



## Radon Testing in Schools Protocol

### Type of Detector

Use alpha track or long-term e-perm detectors from an established manufacturer.

### Time and Duration

The monitors should be placed in the schools for one half of the school year (either September - January or February - June). If the monitors are placed for one year they are more likely to be lost, especially if teachers shift rooms. The summer time should not be monitored as students are not present and the HVAC system may be shut down, leading to non-representative radon results.

### Monitors per School

A minimum of two (2) monitors should be placed in each utilized school building with the exception of portable classrooms, which require only one (1) monitor. Portable classrooms, like trailers, have little ground contact and normally have low radon concentrations. Add an additional monitor for each 10 rooms in the school. Add an additional monitor for each floor occupied. E.g. 13 rooms 1 story equals  $2 + 2 = 4$  monitors. Every tenth (10th) monitor should be a duplicate test.

### Location of Monitors

The monitor placement location is depended on the age of the children in the school. In the first school district we surveyed for radon, we recovered 96% of the monitors in the elementary-primary grades but only 50% in the junior and senior secondary grades. Therefore, more secure locations in high schools need to be used in order to achieve a high recovery rate of the monitors. Never use a room that is not supervised by a teacher. Administrative offices, libraries and science preparation areas are good monitor locations if they have the same air flow pattern as the other classrooms. Locate one monitor in the most likely radon prone occupied area of the school. Try to cover all wings in the school in the assessment.

The monitors should be placed at breathing height for a seated student and away from strong air flow. Do not place monitors in closets or other closed locations.

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## Follow-up Survey

If the long-term radon test results give an average that exceeds 200 Bq/m<sup>3</sup> do a follow-up survey with a short-term recording monitor for a minimum of two weeks. Determine the radon average concentration during occupied school hours and compared that result to radon average concentration for that test period, to give you the occupancy ratio value. Then multiply the long-term radon monitor average result by the occupancy ratio value, to get a long-term radon average concentration that is applicable during school hours.

Example:

- Long-term test average result = 300 Bq/m<sup>3</sup>
- short-term average radon concentration = 100 Bq/m<sup>3</sup>
- short-term average radon concentration during school hours = 50 Bq/m<sup>3</sup>
- therefore, occupancy ratio value = 0.5
- multiply the long-term average 300 Bq/m<sup>3</sup> by the ratio (0.5) = 150 Bq/m<sup>3</sup>
- the long-term average radon concentration during school time hours is, therefore, 150 Bq/m<sup>3</sup>
- the average long-term school time radon concentration during school hours is below 200 Bq/m<sup>3</sup> and, therefore, no radon mitigation is necessary

## Mitigation Solutions and Costs

Small schools are more prone to radon problems than large schools. Often, only one area of the school has a radon problem while the other parts have acceptable radon concentrations. Mitigation solutions for smaller schools are the same as for detached homes. The *EPA - Radon Reduction for Existing Detached Homes Technical Guides* are good sources of information for mitigation techniques and advice. Sub-slab depressurization, crawl space depressurization and sub-slab membrane depressurization for bare soil crawl spaces are common techniques. Often this mitigation work can be preformed by school district maintenance staff. Follow-up radon measurements are necessary after completion of mitigation.

Larger schools may involve more complex solutions. Solutions generally involve the HVAC system. Often engineering solutions are necessary. *EPA - Radon Prevention in the Design and Construction of Schools and Other Large Buildings* provide some good advice.

Costs for small schools can range from \$1,000 to \$40,000. Costs in larger schools can run from \$5,000 to \$150,000.