Radon Testing in Minnesota Schools

4/08/2021

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1. Radon Testing Plan

This updated testing plan is effective 9/1/2021.

- Radon testing and mitigation must be conducted by licensed individuals (according to MN Statute 144.4961 Minnesota Radon Licensing Act)
- Testing and mitigation must comply with the Minnesota Radon Licensing Act (MN Statute 144.4961) and the MN Administrative Rules (4620.7000 – 4620.7950), which include the ANSI/AARST standards 'Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings' and 'Radon Mitigation Standards for Schools and Large Buildings' or the successor ANSI/AARST standards
- Testing is conducted between November 1 and March 31
- Conduct tests with short-term tests
- Conduct testing on school days or with HVAC operating under occupied conditions
- Test all occupied and intended to be occupied rooms in contact with the ground, 10% of upper floor rooms, and other rooms specified in the ANSI/AARST standard
- Conduct follow-up testing in rooms that have radon ≥ 4 pCi/L and other rooms specified in the ANSI/AARST standard
- Mitigate occupied and intended to be occupied rooms that have radon ≥ 4 pCi/L
- Re-test the building after mitigation to verify radon reduction
- Report all radon test results to MDH on the 'School Radon Testing Form' at the conclusion of the testing project (after follow-up testing, mitigation and post-mitigation testing have been completed)
- Report radon test results at a school board meeting

2. School Testing Overview

Radon testing in schools is not required in Minnesota, but it is highly encouraged. If school districts choose to test, there are requirements they must follow (MN Statute 123B.571, MN Statute 144.4961). School districts that receive authority to use long-term facilities maintenance revenue to conduct radon testing must follow the state's 'Radon Testing Plan'. In addition, school districts must report test results to MDH and at a school board meeting. Radon measurement and mitigation professionals must be licensed by MDH. School staff must be licensed to test or mitigate radon. Licensed individuals can be found on the MDH website.

Test all ground contact locations that are occupied or intended to be occupied. This includes rooms, offices, classrooms, and other general use areas. Ground contact means rooms that have floors or walls in contact with the ground. It also includes rooms that are closest to the ground over untested ground-contact locations, such as a crawl space, utility tunnel, parking garage and other non-habitable space that is in contact with ground. Intended to be occupied rooms are locations where there are plans to occupy rooms even though they are unoccupied at the time of the testing. In addition, if the building has upper floors, at least 10% of these rooms must be tested. Testing all these rooms is necessary because radon levels may vary

significantly from room to room, and, where there is a problem, it is usually found in a few rooms.

Initial testing must be conducted during the colder months when the building is heated (November through March), because radon levels may be higher during this timeframe. Check HVAC systems for proper maintenance and operation prior to testing for radon, as these systems can affect radon levels.

Conduct testing under closed building conditions, which include heating and cooling set to normal occupied operating conditions, windows closed, and doors closed (except momentary entry and exit). Short term testing devices approved and certified by NRPP or NRSB must be used. Testing must be conducted on school days, meaning when school is in session, or, if this is not possible, with HVAC operating under occupied conditions. Testing from Monday to Thursday or Friday is recommended.

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. Testing also includes quality assurance and quality control steps, including spikes, duplicates, and blanks, to provide assurance of the accuracy and reliability of the measurements.

A single test result is not the basis for determining if action needs to be taken to reduce radon levels. Conduct follow up testing in rooms where valid measurements were not obtained (except if all tests were under 2.0 pCi/L and only a small number of test were not valid, as defined in section 6.2 of the ANSI/AARST Standard). In addition, if the initial test results indicate the radon level in a room is 4.0 picocuries per liter (pCi/L) or greater, follow-up testing must be completed. Follow-up testing should be done quickly. These measurements should be made in the same locations, during the heating season, and under closed building conditions. If these conditions are not met, then an additional round of follow-up testing should be done at a time when the conditions can be met.

A continuous radon monitor (CRM) is recommended for follow-up testing in elevated rooms 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 to lend to licensed individuals to conduct these follow-up measurements. Many consultants own CRMs and they can also be rented 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 be reduced (mitigated) by installing an active soil depressurization (ASD) system or by installing a system to dilute or pressurize the soil or indoor air (non-ASD methods). The building must be re-tested, to verify reduction and ensure mitigation has not increased radon in rooms that used to be low. An operations, maintenance and monitoring plan is implemented to ensure the system continues to function in the future. Test results must be reported to the Minnesota Department of Health and at a school board meeting. Results should also be made available to other interested parties. Future re-testing should be considered when major changes to the

foundation or HVAC system have occurred. These building changes may affect the entry of radon. In addition, schools should be tested periodically, such as every 5 years. If the building has a mitigation system, it is recommended to test every 2 years to verify mitigation system effectiveness.

MDH is available to provide technical assistance at no cost to schools. This includes presentations, providing radon testing data for your local community, reviewing your testing plans, and advising on mitigation. MDH can lend continuous radon monitors to licensed individuals, for follow-up testing in rooms with high initial test results. Currently, schools can purchase short term test kits for about $5-10 each, including lab analysis, directly through Air Chek. Public schools may qualify to purchase short-term test kits at about $5 through the State's Master contract vendor.[1]

More information about radon, schools, and licensure is available at Radon in Homes (www.mn.gov/radon) .

3. Radon Background

3.1 Basics

Radon is a naturally occurring radioactive gas. Radon is colorless, odorless, and tasteless. It comes from the natural breakdown (decay) of uranium, which is found in soil and rock across the United States. Radon travels through soil and enters buildings through cracks and other openings the foundation. It decays into 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.

EPA studies have found that radon concentrations in outdoor air average about 0.4 pCi/L. Radon and its decay products can accumulate to much higher concentrations inside buildings. Testing the building is the only way to know whether an elevated level of radon is present. Testing a sample of rooms is not acceptable because problems can be missed (adjacent rooms can have different levels of radon).

3.2 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 due to radon exposure. The U. S. Surgeon General has warned that radon is the

[1] The State Master Contract can be found on the Minnesota Department of Administration site. Schools can see if they are on the current CPV Member List. If they are 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).

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 lung cancer from radon depends on the level of radon, the duration of exposure, and other cancer risk factors. The 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.

3.3 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, about 2 in 5 homes have radon levels above 4 pCi/L. MDH's radon data portal has maps, charts, and other data about radon in Minnesota.[2] MDH can provide more specific radon test data (by zip code), which may help provide context and encourage people to also test their homes.

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. Licensed radon professionals can also conduct radon testing.

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. For 2012-2020, MDH received data for 1,027 school buildings, and 141 buildings (14%) had one or more room above 4.0 pCi/L. Of the 37,616 rooms tested, there were 392 rooms (1%) 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. In many school buildings, radon can be reduced by HVAC pressurization or dilution. In some buildings, other mitigation approaches may be needed, such as active soil depressurization, to vent radon from under the building to the outdoor air.

3.4 Entry

Many factors contribute to the entry of radon gas. Buildings in proximity can have significantly different radon levels. Testing is only way to know the levels of radon. The following factors determine why some buildings have elevated radon levels:

- the concentration of radon in the soil gas (source strength);
- permeability of the soil under the building (gas mobility);
- pathways for soil gas entry in the foundation;
- the type, operation, and maintenance of the HVAC system; and

[2] MDH Radon Data Portal: data.web.health.state.mn.us/web/mndata/radon

- 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, openings, penetrations (e.g., around pipes), and expansion joints between the slab and the ground soil. Other features, such as basement areas, crawl spaces, utility tunnels, and sub-slab HVAC ducts, may affect radon entry to occupied 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.

3.5 Laws & Standards

Testing in schools is not required in Minnesota, but it is highly encouraged. If schools choose to test, there are requirements they must follow.

A school radon testing law (MN Statute 123B.571) was codified during the 2012 legislature. Under this law, school districts may include radon testing as a part of its ten-year facility plan. School districts that receive authority to use long-term facilities maintenance revenue to conduct radon testing must follow the state's 'Radon Testing Plan'. The 'Radon Testing Plan' can be found in section 1 this guidance document. In addition, school districts must report test results to MDH and at a school board meeting. MDH updated the reporting form in 2021, which is available at the MDH school radon website[3]. This reporting is done by school districts, to provide a project summary and determine consistency with the state's 'Radon Testing Plan'. It is separate and different from the quarterly licensee reporting for individual tests.

The Minnesota Radon Licensing Act (Minnesota Statutes 144.4961) was enacted by the 2015 legislature. This law gives the Minnesota Department of Health (MDH) authority to write rules and enforce requirements for the radon industry in the state. Radon measurement and mitigation professionals who conduct testing are required to be licensed by MDH. Licensed individuals can be found on the MDH website. School staff are typically required to be licensed.

[3] MDH Radon in Schools: www.health.state.mn.us/communities/environment/air/radon/radonschool.html

Only individuals that are uncompensated and own or lease a building are exempt from licensure. To become licensed, an individual must complete 1 or 2 initial training(s), pass 1 or 2 exam(s), submit a quality assurance plan, and apply for licensure through MDH. Radon professionals must follow work practices, including the standards published by the American Association of Radon Scientists and Technologists (ANSI/AARST). They must also follow standards of conduct, report their work to MDH, and complete continuing education. Mitigation professionals must affix MDH radon system tags on to radon mitigation systems.

The EPA and MDH do not maintain prescriptive testing guidance for schools. The ANS/AARST standards have detailed protocols and additional informative advisories and recommendations concerning radon testing and mitigation. The standards can be viewed online for free[4]. There is a fee to purchase or download the standards. Individuals required to be licensed, including school staff, must follow the requirements of the ANSI/AARST standards when testing or mitigating radon in schools. The testing standards include requirements concerning preparations, test locations, test conditions, procedures for conducting the test (including quality control), actions based on results, and test reports. The mitigation standards include general practices, system design, building investigations, active soil depressurization (ASD) installations, sealing, requirements, non-ASD systems, post-mitigation, documentation, and health and safety.

4. Summary

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 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 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 and report the results to MDH and at a board meeting. Testing and mitigation in schools must be conducted by licensed individuals, whether they are contracted professionals or school staff (licensing exemptions would not typically apply). Detailed testing procedures are described in the ANSI/AARST standards for radon measurement and mitigation in schools.

School officials can contact MDH Indoor Air Unit for further information.

[4] AARST Standards: standards.aarst.org