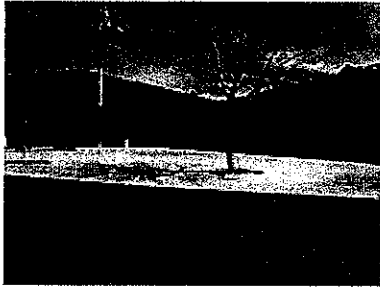


9 Pau-Wa-Lu Middle School

9.1 Description



Short-term radon measurements were conducted in this school from March 18-20, 2009. The results obtained from these tests reflect the conditions that existed within this school and within these dates.

Tests were conducted in accordance with the US EPA's Guidance Document Radon Measurements in Schools, Revised Edition, EPA 402-R-92-014, July 1993.

These tests included all frequently occupied ground floor rooms within all structures on the campus. Additional details on the methodology of these tests as well as room selection can be found in Section 1.2 of this report.

Locations tested:	84
Locations where devices retrieved:	84
Locations with short-term results at or above 4.0 pCi/L:	1
Rooms at or above 4.0 pCi/L:	G-9
Survey anomalies:	None observed

Quality control and quality assurance measures that were taken for this school, which are detailed in Section 13, indicate that confidence can be placed in the survey results for this facility.

9.2 Results

The results provided below in both tabular and pictorial form represent the radon levels within these locations that were present at the time of the survey and under the condition in which the building was being operated, including its HVAC system. Locations determined to have short-term radon levels at or above 4.0 pCi/L are shown in "bold" within the table and in red on the diagram.

All times indicated are Eastern Daylight Savings Time. Results indicated as <0.3 pCi/L are at the lower level of detection for the devices.

Table 10: Pau-Wa-Lu Middle School Radon Survey Results

Room	Device	Start Date	Start Time	End Date	End Time	Result (pCi/L)
A1	4328772	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.5
A2	4328795	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.2
A3	4328788	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.9
A4	4328687	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.5
A5	4328694	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.7
A6	4328768	2009-03-18	6:00 pm	2009-03-20	9:00 pm	3.5
A7	4328794	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.7
A8	4328779	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.9
A9	4328777	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.9
A10	4328780	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.7
A11	4328775	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.1
A11 office	4328798	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.6
A12	4328774	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.8
B2	4328968	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.9
B3	4328776	2009-03-18	5:00 pm	2009-03-20	8:00 pm	2.6
B4	4328778	2009-03-18	5:00 pm	2009-03-20	8:00 pm	2.8
B5	4328786	2009-03-18	5:00 pm	2009-03-20	8:00 pm	3.5
B6	4328685	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.6
B7	4328800	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.2
B8	4328698	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.5
B9	4328686	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.3
B10	4328781	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.2
B11	4328791	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.7
B12	4328697	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.7
C1	4328797	2009-03-18	6:00 pm	2009-03-20	8:00 pm	0.7
C2	4328902	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.3
C3	4328920	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.5
C4	4328692	2009-03-18	6:00 pm	2009-03-20	8:00 pm	0.9
C5	4328683	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.6
C6	4328662	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.1
C7	4328790	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.3
C8	4328695	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.9
C9	4328976	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.1
C10	4328766	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.1
C11	4328700	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.4
C12	4328696	2009-03-18	6:00 pm	2009-03-20	8:00 pm	1.7
D1	4328919	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
D2	4328983	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.8
D3	4328691	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
D4	4328676	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.8
D5	4328669	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.9
D6	4328936	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.1
D7	4328677	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.6
D8	4328982	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
D9	4328690	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.9
D10	4328917	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3

Room	Device	Start Date	Start Time	End Date	End Time	Result (pCi/L)
D11	4328799	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.0
D12	4328907	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.1
E1	4328684	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E2	4328665	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.6
E3	4328914	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.5
E4	4328984	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E5	4328675	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E6	4328668	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E7	4328653	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E8	4328667	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E9	4328913	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E10	4328670	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E11	4328661	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
E12	4328928	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
F5	4328666	2009-03-18	6:00 pm	2009-03-20	9:00 pm	1.0
F7	4328343	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.6
G5	4328396	2009-03-18	7:00 pm	2009-03-20	9:00 pm	1.2
G6	4328390	2009-03-18	7:00 pm	2009-03-20	9:00 pm	2.6
G6 P1	4328342	2009-03-18	7:00 pm	2009-03-20	9:00 pm	1.3
G6 P2	4328351	2009-03-18	7:00 pm	2009-03-20	9:00 pm	0.9
G7	4328389	2009-03-18	7:00 pm	2009-03-20	9:00 pm	2.2
G8	4328399	2009-03-18	7:00 pm	2009-03-20	9:00 pm	2.5
G9	4328397	2009-03-18	7:00 pm	2009-03-20	9:00 pm	5.0
Cafeteria 1	4328361	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.1
Cafeteria 2	4328338	2009-03-18	6:00 pm	2009-03-20	9:00 pm	2.0
Conference Rm	4328771	2009-03-18	5:00 pm	2009-03-20	8:00 pm	2.1
Gym 1	4328990	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.8
Gym 2	4328915	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.5
Kitchen	4328339	2009-03-18	7:00 pm	2009-03-20	9:00 pm	1.1
Kitchen Ofc	4328398	2009-03-18	7:00 pm	2009-03-20	9:00 pm	1.5
Library 1	4328783	2009-03-18	5:00 pm	2009-03-20	8:00 pm	2.3
Library 2	4328787	2009-03-18	5:00 pm	2009-03-20	8:00 pm	3.3
Ofc Workroom	4328796	2009-03-18	5:00 pm	2009-03-20	8:00 pm	2.1
Office	4328792	2009-03-18	5:00 pm	2009-03-20	8:00 pm	2.0
Reception	4328767	2009-03-18	5:00 pm	2009-03-20	8:00 pm	1.9
Small Gym 1	4328682	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3
Small Gym 2	4328924	2009-03-18	6:00 pm	2009-03-20	9:00 pm	0.5
Weight	4328922	2009-03-18	6:00 pm	2009-03-20	9:00 pm	< 0.3

9.3 Discussion

Room G-9 within this building was found to have a reported reading in excess of 4.0 pCi/L.

Adjacent rooms had lower readings than G-9, which may suggest a situation where the HVAC system is imbalanced where inadequate supply air is being provided to Room G-9. Note that a similar situation may also be occurring in Room A-6 that had a reading of 3.5 pCi/L that was higher than adjacent rooms as well.

It is apparent that there is a potential within this school to have elevated radon levels if negative pressures exist within rooms that may not have the benefit of sufficient supply and make-up air to counteract these pressures.

It also may be true that the elevated readings that were obtained are averages of much higher readings encountered during non-occupied hours (when the HVAC system goes to a night set back mode) and occupied hours when lower radon levels likely exist. The only means to determine this is with a confirmatory testing utilizing a continuous radon monitor that records radon on an hourly basis, to identify daytime to nighttime trends.

9.4 Recommendations

- Confirm elevated radon levels within Room G-9 and A6 with the use of a continuous radon monitor that, in addition to providing a confirmatory integrated measurement, it would also provide a more informative indication of the daytime to nighttime averages of radon exposure.
- Review HVAC system for the area within which these Rooms G-9 and A-6 are located.
 - Insure both the presence and capacity of air supply to these rooms
 - Adjust supply to maintain a 0.010 inch of water column positive pressurization within these rooms relative to the sub-grade.
 - Verify that positive pressure is maintained in all other rooms that are served by the air handler that serves Rooms G-9 and A-6. If not, increase capacity of the air handler to insure positive pressure through adjustments to fresh air make-up and/or fan speed.
- After adequate HVAC adjustments have been accomplished, conduct short-term confirmatory measurements in all rooms served by the HVAC system that serves Rooms G-9 and A-6.

Maintenance

Given the potential for this school to have elevated radon levels, a program should be instituted that:

1. Retest Rooms G-9 and A-6, once every year as recommended by US EPA protocols
2. Retest rooms after renovations, which would affect air flow and air supply, occur. This would include but not be limited to situations when:
 - HVAC system is modified, (Retest rooms affected by HVAC that is modified)
 - Partition walls are added within a room,

- Insure that renovations include provisions for balanced air supply and return from newly created room.
 - Additions occur at this campus, whether they are new buildings or portable classrooms.
3. Maintain fresh air make-up in conformance with ASHRAE standards and state codes for schools and to insure an interior positive building pressure during occupied hours.
 4. Develop a database either specifically for this school or district wide for all schools that allows for the retention of future test results that clearly delineate:
 1. Location
 2. Date of test
 3. Purpose of test (routine, post-mitigation or post renovation, etc.)
 4. Method by which room nomenclature is maintained or a clear means of determining when names are changed or rooms added.