

***Former Karnish Instruments
Characterization Surveys
And
Remedial Action Options
City of Lock Haven,
Clinton County, PA***

***Prepared for: Pennsylvania
Department of Environmental Protection***

***PADEP Requisition No. 4-055
URS Project No. 41785927***

March 2008

BRP Radon Division
* Not For Public Release

Re: Radon testing at Ron's Rental shop, Lock Haven, PA

In support of the Decommissioning Section the Radon Division supplied 32 F&J R40VDB, diffusion barrier charcoal test kits for radon characterization at Ron's Rental shop. The test kits were placed by Jeff Whitehead of the BRP on 12/21/2007 and they were retrieved on 12/27/2007 by Cheryl Sinclair of the PA DEP Environmental Clean-up Group in the Williamsport office. The building was maintained under closed-building conditions during the testing. Geno Simonetti of the BRP Radon Division counted and analyzed the test kits on 12/27-28/2007.

As part of the total 32 test kits three sets of duplicates and two blanks were also incorporated into the sampling plan. The blanks, serial numbers 69626 and 69627 both showed results of 0.1 pCi/L. Blanks should exhibit results less than or equal to the MDA for the counting system. The MDA for the counting system is a function of the background count and the counting time, for our system this is typically less than 1 pCi/L. The project blanks therefore show no accumulation of radon during shipment or storage. The duplicates provide for a measure of the precision of the measurement system, and for good precision we expect to see the coefficient of variation (COV) of a set of duplicates of less than 10%. The duplicate serial numbers for this project are 69628/69629, 69665/69666, and 69623/69624, with COV's of 3.7%, 4.6%, and 0.9% respectively, all well below the 10% limit. Spikes are also performed on a monthly basis with a radon chamber in Dayton, Ohio, with individual relative errors on the order of less than +/- 10%.

Test results show some interesting findings:

The ground floor shows values ranging from 5.2 (front dock) to 230 pCi/L (furnace room). The two docks show a significant difference, with the back dock showing 23 and 28 pCi/L, and the front dock showing only 5.2 pCi/L. This difference could be due to ventilations rates, source contamination, or soil gas entry rates from below the slab. Ventilation rates may possibly be determined just by visual observation, and contamination rates have already been done in the back dock, with some significant results. No front dock smear samples seem to have been taken, nor would the radon test results suggest much of a problem.

The current round of radon test results are consistent with the previous test results of November 2007 where two charcoal canisters showed results of 34.7 and 33.7 on the ground floor. These two test results were performed by ?????????????????????????? (SEC)

The highest radon test result on the ground floor of 230 pCi/l correlates with the highest microR reading of 230 µR/hr in the furnace room. The two values of 230 are only coincidental.

Eleven test kits were placed directly on the concrete floor on the ground floor area. This was done to see if we could determine if the building radon was due to the Ra-226 surface contamination inside the building or the more typical naturally occurring Ra-226 soil gas contribution from below the building. We may not be able to be conclusive in this determination. It should be noted that test kit placement on the floor surface is contrary to placement protocol. With the one exception of the 230 pCi/L value in the furnace room the floor placement test kits are similar to the waist high placement test kits. Would this suggest that most of the surface contamination is not contributing to the building radon?

In the residential testing environment the basement radon value typically shows about twice the radon value as the floor above it. This is not the case in this survey, with second floor readings being higher than first floor readings, with the one exception of the 230 value in the furnace room. Second floor apartment values range from 15 to 74 pCi/L. This may tend to suggest that there is an additional source of radon on the second floor, other than the typical soil gas movement from soil to basement to first floor to second floor, etc. In this particular case that suspected contamination may in fact be from Ra-226. Another possibility could be radon entry via ground water use in the apartments, if in fact their water source is from a well. This could easily be tested.

The final observation is the difference in radon values in each apartment, with highest to lowest being, apartment 4, apartment 3, apartment 2, and apartment 1. This again could be an indication of variable contamination within the different apartments?

These radon values are all of a significant health concern in light of the US EPA guideline value of 4.0 pCi/L, particularly the second floor apartments where more residence time is expected.