term testing, and the University’s testing protocol is based on EPA recommendations.

What does a sampling canister look like?
LS devices are small vials made of plastic or glass containing 1 to 3 grams of charcoal. The device is opened in the testing space and closed 2 to 7 days later. The sealed container is promptly sent to a lab, which analyzes the sample and returns a radon concentration reading in pCi/L. The vials are about 2.5" in height.

Do the air sampling vials pose any health risk?
The charcoal which the vials contain is not hazardous, and the charcoal does not re-emit radon after the radon is absorbed on the charcoal.

Where are the sampling vials placed?
When testing is being performed in a building, the vials are placed in rooms, occupied for more than two hours per week, that are in contact with the ground or are directly above closed crawl spaces (typically this will not include stairways, closets, restrooms or equipment rooms).

Why is testing only performed at the lower levels of a building?
EPA studies indicate that radon levels on upper floors are not likely to exceed the levels found in ground-contact rooms. Testing rooms on the ground-contact floor is sufficient to determine if radon is a problem in a building.

Why doesn’t the University test every space that could potentially be occupied?
The risk of adverse long-term effects is proportional to the amount of time spent in an area. This means that, if only a short time is spent in an area in which substantially
If elevated levels of radon are present, one’s risk is essentially not any greater. In designing its protocol for sampling in non-residential spaces such as schools, the EPA recognized that measurement and mitigation resources should be concentrated on areas in which occupancy is at least 2 hours per week or more.

If elevated levels of radon are found in a building, what are the next steps the University takes?
The University’s testing protocol specifies that initial testing will be performed using short-term charcoal canisters. If this initial testing indicates levels of 4 picoCuries per liter (pCi/L) or greater in a location, these follow-up steps are taken:

- If the initial testing indicates the presence of levels of 4 pCi/L or greater in any space, then long-term alpha track detectors will be placed in the same locations for periods of 4 months. If this long-term testing confirms the presence of radon levels greater than 4 pCi/L, plans will be made to mitigate radon levels in the building to 4 pCi/L or less.
- Whenever mitigation is performed, follow-up testing with charcoal canisters will be performed to determine whether the mitigation was successful in reducing levels to 4 pCi/L or less.

If there are elevated radon levels in the room next to my office, does that mean there will be elevated levels in my office?
Not necessarily. Indoor radon levels vary from room to room, depending on the pattern of airflow in the building, the location of features such as crawlspace and foundation cracks, and the depth of soil and rock under different parts of the building. Therefore, it is not possible to make a reliable prediction. The only way to determine radon levels throughout a building is to test in all frequently occupied areas.

If there are elevated radon levels in the building next to mine, does that mean there will be elevated levels in my building?
Not necessarily. Indoor radon levels vary from building to building, so it is not possible to make a reliable prediction. Do not rely on radon test results taken in other buildings nearby to estimate the radon level in your building. The only way to determine radon levels in a given building is to test.

Does the age of my building affect radon levels in the building?
The age of a building does not necessarily affect radon levels in a building. Although an older building is more likely to have crawl spaces exposed to the soil or cracks in the foundation that could allow the infiltration of radon into the building, some old buildings are less air-tight, which could prevent the build-up of radon. Additionally, if the geological make-up of the rock under the building doesn’t contain much uranium, there is no reason to expect elevated radon levels in a building regardless of its age.

I know that the EPA recommends radon levels in residential areas not exceed 4 picoCuries per liter. What is a picoCurie?
The quantity of radioactivity present is expressed in a unit called the Curie. One Curie is equivalent to 37 billion radioactive atoms disintegrating per second. However, the amount of radioactive atoms disintegrating per second as a result of the presence of radon in air is only a very small fraction of a Curie amount. In fact, the most convenient unit to express the amount of radioactivity present in air is the picoCurie unit, which is
1 trillionth of a Curie. For instance, in the average building, typically you’ll find radon levels of 1 picoCuries per liter of air (this is equivalent to 0.037 radioactive atoms disintegrating per second in that liter of air).

**Is exposure to radon more hazardous for smokers?**
Yes, radon exposure amplifies the risks associated with smoking. Many studies, including studies of uranium mine workers who were exposed to higher levels of radon, indicate that a significantly higher percentage of smokers than expected will develop lung cancer when compared to nonsmokers exposed at the same radon level. The following table from the EPA is an updated chart of the lifetime risk of lung cancer death per person from radon exposure in homes (excerpted from the EPA's updated radon risk assessment).

**Lifetime Risk of Lung Cancer Death (per person) from Radon Exposure in Homes (b)**

<table>
<thead>
<tr>
<th>Radon Level pCi/L</th>
<th>Never Smokers</th>
<th>Current Smokers</th>
<th>General Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>36 out of 1000</td>
<td>26 out of 100</td>
<td>11 out of 100</td>
</tr>
<tr>
<td>10</td>
<td>18 out of 1000</td>
<td>15 out of 100</td>
<td>56 out of 1000</td>
</tr>
<tr>
<td>8</td>
<td>15 out of 1000</td>
<td>12 out of 100</td>
<td>45 out of 1000</td>
</tr>
<tr>
<td>5</td>
<td>73 out of 10,000</td>
<td>62 out of 1000</td>
<td>23 out of 1000</td>
</tr>
<tr>
<td>2</td>
<td>37 out of 10,000</td>
<td>32 out of 1000</td>
<td>12 out of 1000</td>
</tr>
<tr>
<td>1.25</td>
<td>23 out of 10,000</td>
<td>20 out of 1000</td>
<td>73 out of 10,000</td>
</tr>
<tr>
<td>0.4</td>
<td>73 out of 100,000</td>
<td>64 out of 10,000</td>
<td>23 out of 10,000</td>
</tr>
</tbody>
</table>

(a) Assumes constant lifetime exposure in homes at these levels.
(b) Estimates are subject to uncertainties as discussed in Chapter VIII of the risk assessment.
(c) Note: BEIR VI did not specify excess relative risks for current smokers.

**What resources are available for additional information?**

- [A Citizen's Guide to Radon (EPA)](https://www.epa.gov/)

**If my question is not answered here, who can I contact at the University?**

For questions about the results of radon testing and the mechanics of the testing program, contact the Environmental Health & Safety Department.