Department of Health & Human Services
DHHS
NEBRASKA

State of Nebraska
Pete Ricketts, Governor

Kimberly Lingenfelter, Superintendent
Neligh-Oakdale Public Schools
600 J Street
Neligh, NE 68756

June 1, 2015

Ms. Lingenfelter,

Radon is an odorless naturally-occurring gas that has radioactive properties. Long-term exposures to elevated levels of radon gas can increase one's risk of lung cancer. Radon-related lung cancer is the second leading cause of lung cancer in the U.S. Radon originates underground as a product of uranium decay, and can enter into home and other buildings and accumulate to high levels. The prevalence of elevated radon level in Nebraska is greater than most states.

In this letter I am forwarding the "Radon Testing Report", which contains the results of long-term radon tests conducted in the Neligh-Oakdale High School/East Ward by the Nebraska Department of Health and Human Services between January 30 and May 11, 2015.

As shown in the enclosed report, indoor radon levels in the basement of the high school were elevated (greater than >4.0 pCi/L) in the following rooms: Spanish Room & Band Room (B16). The Department recommends lowering the radon level in rooms with elevated radon levels. During the radon measuring period, these rooms were not frequently being occupied. The use of these rooms should continue to be limited to reduce the negative health effects associated with long-term exposure to radon.

I have enclosed Section III from the EPA document "Radon Measurement In Schools," which explains two strategies to reduce radon concentrations in schools. Another useful EPA document is "Reducing Radon In Schools: A Team Approach," which you can view online at: *http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=00000AOV.txt*

Ventilation using the current HVAC system is one radon reduction strategy that can be less expensive in the short run, however it is a temporary solution and can result in greater energy penalty over time. Active sub-slab depressurization is another effective radon reduction method, but can have a greater initial cost. Caulking and sealing any wall and floor cracks can also help by reducing radon entry into the building and is inexpensive and can be done by anyone.

An active sub-slab depressurization system needs to be installed by a state-licensed radon mitigation contractor. Contacting licensed contractors will give you information such as potential cost, design, and timelines for the installation of a radon mitigation system, and can help you

choose one you are most comfortable working with. I have enclosed a list of licensed radon mitigation businesses for your use.

The Nebraska Radon Program at the Department of Health and Human Services greatly appreciates your participation in our school testing project. In order to help increase radon awareness across Nebraska, I encourage you to share the results with your staff, parents, and/or school board (i.e. in a newsletter article or on the school website). If you have any further questions regarding the enclosed report, or radon reduction, please feel free to contact me.

Sincerely,

Jeremy Poell
Health Program Manager I
402-471-8320
jeremy.poell@nebraska.gov

Radon Testing Report

School Neligh-Oakdale Public Schools

School Info 600 J Street
Neligh, NE 68756

Device Type Alpha Track – long term

Dates of Testing 01/30/2015 to 05/11/2015

Testing conducted by Jeremy Poell, RMS #230
Nebraska Dept of Health & Human Services #RMB-1066

Date of Report 06/01/2015

Range of Test Results 0.2 – 7.3 pCi/L

# of tests conducted 6

# of elevated tests 3

Comments

Kit #	Room	Start Date	Start Time	Stop Date	Stop Time	Result (pCi/L)	QA
	HS Building						
292256	Teacher's Lounge	2015-01-30	12:00 PM	2015-05-11	1:00 PM	2.7	
292260	**Spanish Room**	**2015-01-30**	**12:00 PM**	**2015-05-11**	**1:00 PM**	**7.3**	
292252	**Room B16 – Band**	**2015-01-30**	**12:00 PM**	**2015-05-11**	**1:00 PM**	**6.3**	
292255	**Room B16 – Band**	**2015-01-30**	**12:00 PM**	**2015-05-11**	**1:00 PM**	**6.0**	**Duplicate**
292262	Art Room	2015-01-30	12:00 PM	2015-05-11	1:00 PM	2.1	
292251	Art Room	2015-01-30	12:00 PM	2015-05-11	1:00 PM	0.2	Blank

The State of Nebraska recommends that any structure with a radon level of 4.0 pCi/L or greater be mitigated. State protocol also recommends a total of two tests before a decision to mitigate is reached, this radon testing report is the second test. Please contact the state Radon Program for more information.

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Radon Program
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RSSI

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May 22, 2015

Nebraska Radon Program
Jeremy Poell
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P.O. Box 95026
Lincoln, NE 68509
USA

Alpha Track Test Results

Detector Number	pCi/L	Test Location	Test Address	Start Date	End Date	Note*
292251	0.2 ± 15%	Speech room (Blank)	High School, 600 J Street Neligh, NE 68756	1/30/2015	5/11/2015	
292252	6.3 ± 3%	Room B16 - band	High School, 600 J Street Neligh, NE 68756	1/30/2015	5/11/2015	
292255	6.0 ± 3%	English room (B16 - Duplicate)	High School, 600 J Street Neligh, NE 68756	1/30/2015	5/11/2015	
292256	2.7 ± 5%	Teacher's lounge	High School, 600 J Street Neligh, NE 68756	1/30/2015	5/11/2015	
292260	7.3 ± 3%	Spanish room	High School, 600 J Street Neligh, NE 68756	1/30/2015	5/11/2015	
292262	2.1 ± 5%	Art room	High School, 600 J Street Neligh, NE 68756	1/30/2015	5/11/2015	

These results relate to the detector as received by RSSI.

Customer Number: 4120

Detector Number	pCi/L	Test Location	Test Address	Start Date	End Date	Note*

Analyzed By: Krzysztof Flis — Analysis Date: 05/21/ 2015

*****END REPORT*****

* 1-Broken Seal, 2-Damaged Filter, 3-Loose Test Material, 4-Missing Test Material, 5-Missing End Date, 6-Missing Start Date, 7-Less Than 8 Days, 8-Past Expiration Date, 9-Missing Both Dates, NA-No applicable notes

Nebraska Department of Health & Human Services
Quality Control Summary

Duplicates

Duplicate table for measurements below 4.0 pCi/L

D_1	D_2	M	RPD
6.3	6.0	6.15	5%
			Average RPD = 5%

D_1= 1st Duplicate measurement
D_2= 2nd Duplicate measurement

Where M (Mean) = (D1 + D2)/2

Where RPD (Relative Percent Difference) = (D1-D2)/M x 100

Average RPD (Average Relative Percent Difference) = Total Sum of RPD/N

When radon levels are below 4.0 pCi/L, then:
If Average RPD < 25%, then devices are fine
If Average RPD > 25%, then devices may be in error

Blanks

Blanks	Result
292251	0.2

If blank result < 1.0 pCi/L, then device is fine
If blank result > 1.0 pCi/L, then device is questionable, Lab should be contacted.

SECTION III: REDUCING RADON CONCENTRATIONS

Introduction

EPA has investigated schools with elevated radon levels nationwide. These investigations indicate that school buildings are more complex in their construction and operation than most houses. As a result, diagnostic measurements are necessary to develop and implement an appropriate mitigation strategy. In addition, these investigations indicate that the following two strategies are effective in school buildings:

- venting radon gas from beneath the building slab (active sub-slab depressurization - **ASD**)
- pressurizing and ventilating a school building with an HV AC system (**HVAC pressurization/ventilation**)

ASD has been successfully used in homes and school buildings. It is a particularly effective strategy when initial radon levels are above 20 pCi/L. HVAC pressurization and ventilation has also been used successfully to reduce radon levels to below EPA's action level guideline of 4 pCi/L. Because of local building code requirements, occupancy patterns, school building construction/operation, and initial radon levels, the use of an HVAC mitigation strategy may be more appropriate than ASD.

Contractors or school maintenance personnel who have demonstrated proficiency in radon mitigation through EPA's *Radon Contractor Proficiency* (RCP) *Program* should develop the mitigation strategy for a school. School officials may call their State Radon Contact or EPA Regional Office for information on State-Certified and/or RCP-listed contractors (See **Appendices A and B**). In selecting a contractor, ask if they have experience mitigating school buildings. It may also be advantageous to consult an HVAC specialist particularly if an HVAC mitigation strategy is chosen. More comprehensive information on radon mitigation in schools is available in *Reducing Radon in Schools: A Team Approach* (402-R-94-008).

Indoor Air Quality

During EPA's investigations of school mitigation strategies, many schools were found to have problems with the quality of their indoor air resulting from the lack of ventilation (the introduction of outside air into the building). In general, for many of these schools, the ventilation capabilities of their HVAC system(s) were in

disrepair or blocked to reduce heating and/or cooling costs. When considering the indoor air quality of high occupancy buildings like schools, proper ventilation is a significant part of an overall approach to its improvement.

Active Sub-slab Depressurization

ASD creates a lower air pressure beneath the slab to reverse the flow of air through the building foundation thus preventing radon entry. This is accomplished by installing a series of pipes that penetrate the slab or foundation walls. A high suction fan is attached to these pipes to draw and vent the soil gas (containing radon) from beneath the building foundation before the gas has a chance to enter into the building. When radon levels are greater than 10 pCi/L, ASD will probably be needed to lower levels below EPA's action level of 4 pCi/L. Although ASD is an effective strategy for controlling radon entry into buildings, it has no other demonstrable effect on the overall quality of indoor air within a school building other than its effects on radon levels.

The installation of an ASD system should be accompanied by the sealing of radon entry routes. Sealing will increase the effectiveness of the system and reduce the energy costs associated with operation of an ASD system. EPA does not recommend the use of sealing alone to reduce radon levels. EPA studies indicate that sealing will not lower radon levels consistently.

HVAC Pressurization/Ventilation

The HVAC system(s) in school buildings can directly influence radon entry by altering air pressure differences between the radon laden soil and the building interior. Depending on its type and operation, a school's HVAC system may produce positive or negative air pressure conditions within the building. Positive pressure within the building can prevent radon from entering a building while negative pressure can permit or, in some cases enhance, radon entry into the building.

The pressurization of a school building is accomplished when sufficient quantities of outdoor air are introduced into the building producing a positive air pressure within the building. Pressurization may require additional heating, cooling, and/or dehumidification that may exceed the capacity of the existing HVAC equipment. In addition, routine operation and maintenance will be necessary for this type of mitigation strategy to consistently reduce radon levels.

Restoring the ventilation capacity of an existing HVAC system to meet its original design specifications will, in some cases, achieve the appropriate level of building pressurization. If possible, ventilation rates should be increased to meet current ventilation standards. Proper ventilation through the introduction of

outdoor air can reduce radon levels by diluting the radon that has entered the building. Some older schools may not have a mechanical ventilation system (HVAC). For these schools, consideration should be given to the installation of a ventilation system when addressing radon problems especially since such a system may contribute to an improvement in the overall indoor air quality of the school.

Because schools vary in their design, construction, and operation, there is no standard HVAC pressurization and ventilation strategy for all schools. As a result, an HVAC engineer may need to be consulted when considering HVAC pressurization and ventilation as a mitigation strategy.

SECTION IV: FREQUENTLY-ASKED QUESTIONS

A. RADON AND RADIATION:

Q: **Does radon cause headaches, eye irritation, or sick-building syndrome?**

A: No.

Q: **Do children have a greater risk than adults for certain types of cancer caused by radon exposure?**

A: Children have been reported to have greater risk than adults of certain types of cancer from radiation, but there are no conclusive data on whether children are at greater risk than adults from radon.

Q: **What is a picocurie of radiation and why are radon levels reported in units of picoCuries per liter?**

A: All radioactive substances are unstable and undergo radioactive decay. The amount of radioactivity can be assessed by the number of particles which decay each minute. A picocurie (pCi/L) of radiation is equal to 2.2 radioactive decays per minute. A measurement result of 1 pCi/L of radon gas means that in each liter of air there is enough radon to produce 2.2 radioactive decays each minute.