Guidance for Radon Testing in Minnesota Schools

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Radon Testing Plan

According to Minnesota Statute 123B.571, school districts that receive authority to use long-term facilities maintenance revenue to conduct radon testing must conduct the testing according to this 'Radon Testing Plan.'

- If short term testing is chosen, conduct testing on school days only (not holidays, vacations or weekends), between Nov. 1 and March 31
- If long term testing is chosen, conduct testing in a manner where at least half the test duration includes days between Nov. 1 and March 31
- Use certified radon testing devices, as listed by either the:
    - National Radon Proficiency Program (NRPP): http://aarst-nrpp.com/wp/certification/approved-devices/l,or
    - National Radon Safety Board (NRSB): http://www.nrsb.org/devices.asp
- Test all frequently-occupied rooms, including rooms with ground contact and rooms immediately above unoccupied spaces that are in contact with the ground, such as crawl spaces and tunnels.
- Conduct follow-up testing in all frequently-occupied rooms that have radon ≥ 4 pCi/L
- Mitigate or take corrective measures in frequently-occupied rooms that have radon ≥ 4 pCi/L following ANSI/AARST 'Radon Mitigation Standards for Schools and Large Buildings' (ANSI/AARST RMS-LB)
- Re-test after corrective measures to show radon reduction
- Report all radon test results to MDH on the 'School Radon Testing Form' at the conclusion of the testing project (after all follow-up testing and any corrective measures have been shown to reduce radon levels).
- Report radon test results at a school board meeting.

1. Introduction

While radon testing is not required in Minnesota schools, it is highly recommended. Beginning January 1, 2019, radon measurement professionals will be required to be licensed through the Minnesota Department of Health (MDH). This includes consultants hired by schools to conduct radon testing. Licensed radon measurement professionals will be required to follow the national radon measurement standard for schools and large buildings: ANSI/AARST 'Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings' (ANSI/AARST MALB). This standard is considered the current best practice for radon measurement in Minnesota schools.

School staff who wish to test for radon on their own can do so without obtaining a radon measurement license through MDH. However, school staff should consider becoming licensed. If a school district receives authority to use long-term facilities maintenance revenue to conduct radon testing, the district must conduct the testing according to the state's 'Radon Testing Plan.' The ANSI/AARST standard referenced above is an additional guidance resource for schools and should be followed to ensure the most accurate and complete radon test results.

Initial radon tests shall be made in all frequently-occupied ground contact rooms and immediately above unoccupied spaces that are in contact with the ground, such as crawl spaces and tunnels. For short term tests, initial testing must be conducted during the coldest months (November through March), and for long term tests at least half the duration must be during this time period. Testing should be done when the ventilation system is operating normally, and windows and doors are closed (except for normal entry and exit). The use of approved and certified testing devices is also required.

MDH recommends all initial radon measurements conducted in schools should be made with a short-term radon measurement device. If short-term testing is chosen, testing must be conducted when school is in session from Monday to Thursday or Friday. Initial short term testing must not be conducted during the weekend or breaks in the school year.

Test kits should be shipped to the laboratory overnight on the same day as they are retrieved. The laboratory should analyze the test kits on the same day they are received. Quality assurance and quality control devices such as duplicates and blanks should accompany all testing to provide assurance of the quality of the measurements.

A single test result should not be the basis for determining if action needs to be taken to reduce radon levels. If the initial testing results indicate the radon level in a room is 4 picocuries per liter (pCi/L) or greater, follow-up testing must be completed. A continuous radon monitor (CRM) is recommended because it can determine if elevated levels are present during occupied times (radon levels can fluctuate with the operation of ventilation). MDH has a limited number of CRMs available for loan to schools to conduct these follow-up measurements. They're also available through consultants and for rental through radon vendors.

Rooms with elevated radon during occupied times must be mitigated following ANSI/AARST 'Radon Mitigation Standards for Schools and Large Buildings' (ANSI/AARST RMS-LB). Radon can usually be reduced (mitigated) by adjusting the existing HVAC system (e.g., increasing fresh air

ventilation rate and/or balancing air flow to rooms) or by installing an active soil depressurization system. Testing must be done after mitigation, to verify reduction.

Test results must be reported to Minnesota Department of Health and at a school board meeting. Results should also be made available to other interested parties. The building should be re-tested after any renovations to the building or HVAC system, and also be tested periodically, such as every 5 years.

2. Radon Background

2.1 Radon Basics

Radon is a naturally-occurring radioactive gas. It comes from the natural breakdown (decay) of uranium, which is found in soil and rock all over the United States. Radon travels through soil and enters buildings through cracks and other holes in the foundation. Eventually, it decays into radioactive particles (decay products) that can become trapped in your lungs when you breathe. As these particles in turn decay, they release small bursts of radiation. This radiation can damage lung tissue and lead to an increased risk of lung cancer over the course of a person's lifetime. EPA studies have found that radon concentrations in outdoor air average are about 0.4 pCi/L. However, radon and its decay products can accumulate too much higher concentrations inside buildings.

Radon is colorless, odorless, and tasteless. Testing is the only way to know whether or not an elevated level of radon is present. Each frequently-occupied room that is in contact with the ground must be tested because adjacent rooms can have significantly different levels of radon.

2.2 Health Effects

Radon is a known human carcinogen. Prolonged exposure to elevated radon concentrations causes an increased risk of lung cancer. The EPA estimates that each year 21,000 people die of lung cancer as a result of being exposed to radon. The U. S. Surgeon General has warned that radon is the second leading cause of lung cancer deaths. Only smoking causes more lung cancer deaths. Not everyone that breathes radon decay products will develop lung cancer. An individual's risk of getting lung cancer from radon depends mostly on three factors: the level of radon, the duration of exposure, and other cancer risk factors. Risk increases as an individual is exposed to higher levels of radon over a long period of time. Smoking combined with radon is an especially serious health risk. Children have been reported to have greater risk than adults for certain types of cancer from radiation, but there is no scientific consensus currently on whether children are at greater risk than adults from radon exposure.

2.3 Radon Exposure

The home is likely to be the most significant source of radon exposure because people typically spend most of their time at home and radon concentrations are usually higher in homes. In Minnesota, more than 2 in 5 homes have radon levels above 4 pCi/L. Parents and staff are encouraged to test their homes for radon and to take action to reduce elevated radon

concentrations. Inexpensive radon test devices are available from many local health departments or online. Upon request, MDH can provide radon test result data for specific communities (by zip code), which may help provide context and encourage people to also test their homes.

Test all frequently-occupied rooms, including rooms with ground contact and rooms immediately above unoccupied spaces that are in contact with the ground, such as crawl spaces and tunnels. A frequently occupied room is one that has student or staff occupancy at any time of the day. Unoccupied rooms that could become occupied in the future shall also be tested.

For most school children and staff, their school is the second largest contributor to their radon exposure. MDH has been analyzing radon data reported by schools since 2012. In August 2018, a review of the data from 649 buildings found that 80 buildings (12%) had one or more room above 4.0 pCi/L. Of the 14,056 rooms tested, there were 217 rooms (1.5%) that had elevated radon.

MDH and EPA recommend reducing the concentration of radon in the air of a building to below the action level of 4.0 pCi/L to reduce the risk of lung cancer.. Depending on building characteristics, in many buildings radon levels can be reduced to below 4.0 pCi/L by increasing or balancing the amount of air flow to rooms. In other buildings, reducing radon levels to below 4.0 pCi/L may be more difficult, and other mitigation approaches may be needed, such as active soil depressurization.

2.4 Radon Entry

Many factors contribute to the entry of radon gas. Buildings in nearby areas can have significantly different radon levels from one another. As a result, it isn't possible to know the levels of radon without testing. The following factors determine why some buildings have elevated radon levels:

- the type, operation and maintenance of the HVAC system;
- the concentration of radon in the soil gas (source strength) and permeability of the soil (gas mobility) under the building; and
- the structure and construction characteristics of the building.

Many schools and commercial buildings are constructed on concrete slabs that permit radon gas to enter through cracks and expansion joints between the slab and the ground soil. Other features, such as the presence of basement areas, crawl spaces, utility tunnels, sub-slab HVAC ducts, cracks, or other penetrations in the slab (e.g., around pipes) also provide areas for radon to enter indoor spaces.

Depending on their design and operation, HVAC systems can influence radon levels in a building by:

- increasing ventilation (diluting indoor radon concentrations with outdoor air)
- decreasing ventilation (allowing radon gas to build up)
- pressurizing a building (keeping radon out)
- depressurizing a building (drawing radon inside)

The frequency and thoroughness of HVAC maintenance can also play an important role. For example, if air intake filters are not periodically cleaned or changed or outdoor intake dampers are closed, the amount of outdoor air ventilating the indoor environment can be significantly less than design specifications. Less ventilation allows for radon to accumulate indoors. In addition, if ventilation systems are imbalanced and certain rooms are provided less air, then these rooms may have higher radon concentrations.

2.5 School Radon Testing Law

A Minnesota school radon testing law (123B.571) was codified during the 2012 session. The statute states:

> **123B.571 RADON TESTING.**
>
> **Subdivision 1. Voluntary plan.** The commissioners of health and education may jointly develop a plan to encourage school districts to accurately and efficiently test for the presence of radon in public school buildings serving students in kindergarten through grade 12. To the extent possible, the commissioners shall base the plan on the standards established by the United States Environmental Protection Agency.
>
> **Subd. 2. Radon testing.** A school district may include radon testing as a part of its ten-year facility plan under section 123B.595, subdivision 4. If a school district receives authority to use long-term facilities maintenance revenue to conduct radon testing, the district shall conduct the testing according to the radon testing plan developed by the commissioners of health and education.
>
> **Subd. 3. Reporting.** A school district that has tested its school buildings for the presence of radon shall report the results of its tests to the Department of Health in a form and manner prescribed by the commissioner of health. A school district that has tested for the presence of radon shall also report the results of its testing at a school board meeting.

The 'Radon Testing Plan' can be found in the preface of this guidance document. The department updated the reporting form in 2018, which is available at the MDH school radon website. For further information, contact the MDH Indoor Air Unit.

3. Radon Testing

3.1 Devices

There are two general ways to test for radon: short-term or long-term measurements. Use certified radon testing devices. They are approved and listed by two national industry organizations.

- National Radon Proficiency Program (NRPP):
- http://aarst-nrpp.com/wp/certification/approved-devices/
- National Radon Safety Board (NRSB): http://www.nrsb.org/devices.asp

3.1.1 Short-term Test

The short-term test is the quickest and least expensive means to test for radon. In this test, devices are placed in rooms for 2 to 4 days. At the end of the deployment timeframe, the devices are gathered and sent immediately to the analysis lab. Short-term measurements are usually made with activated charcoal devices, which cost $5-$10 per test kit. Public schools may qualify to purchase short-term test kits at a slightly cheaper rate through the State's Master contract vendor.[1] Short-term testing can also be done using a continuous radon monitor (CRM), which is discussed under Section 3.2.4.

Short-term measurements have advantages and disadvantages. Short-term tests are less costly. A short-term test provides results more quickly, allowing for possible follow-up testing and mitigation sooner. Test kits may be less likely to disappear. In addition, short-term testing, when done on school days (between Monday and Friday), results in a smaller portion of the test period during unoccupied times (no weekends or holidays). On the other hand, a short-term test may be inaccurate due to the short-time frame, if doors or windows are opened, if severe weather is experienced, or if the ventilation operates in an unusual manner during the test period. If severe weather or high winds are expected during the test period, the test start should be delayed until a week where severe weather is not forecasted. To improve accuracy, short-term testing must be done during a school week (e.g., Monday to Thursday or Friday) between November and March. In addition, the HVAC system needs to be operating under typical occupied conditions, exterior doors and windows should be closed and the weather conditions should be normal.

[1] The State Master Contract can be found on the Minnesota Department of Administration site Schools can see if they're on the current CPV Member List. If they're not CPV members, they can apply. The state contracts are listed on the site. Further questions can be directed to MDA State Procurement or the MDH Indoor Air Unit (health.indoorair@state.mn.us).

3.1.2 Long-term Test

A long-term test remains in place for more than 90 days. Long-term measurements are usually made with alpha track devices, which cost $15-$30 per test kit.

Long-term measurements have advantages and disadvantages. A long-term test is not affected as much as short term testing by severe weather, short periods where doors and windows are opened or fluctuation in ventilation operations. In addition, test kits can be deployed at a more leisurely pace on a day the building is closed, for example over a weekend, without interrupting activities (such as classes). On the other hand, long-term testing includes weekends and holidays, and if ventilation differs at these times, results can be skewed. In addition, long term test kits are more likely to disappear and they are more costly. Lastly, obtaining results and completing follow-up remedies will take longer. Test kits need to be deployed for at least three months. Once test results are obtained, it may be past March. As such, follow-up testing in elevated rooms would be conducted twice: in the spring and possibly again during the next heating season (November – March).

Advantages of Short-term vs. Long-term Testing

Short-term Testing (Mon – Thurs/Fri)	Long-Term Testing (3 months)
▪ Recommended by MDH for initial round of testing ▪ Provides results more quickly ▪ Less expensive ▪ Fewer test kits disappear or tampered ▪ Smaller portion of test period during unoccupied times (no weekends, school breaks) ▪ Can respond to very high levels sooner	▪ Averages weekly and monthly fluctuations ▪ Occasional opening of doors or windows not a problem ▪ Not affected as much by weather events ▪ Not affected as much by fluctuation of mechanical ventilation (e.g., dampers closed when very cold) ▪ Can be deployed and retrieved over the weekend (short-term tests should be deployed and retrieved on weekdays)

While schools can employ either testing strategy, MDH recommends short-term testing in Minnesota schools. The advantages of short term testing usually outweigh the advantages of long term testing.

3.2 Measurement Strategy

3.2.1 Planning and Communication

Guidance regarding planning and communicating radon measurements in schools can be found in the ANSI/AARST 'Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings' (ANSI/AARST MALB). Schools can contact MDH Indoor Air Unit for instructions on how to view or obtain a copy of the current standard or the

standard can be purchased from the ANSI/AARST website.[2] See Appendix A for Model Radon Summary Policy language for schools.

3.2.3 Initial Measurements

Conduct initial measurements in all rooms in contact with the ground or located above unoccupied rooms in ground contact (e.g., rooms above basements, crawlspaces, or utility tunnels). All rooms within the same facility or building should be tested simultaneously with short-term radon devices. All of the appropriate quality assurance and quality control (QAQC) devices should be included. Guidance on the QAQC measurements is discussed in the standard referenced above. A licensed radon measurement professional must have a QA Plan and follow these QAQC procedures. Once the testing duration is complete, retrieve all test kits on the same day and send to the laboratory. Test kits should be boxed together and shipped overnight to the laboratory. Schools should keep a copy of the radon test kit tracking log for future reference.

3.2.4 Follow-up Measurements

MDH and EPA do not recommend using a single test as the basis for determining whether or not action needs to be taken to reduce radon levels. Follow-up measurements must be made, preferably with a continuous radon monitor (CRM), in every room ≥ 4.0 pCi/L. In MDH's experience, follow-up testing is usually needed in a few rooms, which makes use of a CRM practical.

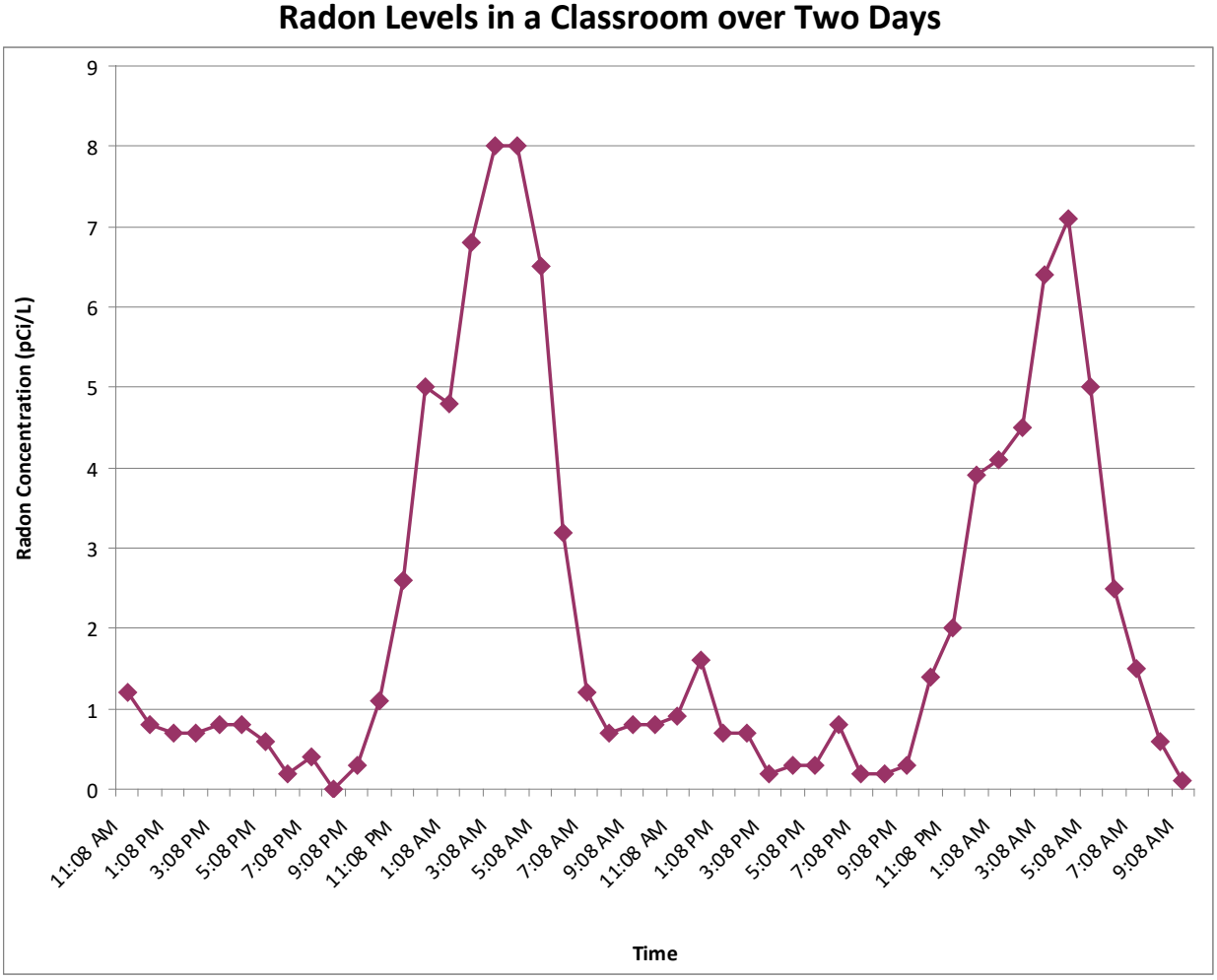
A CRM can provide hourly radon readings. This testing can evaluate whether elevated levels are present during occupied periods or unoccupied periods (i.e., over-night, weekends, and holidays). Since HVAC systems typically operate at a higher rate during occupied periods, it is possible that average concentrations are below the action level during occupied periods. CRM testing should be done as a follow-up in rooms that were elevated according to initial measurements. MDH has CRMs that schools can borrow, at no cost, depending on availability. A CRM can also be rented from manufacturers or laboratories for about $100-$200 per month. Many licensed radon professionals also have CRMs that they can deploy.

Radon levels in a classroom may fluctuate over the course of each day, due to the operation of the HVAC system and other factors. This has been observed by MDH in many classrooms that had an average of 4 pCi/L or greater over several months. The graph below illustrates this daily cyclical trend and data in one Minnesota school classroom.

Follow-up testing should be done quickly, starting within one month of receiving initial test results. Follow-up measurements should be made in the same locations and under conditions similar to the initial measurements. This will ensure that the two results are as comparable as possible. As with all short-term testing, the CRM testing should be done in the winter when the HVAC system is running under normal operating conditions with all exterior door and windows closed (except normal entry and exit).

[2] https://aarst-nrpp.com/wp/store/

If the conditions in the preceding paragraph have been met and the first round of CRM testing shows an average radon level during occupied times under 4 pCi/L, then no further testing is necessary. If the above conditions are not met, then an additional round of CRM testing should be done at a time when the conditions can be met. Schools should not delay CRM testing more than a month and should not wait until the next winter, because elevated levels may be confirmed in seasons other than winter and corrective measures should then be initiated.



Note on Graph: Measurements were made in a student nutrition classroom (aka 'home-ec') using a CRM. A year prior, a 10-month test showed radon levels of 5.0 pCi/L. The results shown in the graph were from testing conducted in February.

If CRM testing finds levels to be ≥ 4 pCi/L during occupied periods, mitigation should be conducted following ANSI/AARST 'Radon Mitigation Standards for Schools and Large Buildings' (ANSI/AARST RMS-LB) or successor standards. Additional assessment, such as pressure testing, air flow measurements and other evaluation of the HVAC may be necessary in developing an effective radon reduction plan. MDH has a list of radon mitigation professionals available on its website. Some mitigation professionals may be able to conduct advanced diagnostics and evaluate whether radon can be mitigated through adjustments to a commercial HVAC system. Be sure to check on their qualifications prior to hiring them to conduct any work. They should have experience in mitigating radon in schools or large buildings. A competent HVAC engineer may also be able to help mitigate radon.

3.2.5 Reduction Verification Testing

After radon mitigation projects are completed, rooms that were ≥ 4 pCi/L should be retested to verify levels were reduced to < 4 pCi/L. If mitigation may have affected other rooms and caused an increase in radon in these rooms, then these rooms should also be tested. For example, if air flow was increased to a problem area, which caused air flow to decrease elsewhere, then the areas with decreased air flow should also be retested. CRM testing is recommended, but if a large number of rooms need verification testing, a combination of CRM and the method used for initial testing could be used. If occupant concerns exist, a combination of CRM and another short-term test (e.g., activated charcoal) may be preferable. Testing should be done as soon as possible in the same locations and under conditions similar to the initial measurements. Another round of reduction verification testing may be needed at the time of year when initial or follow-up measurements were conducted.

3.2.6 Future Re-testing

A building-wide retest of all ground-contact rooms should be conducted after major renovations to the building or changes to the HVAC system. These building changes may affect the entry of radon. In addition, re-testing should be done periodically, at least every 5 years. Retesting should be done in all buildings and in all ground contact rooms, regardless of prior results.

3.3 What Rooms to Test

Guidance regarding what rooms to test in schools can be found in the ANSI/AARST 'Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings' (ANSI/AARST MALB). Schools should contact MDH Indoor Air Unit for instructions on how to view or obtain a copy of the current standard. The following language is from the ANSI/AARST MALB 2017 standard:

> *"Measurements shall be conducted in all frequently-occupied rooms in contact with the ground. This means each room or area that has floor(s) and/or side wall(s) in contact with the ground or is over unoccupiable basements, crawl spaces, utility tunnels or parking garages. Frequently-occupied rooms are usually offices, classrooms, laboratories, cafeterias, libraries, auditoriums and gymnasiums. Test locations would not normally include hallways, bathrooms or shower areas unless they are open to other rooms that are occupied for other purposes.*

3.4 Placing Detectors in a Room

- Do not place detectors near drafts resulting from heating, ventilating vents, air conditioning vents, fans, doors, and windows.
- Place detectors where they are least likely to be disturbed or covered up. Test kits should be placed in a secure location, behind or next to the teacher's desk, such as hung from the ceiling or a fixture, behind televisions, on top of ceiling mounted projectors, on top of cabinets, secured to a bulletin boards or wooden surfaces, or on a shelf. Consider zip tying the test kit to a fixture.

- Do not place detectors in direct sunlight, in areas of high humidity, or on top of appliances that emit heat or moisture.
- Place detectors at least 20 inches above the floor, 3 ft. from exterior doors and windows, and 1 ft. from exterior walls
- Situate the device such that there is at least 4 inches of space around the part of device into which air diffuses; in other words, point the device away from walls and objects.
- Do not disturb the test device at any time during the test.
- Rooms with moveable and operable partitions should be individually tested if partitions extend from the floor to ceiling.
- Inform teachers, custodians, students, and other staff not to tamper with the device.

3.5 When to Conduct Testing

The purpose of initial testing is to identify rooms that have a potential for elevated radon levels (i.e., levels of 4 pCi/L or greater).

Initial measurements should be collected as follows:

- under closed conditions (closed windows/doors except for normal exit/entry);
- during colder months (November 1 through March 31);
- with HVAC systems operating in a manner typical for normal occupancy;
- NOT during structural changes to a building and/or the renovation or replacement of the HVAC system.
- NOT during unusually severe storms or periods of unusually high winds.

3.6 Who May Conduct Testing

While radon testing is not required in Minnesota schools, it is highly recommended. Beginning January 1, 2019, radon measurement professionals will be required to be licensed through the Minnesota Department of Health (MDH), this includes consultants hired by schools to conduct radon testing. Licensed radon measurement professionals will be required to follow the national radon measurement standard for schools and large buildings: ANSI/AARST 'Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings' (ANSI/AARST MALB). This standard is also considered the current best practice for radon measurement conducted by school staff in Minnesota schools.

Schools who wish to test for radon on their own can do so without obtaining a radon measurement license through MDH, although it is recommended that school staff become licensed. If a school district receives authority to use long-term facilities maintenance revenue to conduct radon testing, the district must conduct the testing according to the state's 'Radon Testing Plan.' The state's 'Radon Testing Plan' is shown in the preface of this guidance document. The ANSI/AARST standard referenced above is an additional guidance resource for schools and should be followed to ensure the most accurate and complete radon test results.

In addition, formal training is available through multiple training providers. A list of approved initial radon measurement courses is available on the MDH website. For more information on

purchasing test kits, finding a measurement provider, or formal training contact the Minnesota Department of Health Indoor Air Unit (health.indoorair@state.mn.us).

3.7 Quality Assurance Measurements

To ensure that measurement results are reliable, quality assurance measurements should accompany initial and follow-up measurements. The term quality assurance refers to maintaining minimum acceptable standards of precision and accuracy in a testing program. Quality assurance measurements include side-by-side detectors (duplicates), unexposed control detectors (blanks), and detectors exposed to a known level of radon (spikes). Additional information is available in the ANSI/AARST 'Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings' (ANSI/AARST MALB).

3.8 MDH Technical Assistance

MDH may be able to assist schools with radon testing, depending on staff and equipment availability. There is no cost for these consultation services. The following services are offered.

- Advise, meet with, and/or present to school staff about radon testing
- Provide test results, primarily from homes, for your local community
- Help schools find reasonably priced test kits
- Assist with the deployment and collection of test kits
- Analyze test results
- Lend a continuous radon monitor to conduct diagnostic testing in rooms that had high radon levels
- Advise school officials about radon mitigation

4. Conclusions

The EPA, MDH and other national and international scientific organizations have concluded that radon is a human carcinogen and a significant environmental health hazard. Early concern about indoor radon was focused primarily on the hazard posed in the home. The EPA, MDH and other researchers have found that radon can be present at elevated levels in other buildings, including schools. Elevated levels of radon may be found throughout the state of Minnesota. Testing is the only way to determine whether or not the radon concentration in a building is elevated.

The EPA and MDH recommend all schools test for radon. Minnesota schools are not required to test for radon. Public schools that use long-term facilities maintenance revenue to conduct radon testing must conduct the testing according to the state's 'Radon Testing Plan.' Further guidance is offered by MDH in this 'Guidance for Radon Testing in Minnesota Schools'. Detailed guidance for schools and requirements for professionals are described the ANSI/AARST standards for radon measurements and mitigation for schools.

All frequently-occupied rooms in contact with the ground must be tested and other areas may need to be tested. This is because radon levels have been found to vary significantly from room to room, and where there is a problem, it's usually in just a few rooms. Initial testing using short

term kits must be conducted during the colder months (November 1 through March 31), while for long term testing at least half the test period must include this timeframe. MDH recommends short term testing in most cases, although long-term testing is acceptable. In rooms with radon concentrations greater than or equal to 4.0 pCi/L, follow-up testing must be done to determine whether levels are elevated during occupied times. Follow-up testing with a continuous radon monitor is recommended.

Schools should take action to reduce the level of radon when levels are greater than or equal to 4 pCi/L during occupied hours. Radon can be reduced either by pressurizing and increasing ventilation in the building or venting radon from beneath the building's slab. For further radon mitigation information, consult ANSI/AARST 'Radon Mitigation Standards for Schools and Large Buildings' (ANSI/AARST RMS-LB) and/or the MDH Indoor Air Unit.

After radon mitigation efforts are completed, testing must be done to verify the reduction of radon. Results must be reported to MDH and at a school board meeting. Future re-testing should be considered when major changes to the foundation or ventilation have occurred that may affect the entry of air through the building foundation. In addition, schools should be tested periodically, such as every 5 years.

School officials should contact MDH Indoor Air for further information.

Phone: 651-201-4601

Email: health.indoorair@state.mn.us

Appendix A. Model Radon Policy

The following summary policy can be included in your Indoor Air Quality Management Plan and other policy manuals. Edit sections that are italicized. Attaching your radon test result tables is also recommended.

"Radon is a naturally occurring gas that can enter into any building from the underlying soil. In some cases, radon can build-up in classrooms, which may increase occupants' risk for developing lung cancer. MDH guidelines are followed for radon testing and mitigation.

Radon testing was performed in **[*state the names of buildings*]. Results were reported to MDH and at a school board meeting**. In ***[year]***, radon levels were **[*below the 4 pCi/L action level in all rooms or above the action level in X rooms]*. *[Follow-up testing was conducted in rooms that were elevated, to verify levels]. [All radon levels that exceeded 4 pCi/L have been reduced to below 4 pCi/L, which was verified with verification testing after mitigation.]***

Radon testing will be conducted again every ***[X (5 is recommended)]*** years or when there are major changes to the foundation or ventilation in the building. Further, information on the radon testing and mitigation is located in **[*state the location*]**."

School Radon Testing Reporting Form

According to Minnesota Statute 123B.571 subd. 3, a school district that has tested its school buildings for the presence of radon shall report the results of its tests to the Department of Health. Please use this form to submit information about the most recent round or cycle of testing conducted for each building.

Instructions

1. Complete one form for each building tested. In this case, a building is defined as an occupied facility with a unique address. This includes administrative buildings.
2. Include this form, raw data (e.g. laboratory report) and a building map.
3. Submit this form when all work is completed for a round of testing. This includes reporting to the school board, and follow-up testing and post-mitigation testing, if applicable.
4. Email information to health.indoorair@state.mn.us.

Contact Information

Name:	
Mailing Address:	
Phone:	Email:

Initial Radon Testing Information

School Building Name:	
School District & District Number:	
Building Address:	
Test Kit Manufacturer:	Device Name:
Date of Kit Retrieval (DD/MM/YY):	Length of Test (days):
How many rooms were tested?	
Does the test period include weekends? ☐ Yes ☐ No	
Does the test period include school breaks or holidays? ☐ Yes ☐ No	

Were all frequently-occupied ground contact rooms tested?[1] ☐ Yes ☐ No If no, did you attempt to test all frequently occupied ground contact rooms, meaning test kits were placed in all these rooms? ☐ Yes ☐ No
How many rooms had results ≥ 4 pCi/L?:
Were the results reported at a school board meeting? ☐ Yes ☐ No

Follow-up Testing, Mitigation, & Post-Mitigation Testing

If one or more rooms tested ≥ 4 pCi/L, please answer the questions below:

How many rooms had follow-up testing?:		
Number of rooms with follow-up results	≥ 4 pCi/L:	< 4 pCi/L:
Of the rooms that had test results ≥ 4 pCi/L, how many rooms were:		
mitigated by HVAC balancing or operational changes? : mitigated by installation of active soil depressurization: addressed through other corrective measures?[2]:		
What was the cost of the installation and/or HVAC service work, to mitigate radon? $ What is the known or anticipated annual operating cost of mitigation (estimate)? $		
After radon mitigation, how many rooms were retested?:		
Post mitigation results (# of rooms)	≥ 4 pCi/L:	< 4 pCi/L:

[1] This includes classrooms, offices, break rooms, laboratories, cafeterias, libraries, auditoriums, gymnasiums, etc. It includes rooms on grade and rooms above unoccupied spaces that are in contact with the ground, such as rooms above storage rooms, crawl spaces, tunnels, and boiler rooms. If only a sample or portion of rooms were tested, then respond with 'no'.

[2] 'Other corrective measures' could include moving staff out of a room and making a room unoccupied or trying to seal radon entry points.