

## DUAL STANDARD OR CORRECT PROTOCOL? AN ANALYSIS OF CONTINUOUS MONITORS IN REAL ESTATE TRANSACTION TESTING UNDER EPA PROTOCOL

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### ABSTRACT

This paper presents data from continuous monitors and passive devices that are used in real estate transaction testing. It compares performance data and draws conclusions pertaining to the application of the EPA protocols as they relate to real estate testing.

### INTRODUCTION

The EPA Home Buyer's and Seller's Guide to Radon was first published in March 1993 as EPA document number 402-R-93-003, and establishes the protocols used in performing radon tests during real estate transactions. Its supporting document, Rationale for the Home Buyer's and Seller's Guide to Radon preceded its publication in February of 1993 and outlines the reasoning behind the real estate protocols. After two years of application, flaws in the protocols are apparent.

### METHODOLOGY

A comparison of the Rationale for the Home Buyer's Guide and the resulting protocols to available equipment, field practices and completed research of test interference was performed. Much of the test interference criteria was taken from the STUDY OF THE EFFECT OF TAMPERING AND ITS DETECTION DURING SHORT-TERM TESTS (1994 Brodhead, Porter).

### PROTOCOL REVIEW

Under SHORT-TERM TESTING OPTIONS on page 14 of the Home Buyer's and Seller's Guide to Radon it states that passive devices must: "Take an initial short-term test for at least 48 hours. After the first test has been completed, take a follow-up short-term test for at least 48 hours. *or* Take two short-term tests at the same time in the same location for at least 48 hours." If an active device is used the guidance states: "Test the home with a continuous monitor for at least 48 hours."

According to the Rationale for the Home Buyer's and Seller's Guide: "The Science Advisory Board (SAB) determined that a single active device could be used for the purposes of making mitigation decisions. This is *because many active devices also have features which help prevent device interference, a major potential source of measurement error* in real estate radon testing." (Italics by author) The document went on to state that: "Active devices can provide continuous recording of radon concentrations over the course of the measurement period and can more readily discern unusual or suspicious swings in radon levels. Because of this technical capability, the SAB determined that radon test results from a single short-term active device could also be used to determine whether a should be remediated. Based on the SAB's recommendation, the EPA included the use of a single, active device

which utilizes data recording capabilities among the short term testing recommendations. EPA's *Protocols for Radon and Radon Decay Product Measurements in Homes* provides detailed guidance to measurement companies and others on test specifics....Active devices also contain features such as motion detectors, temperature and barometric pressure recording instrumentation, and proximity detectors which can also assist in detecting interference."

## **FIELD RESEARCH REVIEW**

A 1993 study, sponsored by the Pennsylvania Department of Environmental Resources (PA DER), evaluated methods and equipment which could be used to detect or deter test interference. This study was conducted by Bill Brodhead and Sydney W. Porter. The study examined a broad range of manipulative factors that could influence the final results of a radon test. The conclusion of the study states "Considering the limited cases that tampering takes place and is effective, a tester should consider only the minimum methods which are easily accomplished and effective...The EPA in the "Home Protocols" is directing testers, however, to take the necessary steps to ensure that the test conditions are being maintained. Non-interference methods such as using caulk or void seals can be low cost and effective, while adding assurance that the measurements were properly done."

In evaluating the various methods of determining tampering, the study indicated: "Hour by hour measurements were only instrumental in determining that tampering had taken place when drastic changes or unusual levels were recorded". When discussing movement indicators the study cited "These devices were obviously helpful in determining if tampering had taken place. The continuous monitor movement indicators were significantly more helpful than the cage movement indicators because they could record each time and hour that the movement took place". Factors failing to adequately indicate tampering were; temperature, humidity, pressure, equilibrium and CO2 changes.

It was obvious from the in-depth research conducted by Brodhead and Porter that virtually any test device can be thwarted on its own and that the most important function in a real estate transaction test is the communication power of the technician. "All the non-interference methods that would discourage tampering should be explained to the dwelling occupants and be left in writing near the detector. If the occupants know that the test will be invalidated if they cause a seal to be broken or an indicator to be tripped then they will take extra precautions to ensure that the test conditions are maintained".

## **A COMPARISON OF EPA PROTOCOLS AND RATIONALE TO RESEARCH**

According to the EPA rationale, a single active device could be used; "because many active devices also have features which help to prevent device interference, a major potential source of measurement error in real estate radon testing". But the PA DER study appears to indicate that device interference indicators are not indicative of any single type of test device and should be more closely associated with professional practice than technological wizardry. Additionally, the EPA contends: "Active devices also contain features such as motion detectors, temperature and barometric pressure recording instrumentation, and proximity detectors which can also assist in detecting interference". The fact is that few continuous monitors are equipped with this instrumentation. This points to the major problem that exists with the EPA Buyer's and Seller's Guide to Radon, overgeneralization.

The EPA Buyer's and Seller's Guide to Radon fails to state that an active device must utilize "data recording capabilities" in order to be used as a single test in a real estate transaction, even though the *Rationale* for the EPA Guide indicates this was the basis for allowing a continuous monitor to be used alone. Furthermore, while the SAB indicated test interference was a concern, their attention focused primarily on qualifying short-term measurement accuracies due to variations caused by time of day, weather, occupancy patterns and by season. Upon review of the PA DER study it appears a continuous monitor cannot account for these variables in any statistically significant form. With this in mind, the initial concern expressed by the SAB regarding false positives and false negatives equally

applies to continuous monitors. The methodology to rectify this concern, as recommended by the SAB, should then be equally applied to continuous monitors as well as passive devices. The resulting advice from the SAB to deal with this concern was to perform two short-term tests either simultaneously or sequentially.

### ADDITIONAL DATA ANALYSIS

Since April of 1995 Air Chek, Inc. has been performing comparison tests with femto-Tech 510 continuous monitors. This data is gathered from homes during real estate transaction testing. The monitors are placed and retrieved by independent RMP listed inspection personnel. The data garnered from these tests show consistent results with an average valid test spread of 9.1% with the highest spread being 20.0% and the lowest being 0.0%. The mean of the spread was 9.7% with the mean pCi/L reading being 1.4 pCi/L. While this analysis was performed with a very limited database (under 100 tests) it indicates that diurnal fluctuations of radon in structures undergoing real estate transaction testing have little effect on the test data generated by this type of activated carbon detector. Additional conversations with the manufacturer of the continuous monitor indicated that similar results have been achieved by other continuous monitor primary laboratories that use Air Chek test kits to perform replicate measurements for the 510 monitors. This practice of performing side by side measurements should readily meet the criteria established by the SAB regarding simultaneous testing.

### CONCLUSION

The EPA protocol, as stated in the Buyer's and Seller's Guide to Radon, is inconsistent with the Rationale for the Home Buyer's and Seller's Guide to Radon. The *Buyer's Guide* makes no mention of the need for an activated continuous monitor to have data recording capabilities. The *Buyer's Guide* protocol for continuous monitors also fails to account for variations caused by time of day, weather, occupancy patterns and season which were the primary concerns of the SAB regarding short-term tests.

While the Buyer's and Seller's Guide for Radon does address test interference measures it falls short in this area also. Test interference indicators are not the private domain of continuous monitors nor are they even an option on many manufacturer's models. Some passive devices have been applying test interference indicators successfully for several years.