



LBL ESD RADON TESTING PLAN

Linn Benton Lincoln Education Service District has developed a radon testing plan in compliance with ORS 332.166-167 and House Bill (HB) 2931. The 2015 Legislature passed HB 2931 so that elevated radon levels in Oregon schools would be known.

House Bill 2931 later became Oregon Revised Statute (ORS) 332.166-167. As directed by this statute, all school districts in Oregon must develop a plan to accurately measure school buildings for elevated radon levels. Under the statute, school districts must submit a plan to Oregon Health Authority (OHA) by September 1, 2016. Per ORS 332.166-167, actual testing of schools must be done on or before January 1, 2021 and the testing results sent to OHA and posted on the school or school district's website.

This plan document will outline the protocols LBL will follow that are necessary for compliance. OHA has developed recommendations for testing for elevated radon in Oregon Schools. This 59 page plan can be located at the following link on the Oregon Health Authority's website:

<http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/RadonGas/Pages/Testing-in-Schools-.aspx>

LBL will specifically refer to Appendices A and D in their testing plan. Appendix A is a radon test placement protocol checklist. Appendix D is a step by step guide for planning radon testing in Oregon Schools. Per ORS 332.166-167, School Radon Measurement Teams (i.e. personnel appointed to measure a school site for elevated radon) must, at a minimum, conduct initial measurements in all frequently occupied rooms in contact with the soil or located above a basement or a crawlspace. Testing will occur in all frequently occupied spaces simultaneously per LBL site. Examples include: offices, classrooms, conference rooms, gyms, auditoriums, cafeterias & break rooms. A minimum of one detector for every 2000 sq. ft. of open floor space or portion will be used. United States Environmental Protection Agency (USEPA) 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 or above unoccupied basements or crawlspaces is sufficient to determine if radon is a problem in an office and school setting. Areas such as restrooms, hallways, stairwells, elevator shafts, utility closets, kitchens storage closets will not be tested.

At this time LBL has identified 53 test locations at the LBL main building and 25 test locations at the Farm Home School. LBL will order short term test kits in bulk to complete this project.

For initial and follow-up testing, as needed, LBL will use passive test devices. Active devices (electrically powered, continuous radon monitors) may be used in follow-up testing of locations, if needed, where it is important to determine that radon levels vary according to the time of day.

Because testing under closed conditions is important to obtain meaningful results from short-term tests, LBL will schedule testing during the coldest months of the year. “Closed building conditions” are defined as 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. Testing will occur between October and March in any given school year. Short-term testing will be used with passive test kits in these “closed building conditions”. Test Kits will be placed during weekdays with HVAC (heating, ventilation, air conditioning) systems operating as they do normally.

A Test Kit Placement Log and a Test Kit Location Floor Plan will be prepared for the LBL Main Building and the Farm Home School. Test kit placement will be determined by a building walk through in conjunction with the use of the emergency/fire escape plan templates for each building. Test kit location will be accurately recorded on both a Log and Floor Plan for each site. LBL will use the following is a detailed protocol instruction checklist:

Plan Steps

1. Test kits or testing services will meet the current requirements of the national certifying organizations, National Radon Proficiency Program (NRPP, www.nrpp.info) or the National Radon Safety Board (NRSB, www.nrsb.org). Testing will be done following the directions on the test kits.
2. In accordance with ORS 332.166-167, the radon measurement team will, at a minimum, conduct initial measurements in all frequently occupied rooms in contact with the soil or located above a basement or a crawlspace. Room examples include offices, classrooms, conference rooms, gyms, auditoriums, cafeterias and break rooms.
3. The number of test kits used to measure radon (detectors) will be determined by counting the number of appropriate rooms. One detector kit is used for each room that is 2000 square feet or less. Additional test kits are needed for larger rooms. Added to this number will be the test kits needed for Quality Assurance purposes.
4. Test kits will be placed in all rooms in contact with the soil or located above a basement or crawlspace that are frequently occupied by students and school staff.
5. Testing will occur during the time that students and teachers are normally present (during weekdays).
6. In addition to placing detectors, additional test kits will be provided to serve as quality assurance measures (duplicate, blank, and spike measurements). Quality Assurance procedures will be conducted as described in OHA’s [Testing for Elevated Radon in Oregon Schools](#). (A link to this document was already provided on page 1).
7. All test kits placed in the school site (detectors, duplicates, and blanks) will be noted on the Device Placement Log and Floor Plan by their serial number.
8. Test kits will be placed:
 - a. Where they are least likely to be disturbed or covered up.
 - b. At least three feet from doors, windows to outside or ventilation ducts.
 - c. At least one foot from exterior walls.
 - d. At least 20 inches to six feet from floor.

- e. About every 2,000 square feet for large spaces (e.g., a 3500 square foot gymnasium would require two test kits)

Along with the five-item placement protocol above, Radon Measurement Teams may simply place the test kit on desks or up on a bookshelf, out of the way of students. To prevent tampering, kits may be suspended from a wall or ceiling (using string and thumb-tack/tape). If they are suspended, they will be placed 20 inches to 6 feet above the floor, at least 1 foot below the ceiling.

9. Test kits will **NOT** be placed:

- a. Near drafts resulting from heating, ventilating vents, air conditioning vents, fans, doors, and windows or in direct sunlight.
- b. In areas of high humidity such as bathrooms, kitchens, laundry rooms, etc.
- c. Where they may be disturbed at any time during the test

10. Testing with short-term test kits will be used under closed conditions (closed windows/doors except for normal exit/entry).

11. Closed conditions:

- a. Short-term tests should be made under closed conditions in order to obtain more representative and reproducible results. Open windows and doors permit the movement of outdoor air into a room. When closed conditions in a room are not maintained during testing, the subsequent dilution of radon gas by outdoor air may produce a measurement result that falls below the actionable level in a room that actually has a potential for an elevated radon level. LBL shall test for radon during periods when the HVAC system is operating as it does normally.
- b. All external doors should be closed except for normal use – structural and weatherization defects need to be repaired prior to testing.
- c. Closed conditions will be verified when placing and retrieving test kits.

12. Short-term test kits will be placed during colder months (October through March).

- a. Colder months: Because testing under closed conditions is important to obtain meaningful results from short-term tests, LBL staff will schedule testing during the coldest months of the year. During these months, windows and exterior doors are more likely to be closed. In addition, the heating system is more likely to be operating. This usually results in the reduced intake of outside air. Moreover, studies of seasonal variations of radon measurements in schools found that short-term measurements may more likely reflect the average radon level in a room for the school year when taken during the winter heating season.
- b. LBL staff will check and document local weather forecasts prior to placing test kits. Staff will not conduct short-term measurements (2-5 days) during severe storms or period of high winds. The definition of severe storm by the National Weather Service is one that generates winds of 58 mph and/or $\frac{3}{4}$ inch diameter hail and may produce tornadoes.

13. Test Kits will be placed during weekdays with HVAC (heating, ventilation, air conditioning) systems operating as they do normally.

Suggested timeline:

Monday morning – Place kits (detectors/duplicates/blanks) per Test Kit Placement Log created for school. Record data, as needed, on Log.

Thursday morning – Pick up kits, record as needed, ship with (previously requested & received) spiked test kits to Radon Measurement Laboratory.

- a. Air conditioning systems that recycle interior air may be operated.
- b. Window air conditioning units may be operated in a re-circulating mode, but must be greater than 20 feet from the test kit.
- c. Ceiling fans, portable humidifiers, dehumidifiers and air filters will be more than 20 feet from the test kit.
- d. Portable window fans will be removed or sealed in place.
- e. Fireplaces or combustion appliances (except for water heaters/cooking appliances) will not be used unless they are the primary source of heat for the building.
- f. If radon mitigation systems are in place in that building, they will still be functioning.

14. LBL will not conduct initial measurements under the following conditions:

- a. During abnormal weather or barometric conditions (e.g., storms and high winds). If major weather or barometric changes are expected, it is recommended that the 2 to 5-day testing be postponed. USEPA studies show that barometric changes affect indoor radon concentrations. For example, radon concentrations can increase with a sudden drop in barometric pressure associated with storms.
- b. During structural changes to a school building and/or the renovation of the building's envelope or replacement of the HVAC system

15. After receiving the results of the initial testing, the LBL Radon Measurement Team will follow the "Interpreting initial results" section of the OHA document *Testing for Elevated Radon in Oregon Schools*.

Follow-up Measurements

Follow-up testing (in rooms with initial short-term measurement of 4.0 pCi/L or higher) will start within one month after receiving the initial test results. Follow-up testing will be conducted in the same location in a room. When conducting follow-up testing using short-term methods will be done in the same conditions as the initial measurement. Follow-up testing using passive short-term test kits will follow the same Quality Assurance procedures and requirements (i.e. percentages of duplicates/blanks/spikes), including quality assurance calculations. LBL staff will follow directions under Radon Test Placement Strategy and Protocol Checklist and Test Kit Placement again.

Report of Results & Distribution

ORS 332.166-167 requires that school districts make all test results available: to the district's school

board; the Oregon Health Authority (to post on its website), and readily available to parents, guardians, students, school employees, school volunteers, administrators and community representatives at the school office, district office or on a website for the school or school district.

US EPA, OHA Oregon Radon Awareness Program, and numerous non-governmental groups recommend that the school district take action to reduce the radon level in those rooms where the average of the initial and follow-up short-term kit results OR the result of the long-term kit used in follow-up is 4.0 pCi/L or more.

Initial testing will be conducted in accordance with ORS 332.166-167 before January 1, 2021. Because buildings age and ground beneath them settles, radon entry may increase due to cracks in the foundation. For that reason, ORS 332.166-167 requires that schools be tested once every 10 years regardless of initial testing results or whether mitigation was done. LBL will test for radon every 10 years in compliance with ORS 332.166-167.

LBL will consider and take action if the following suggested times, for retesting occur in addition to the timeline required under ORS 332.166-167, as follows:

1. If radon mitigation measures have been implemented in an LBL building or school, LBL will retest these systems as a periodic check to ensure that the radon mitigation measures are working. EPA does not provide a specific interval, but OHA recommends that schools with radon mitigation measures retest every 5 years and LBL will follow this recommendation.
2. LBL will retest after any major renovations to the structure of a LBL building or after major alterations to an LBL HVAC system. These renovations and alterations may increase radon levels within a building or school building.
3. If major renovations to the structure of an LBL building or school building or major alterations to the building's HVAC system are planned, retesting will take place before initiating the renovation. If elevated radon is present, radon-resistant techniques will be included as part of the renovation.

Glossary

Radon - A gaseous radioactive decay product of radium.

Blanks - Measurements made by analyzing unexposed (closed) detectors that accompanied exposed detectors to the field. The School District use of blanks is to assess any change in analysis result caused by exposure other than in the environment to be measured. Background levels may be due to leakage of radon into the detector, detector response to gamma radiation, or other causes.

Closed-Building Conditions - Means 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.

Duplicates - Duplicate measurements provide a check on the precision of the measurement result and allow the user to make an estimate of the relative precision. Large precision errors may be caused by detector manufacture or improper data transcription or handling by suppliers, laboratories, or technicians performing placements. Precision error can be an important component of the overall error. The precision of duplicate measurements are monitored and recorded as quality records.

Spikes – Measurements used to assess the accuracy of a lab analysis and/or how accurately detectors supplied by a laboratory (i.e. test kit manufacturer) measure radon. “Spikes” are test kits that have been exposed to a known concentration of radon in a chamber approved by the National Radon Proficiency Program (NRPP) or National Radon Safety Board (NRSB). The process for completing this aspect of a radon measurement effort’s Quality Assurance/Quality Control plan is laid out in the Radon Test Placement Strategy and Protocol Checklist below.

This plan is a living document and may be added to as LBL Facilities staff members continue to learn about radon testing procedures and protocols. If LBL determines that radon testing should be completed by an outside source a company that complies with the Oregon Health Authority recommended procedures and protocols will be utilized.