



Testing, Mitigation, System Design
CCB 180537
CASCARI927C1
Fed ID 26-1809992

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Radon Survey Analysis Job# 19-C113R

for

Vernonia School District Vernonia K-12 School

c/o Mark Brown

property located at

1000 Missouri Ave

Vernonia, OR 97064

March 3, 2020



STATE OF OREGON
CERTIFIED
EMERGING SMALL BUSINESS

ESB#10782

Introduction

The following report documents a study of radon levels for the property located at 1000 Missouri Ave Vernonia OR 97064. The goal of this study is to determine indoor radon levels for all areas in contact with the ground. Testing was performed per Oregon Health Authority School Testing Protocols.

Analysis assumes that the buildings tested were maintained under “closed-building” conditions (windows closed and exterior doors shut immediately after entering and exiting), as well as normal indoor temperatures, for the duration of the testing period. The H-VAC system for each building was set to normal occupied settings for the entirety of the testing period.

Conclusions and Recommendations

Test was a “Short-Term” test, with minimum duration of 60 hours. See the chart below of areas in buildings that were tested, and the corresponding levels found. All current test results are provided in Table 1. Maps of the test levels are provided in Appendix A. Note that seventy-nine (79) of eighty-eight (88) locations tested had results below the USEPA Action Level of 4.0 pCi/L.

It is recommended that a certified radon mitigation company be contacted to evaluate the areas which are elevated to determine appropriate mitigation action to bring them below the USEPA Action Level.

This report represents the average radon concentration for the period that testing was and at the specific location(s) within the building. The concentration of radon gas in indoor air can vary widely; it fluctuates daily, seasonally, and with weather conditions. Indoor radon levels may be affected by barometric pressure, strong winds, rain-soaked ground, snow cover, heating and A/C systems, building construction, open windows, and the like. For further confirmation of average, long-term radon levels, it is suggested that long-term, Alpha-Track type radon testing be performed.

NOTE: It is recommended that any building indicating low radon values be retested at least every 5 years. In areas where mitigation has been performed, it is recommended to test using long-term testing at least every 2 years.

Radon Level Measurements

The building tested was assumed occupied during testing. The measurement technique used (112) AirChek activated charcoal kits.

Test Start Date: 1/27/2020

Test End Date: 1/30/2020

Measurements of radon levels were made in the following areas:

Table 1: Results

Alternative Building

Room	Floor	Kit ID #	Test Start Time	Test End Time	Result (pCi/L)
Basement office	1	9335973	12:15 PM	10:52 AM	5.1
Classroom	1	9335982	12:22 PM	10:50 AM	6.2
Front Little computer room	1	9335974	12:23 PM	10:48 AM	4.9
Kitchen/dining	1	9341904	12:21 PM	10:49 AM	4.3
Main entry	1	Duplicate Avg*	12:20 PM	10:47 AM	4.9
Map chair room	1	9335981	12:16 PM	10:53 AM	6.2
Office	1	9335976	12:24 PM	10:48 AM	5.3
Shop	1	9335985	12:12 PM	10:51 AM	17.6
Watershed council room	1	9335984	12:13 PM	10:52 AM	5.5

K-12 Building

Room	Floor	Kit ID #	Test Start Time	Test End Time	Result (pCi/L)
131	1	9341909	10:43 AM	09:57 AM	0.3
132	1	9341926	10:30 AM	09:51 AM	0.3
133	1	9341918	10:42 AM	09:55 AM	0.3
134	1	9341917	10:31 AM	09:52 AM	0.3
135	1	Duplicate Avg*	10:39 AM	09:55 AM	0.3
136	1	9341916	10:35 AM	09:53 AM	0.3
137	1	9341933	10:37 AM	09:54 AM	0.3
138	1	9335922	10:36 AM	09:54 AM	0.3
141	1	9341958	10:07 AM	10:03 AM	0.3
143	1	9341956	10:04 AM	10:03 AM	0.3
144	1	9341949	09:55 AM	09:58 AM	0.3
145	1	9341954	10:02 AM	10:02 AM	0.3
146	1	9341953	09:56 AM	09:59 AM	0.3
147	1	9341955	10:00 AM	10:01 AM	0.3
148	1	9341950	09:58 AM	10:00 AM	0.3
134 office	1	9341925	10:33 AM	09:53 AM	0.3
142A	1	Duplicate Avg*	09:50 AM	09:57 AM	0.3

Room	Floor	Kit ID #	Test Start Time	Test End Time	Result (pCi/L)
A108	1	9341920	10:08 AM	09:50 AM	0.5
A112	1	9341929	10:11 AM	09:48 AM	0.5
A113	1	9341921	10:18 AM	09:48 AM	1.3
A115	1	9341922	10:19 AM	09:47 AM	0.5
A126	1	Duplicate Avg*	10:19 AM	10:09 AM	0.3
Athletics lobby	1	9335954	10:56 AM	10:18 AM	0.3
Attendance	1	9341934	10:04 AM	09:44 AM	0.3
B 117 Band office	1	Duplicate Avg*	10:38 AM	10:16 AM	0.7
Band	1	9335992	10:33 AM	10:16 AM	0.3
Boys locker room	1	9342538	11:11 AM	10:34 AM	0.8
Boys team room	1	9335913	11:11 AM	10:35 AM	1.7
Choir	1	9341919	10:49 AM	10:13 AM	0.3
Conference	1	9341912	10:23 AM	09:46 AM	0.3
Custodian	1	9335953	10:52 AM	10:12 AM	0.3
Custodian office	1	9335955	10:53 AM	10:11 AM	0.3
Digital arts	1	9341913	10:26 AM	10:04 AM	0.3
East gym basement	1	9341928	11:06 AM	10:28 AM	0.9
Girls coach office	1	9341902	11:20 AM	10:31 AM	0.7
Girls locker rm	1	9335906	11:19 AM	10:31 AM	1.0
Girls team room	1	9341927	11:22 AM	10:32 AM	1.3
Gym storage	1	9335957	11:03 AM	10:22 AM	0.3
H health	1	9341939	10:02 AM	09:43 AM	0.6
Health rm	1	Duplicate Avg*	09:57 AM	09:43 AM	0.3
Janitor room basement	1	9341907	11:09 AM	10:23 AM	2.9
Kitchen office	1	9342568	10:31 AM	10:42 AM	0.3
Main office	1	9341937	09:53 AM	09:42 AM	0.3
Mens PE office	1	Duplicate Avg*	11:12 AM	10:34 AM	0.5
Metal shop office	1	Duplicate Avg*	12:03 PM	10:56 AM	0.3
Metal shop	1	9342590	12:04 PM	10:55 AM	0.3
Music Room	1	9335903	10:36 AM	10:17 AM	0.3

Room	Floor	Kit ID #	Test Start Time	Test End Time	Result (pCi/L)
N Common	1	9341957	10:17 AM	10:13 AM	0.3
N elementary gym	1	9335959	11:07 AM	10:19 AM	0.3
N Kitchen	1	9341962	10:27 AM	10:41 AM	0.3
NE elementary gym	1	9335960	11:07 AM	10:20 AM	0.3
Ne gym basement	1	9341932	11:03 AM	10:27 AM	0.6
Nw basement gym	1	9341906	10:59 AM	10:24 AM	0.7
NW elementary gym	1	9335958	11:06 AM	10:19 AM	0.3
PE Office upstairs	1	Duplicate Avg*	11:02 AM	10:22 AM	0.5
Practice room 1	1	9335923	10:42 AM	10:16 AM	0.3
Practice room 2	1	9335949	10:43 AM	10:15 AM	0.6
Practice room 3	1	9335951	10:45 AM	10:14 AM	0.5
Principal a107	1	9341930	10:06 AM	09:50 AM	0.3
S Common	1	9341959	10:17 AM	10:14 AM	0.3
Se gym basement	1	9341941	11:07 AM	10:26 AM	0.9
Servery	1	9342567	10:29 AM	10:10 AM	0.3
South gym basement	1	9341940	11:07 AM	10:26 AM	0.7
North gym basement	1	9341910	10:55 AM	10:24 AM	0.6
Staff lounge	1	9341924	10:21 AM	09:47 AM	0.3
Student store	1	9335909	11:37 AM	10:09 AM	0.3
SW elementary gym	1	9335961	11:06 AM	10:20 AM	0.3
NW Wrestling	1	9335966	11:28 AM	10:28 AM	0.3
Tool room	1	9342591	12:03 PM	10:56 AM	0.3
Training room	1	9335907	11:17 AM	10:33 AM	0.3
Weights	1	Duplicate Avg*	11:20 AM	10:30 AM	0.9
SW basement gym	1	9341908	10:56 AM	10:23 AM	0.6
Wood shop 1	1	9342592	11:57 AM	10:58 AM	0.9
Wood shop 2	1	9342593	12:00 PM	10:58 AM	0.6
Wood shop room	1	9335921	11:59 AM	10:57 AM	1.0
Work rm	1	Duplicate Avg*	10:12 AM	09:46 AM	0.3
Wrestling S	1	Duplicate Avg*	11:24 AM	10:28 AM	0.4

Duplicate measurements were conducted as a means to assess the precision of the test measurements. The criteria of acceptance is that the average relative percent difference (ARPD) of the results of the two measurement results for results whose averages are greater than 4.0pCi/L, should be within 25%. The results of the collated duplicates are provided in Table 2. The applicable ARPD for this survey was not applicable and is thus in compliance.

Table 2: *Duplicate Table

Room	Kit ID#	Test Start Time	Test End Time	Result (pCi/L)	Average (pCi/L)	Avg > 3.9 pCi/L?	RPD %
142A	9341947	09:50 AM	09:57 AM	0.3	0.3	No	N/A
	9341948	09:50 AM	09:57 AM	0.3			
126A	9341961	10:19 AM	10:09 AM	0.3	0.3	No	N/A
	9341960	10:20 AM	10:09 AM	0.3			
B117	9335924	10:38 AM	10:16 AM	0.7	0.7	No	N/A
	9335910	10:38 AM	10:16 AM	0.6			
PE Office Upstairs	9335956	11:02 AM	10:22 AM	0.3	0.5	No	N/A
	9341905	11:02 AM	10:43 AM	0.6			
Weights	9335962	11:20 AM	10:30 AM	0.8	0.9	No	N/A
	9335963	11:21 AM	10:30 AM	0.9			
Wrestling S	9335964	11:24 AM	10:29 AM	0.5	0.4	No	N/A
	9335965	11:24 AM	10:28 AM	0.3			
Health Room	9341936	09:57 AM	09:43 AM	0.3	0.3	No	N/A
	9341935	09:57 AM	09:43 AM	0.3			
Work RM	9341931	10:12 AM	09:46 AM	0.3	0.3	No	N/A
	9341938	10:12 AM	09:46 AM	0.3			
135	9341923	10:39 AM	09:55 AM	0.3	0.3	No	N/A
	9341915	10:40 AM	09:55 AM	0.3			
Mens PE Office	9335904	11:12 AM	10:34 AM	0.5	0.5	No	N/A
	9341942	11:13 AM	10:34 AM	0.5			
Metal Shop Office	9335914	12:02 PM	10:56 AM	0.3	0.3	No	N/A
	9335920	12:03 PM	10:56 AM	0.3			
Main Entry	9335983	12:20 PM	10:47 AM	4.9	4.9	Yes	2.0
	9335975	12:20 PM	10:47 AM	4.8			

Room	Kit ID#	Test Start Time	Test End Time	Result (pCi/L)	Average (pCi/L)	Avg > 3.9 pCi/L?	RPD %
Average RPD for Duplicate Averages more than 3.9 pCi/L:							Yes
In Compliance:							Yes

As a means to determine any biases in the results, detectors were deployed but not opened. At the time of test retrieval of the regular test, the devices were removed from their packaging and sent to the laboratory for blind analysis. The results of these unexposed devices are shown in Table 3. As can be seen, the laboratory reported these at the lower level of detection, indicating that no biases were introduced in handling and shipping of the devices.

Table 3: Blanks

Room	Blank #	Kit ID #	Result (pCi/L)	In Compliance?
A115	1	9341911	0.3	Yes
N Kitchen	2	9341963	0.3	Yes
Practice RM 3	3	9335952	0.3	Yes
Blank in Transit	4	9335988	0.3	Yes
Blank in Transit	5	9336000	0.3	Yes
Blank in Transit	6	9335995	0.3	Yes
Blank in Transit	7	9335989	0.3	Yes
Blank in Transit	8	9335987	0.3	Yes
Blank in Transit	9	9335986	0.3	Yes

A device was also selected from the lot of detectors that were utilized for exposure to a known radon environment at a spiking chamber (Bowser-Morner, NEHANRPP ID# 101 TC). After exposure, the device was submitted as a blind measurement to the laboratory. A comparison of the reported reading from the lab and the known concentration in the chamber is as follows:

Chamber concentration to which device was exposed:	25.5 pCi/L
Concentration reported by lab:	25.5
Relative percent difference (RPD):	0.0

Chamber concentration to which device was exposed:	25.5 pCi/L
Concentration reported by lab:	28.0
Relative percent difference (RPD):	9.8

Chamber concentration to which device was exposed:	25.5 pCi/L
Concentration reported by lab:	27.4
Relative percent difference (RPD):	7.5

The RPD between the reported and spiking concentration is well within normal limits.

Key:

pCi/L: Picocuries per liter – units of radon concentration.

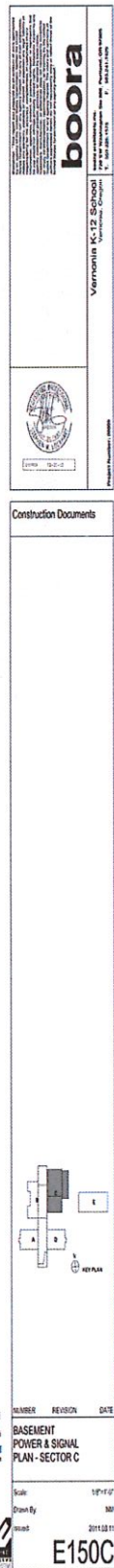
Average (Avg): Cumulative average of the entire period since the test started.

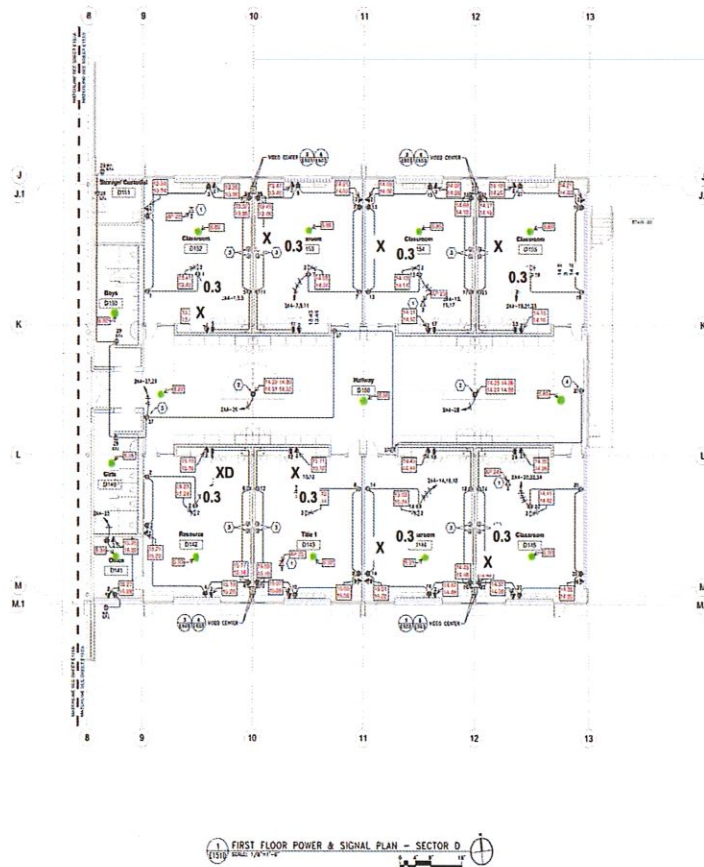
Please contact me if you have any questions.

Thank you,

Rachell Meyers
NRPP 110320 RT







GENERAL NOTES:

1. ALL LOCATIONS FOR AND SYMBOLS SHOWN IN THIS PLAN ARE TO BE INSTALLED IN ACCORDANCE WITH THE ELECTRICAL CODE AND THE NATIONAL ELECTRICAL SAFETY BOARD (N.E.S.B.) STANDARDS.
2. ALL WIRING SHALL BE DONE IN ACCORDANCE WITH THE ELECTRICAL CODE AND THE NATIONAL ELECTRICAL SAFETY BOARD (N.E.S.B.) STANDARDS.
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KEYED NOTES:

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VERIFICATION & SIGNATURE

Electronic Stamp & Seal 2012

DATE: 2012/12/11

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