

**GUIDELINES FOR
RADON/RADON DECAY PRODUCT TESTING
IN REAL ESTATE TRANSACTIONS
OF RESIDENTIAL DWELLINGS**

PREPARED BY

AMERICAN ASSOCIATION OF RADON SCIENTISTS AND TECHNOLOGISTS
REAL ESTATE TESTING COMMITTEE

This document has come about from the hard work over the past two years of many talented individuals who are professionally involved in radon. The document started in a real estate testing committee of the Eastern Pennsylvania Chapter of AARST. The committee's year and a half work was completed and turned over to a special sub-committee of the National AARST Technical Committee in October of 1990. This national committee is presently composed of the following individuals:
Co-Chairs - Bill Brodhead & Richard Roth, Rich Tucker, Jack Dempsey, Dan Cutler, John Sykes, Ian Thompson, Bill Belanger.

This draft document is the most recent version and although close to a final version is still open to revision and comments. The intent of the committee is to have a final version approved for presentation to the National AARST membership for a vote at the EPA Symposium during the first week of April.

To date there have been many inquiries for the most recent version of this document from state agencies in order to help guide them in setting state policies. It is anticipated that this will be the first such document to address real estate testing directly and thus be influential in the direction that testing regulations take in this critical area.

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Version 14B
March 1991

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INTRODUCTION

The American Association of Radon Scientists and Technologists (AARST) is a national, non-profit professional and trade association devoted to benefiting the public health and to formulating measurement and remediation guidelines that assist its members in maintaining a high level of integrity, among other objectives.

Scientific studies since the 1950's have shown a direct relationship between elevated radon and radon decay product concentrations and an increased probability of the incidence of lung cancer. In view of the potential increased risk from lung cancer associated with elevated radon and radon decay products, we, as a professional association, recommend that every occupied dwelling be tested for radon or radon decay products as outlined in the EPA pamphlet, "A Citizen's Guide To Radon" or this guideline.

We further recommend in situations where a dwelling is involved in a real estate transfer, with its many complicating and demanding factors, that it be tested by a professional radon testing technician who is EPA proficient and/or state certified and that the test, as a minimum be conducted according to the guidelines given in this document.

We also recommend that after the installation of a radon mitigation system, a short term test or tests be performed by a testing technician. If the results of this test are below EPA action guidelines, a long term test or several short term tests in different seasons should be done to better define the average concentration of the locations tested and insure that the levels have been adequately reduced.

PURPOSE

This document provides voluntary guidelines for AARST members and other radon testing professionals to follow when conducting radon and radon progeny measurements in residential dwellings involved in the process of a real estate transaction. The purpose of this document is to prescribe procedures and actions which will ensure that accurate measurements are made with a high level of quality assurance and in a manner that is ethical and professional.

Compliance with these guidelines requires that all applicable provisions be completely followed. Exceeding these guidelines is encouraged when doing so is compatible with the purpose of this document.

The Appendices that follow this guideline are listed strictly as examples and are not a part of this guideline. The use of the information or examples in the Appendices is not required to comply with this guideline.

SCOPE

This guideline applies to measurements of indoor radon and radon decay products made in conjunction with real estate transactions of residential dwellings as defined within this document.

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This is a living document that is not intended to limit innovative techniques or research, inhibit or prevent consumer choices or prevent positive changes in the industry and, as such, will be reviewed for content, applicability and new developments in the field on a periodic basis.

DEFINITIONS

Terms used in this document are defined as follows:

Action Guidelines - The level of radon or radon decay products in a home above which the EPA recommends taking corrective action and below which the EPA recommends that the occupant should decide if they should take corrective action to further reduce their exposure.

Active Detector - A radon or radon decay product detector that includes electronics or an active pump.

ARE - The absolute value of the relative error as defined by the EPA.
$$\text{ARE} = | (MV - AV) / AV |$$
 where MV = Measured Value, and
AV = Actual Value.

Attic Ventilator - An exhaust fan installed in the roof or gable of a dwelling that is used to ventilate the attic space.

Average - The number obtained by dividing the sum of a set of quantities by the number of quantities in the set.

Citizen's Guide - EPA Document OPA-86-004 "A Citizen's Guide To Radon", or any revision, amendment or substitution to this document. The Citizen's Guide is an explanation for homeowners of what radon is, how to test their own house for it, and what action would be appropriate based on the test results.

Client - Person, persons or businesses who have contracted with a radon testing company to perform a radon survey in a dwelling involved in a real estate transfer.

Closed-House Conditions - Those conditions defined in the EPA Measurement Protocols and this document for the limiting of building ventilation.

Coefficient of Variation (COV) - The percentage of variation of one measurement to another measurement.

The formula is:

First measurement = M1
Second measurement = M2

$$\frac{\sqrt{(M_1 - M_2)^2 / 2}}{(M_1 + M_2) / 2}$$

Combustion Appliance - A unit designed for heating that burns a fuel inside a dwelling that should have the exhaust gases vented to the outside. Examples of this are wood/coal stoves, fireplaces, oil and gas furnaces, boilers and water heaters. A heat pump or a freestanding kerosene stove is not included in this definition.

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Detector - Any radon or radon decay product measuring device that is used by a testing company and with which the company has successfully passed the most recent EPA RMPP round for that type of detector and/or has met any government or government recognized certification requirements of the state in which the detector is used.

Diagnostic Measurements - Measurements used to help diagnose radon entry routes, radon flux and building conditions. They may or may not follow this guideline or the EPA Measurement Protocols.

Dwelling - A permanent residential structure that is or could be occupied at least 10 hours per week. Excluded are dwellings that are situated above livable spaces over which the occupant of the dwelling has no control. It does not include commercial, industrial, or institutional buildings.

EPA - The United States Environmental Protection Agency.

EPA Measurement Protocols - The following EPA documents: "Interim Indoor Radon and Radon Decay Product Measurement Protocols" (EPA 520/1-86-04, April 1986); "Interim Protocols for Screening and Follow-up Radon and Radon Decay Product Measurements" (EPA 520/1-86-014-1, February 1987); and "Indoor Radon and Radon Decay Product Measurement Protocols" (February 1989) or any revision, amendments, or replacements to these documents that describe how a radon measurement is to be made. Any reference to EPA Protocols refers to those in effect at the time of testing.

Equilibrium Ratio - The ratio of the potential alpha energy concentration in the air to that which would exist if all short lived radon decay products were in equilibrium with the radon present. A formula for determining the equilibrium ratio is: $ER = (WL \times 100) / pCi/L$.

Follow-up Measurements - Radon measurements that are made to confirm whether the average yearly radon levels, indicated from previous measurements, are above the EPA recommended action level.

Fresh Air Supply - An air duct or air intake that routes outside air to a heating or cooling air handling system to add fresh air to the dwelling.

Lived-In Area - A habitable space within a dwelling that is used for cooking, dining, eating, sleeping or living in. It does not include areas used for closets, storage, hallways, utility rooms, laundry rooms or bathrooms.

Long Term Testing - Any radon or radon decay product measurement that is acknowledged as appropriate and acceptable in the EPA measurement protocols and has a duration of more than three months.

Lowest Livable Area - The lowest level of the house that is a lived-in area or could be converted into a lived-in area without major

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structural changes such as lowering the floor to create necessary head room.

Make-up Air - Fresh air that is routed directly from the outside to a combustion appliance to supply combustion air that would otherwise be drawn from indoor air.

MARE - The mean absolute value of the relative errors as defined by the EPA, MARE = the average of the ARE's.

Mitigation System - The permanent installation of materials, equipment or an apparatus that is specifically designed to reduce radon or radon decay product levels in a dwelling.

Non-Interference Agreement - A written agreement that is signed by both a representative of the testing company and by the party or parties responsible for maintaining the required conditions of the radon survey at the dwelling being tested, wherein the parties state that they understand and will maintain the necessary conditions for a proper test to be conducted.

Normal Occupied Temperature - Typically this is between 65 and 75 degrees in the lived in portions of the dwelling. It can however be different in rooms that are occupied irregularly, such as an unfinished basement or an attached green house.

Occupant - A person living in a dwelling who may or may not be the owner of the dwelling, and is responsible for the dwelling.

Parties - Owner(s) of the dwelling, buyer(s) of the dwelling, anyone acting as an authorized agent for the buyer(s) or owner(s), any person who is responsible for maintaining the dwelling to be tested on behalf of the owner.

Passive Detector - A radon or radon decay product measuring device that contains no energized electronic parts or pumps. Examples of passive detectors are charcoal canisters and vials, electret ion chambers, or alpha track detectors.

pCi/L - A unit of measurement of the concentration of radioactivity in a fluid, usually a gas. One pCi/L corresponds to 0.037 radioactive disintegrations per second in a liter of air. One pCi/L is the equivalent of 37 Bq/m³.

Primary Measurements - Radon or radon decay product measurements that provide an averaged concentration over the exposure period. The detector shall be located as specified in the EPA Measurement Protocols. The detector shall be exposed in accordance with the recommendations of the detector manufacturer or supplier. The detector exposure time shall not be less than the recommended time as specified in the EPA Measurement Protocols, the Citizen's Guide or any future EPA Real Estate Testing Protocols. The detector shall not be exposed for fewer than 48 continuous hours.

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Radon - When used in this guideline without modification, the terms "radon" or "radon measurement" refer to the radioactive elements radon (^{222}Rn) and/or its short-lived decay products. If this document states "radon gas", the term refers only to ^{222}Rn , a naturally occurring radioactive element which is a gas and is measured in units of picocuries per liter (pCi/L) or in units of Becquerels per cubic meter (Bq/m^3).

Radon Decay Products - Refers to the first four decay products of radon gas, Polonium 218, Lead 214, Bismuth 214, and Polonium 214. Radon Decay Products are also referred to as radon progeny or radon daughters. The concentration of these products is a combined measurement that is reported in units of working level (WL).

Radon Survey - The process of a testing company following these guidelines in the placing of detectors to sample and analyze the air of a dwelling, either passively or actively, to measure the radon or radon decay product concentration during the test period.

Real Estate Transactions - This refers to the refinancing of a dwelling or the transfer of the title of a dwelling to a new owner and preparing for such actions.

Responsible Individual - This refers to the person or persons who is/are responsible for assuring that closed house conditions are being maintained at a dwelling during a radon survey. This responsible individual does not necessarily have to be the owner of the dwelling.

RMPP - Radon Measurement Proficiency Program sponsored by the EPA to determine the proficiency of testers testing for radon gas and radon decay products

Severe Storm - A period of at least two hours during a test period when the outside winds average at least 25 miles per hour greater than the normal wind speed or there has been over 3/10" of rainfall greater than a typical rainfall for that area in 24 hours.

Shall - indicates a requirement that is necessary to fully adhere to the provisions of this document.

Short Term Testing - Any radon or radon decay product measurement that is a primary measurement and has a duration of from two days to three months.

Should - indicates an advisory recommendation that is to be applied whenever practical.

Structural Area - Each area of a dwelling located directly above a distinct foundation type. Examples of distinct foundation types are a basement, crawl space or slab on grade.

Structural Openings - These are openings from the livable and lived-in portions of the dwelling to the outside that allow a significant exchange of air between the inside and the outside. Examples of these

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openings would be large air spaces around pipes that penetrate above grade, windows that are broken or will not fully close, large gaps around cellar doors, and crawl space foundation vents.

Test Period - This includes the continuous sampling time of the radon or radon decay product detector. If the detector sampling period is four days or fewer in duration, then the test period must be immediately preceded by 12 hours of closed house conditions. The detector exposure period shall be in increments of 24 hours, plus or minus 2 hours for each day of exposure length. This means that a three day test can be exposed from 66 to 78 hours. The exceptions to this are: An exposure period cannot be fewer than 48 hours; an exposure period cannot be less than the minimum exposure time recommended in the EPA Measurement Protocols, future EPA Real Estate Testing Protocols, the Citizen's Guide or regulations of the state in which the test is being carried out; an exposure period shall be in accordance with the manufacturer or supplier recommendations.

Testing Company - A company or an individual who provides a radon survey for a dwelling involved in a real estate transfer.

Testing Technician - The person responsible for placing and retrieving the radon or radon decay product detector. This person may be the owner, an employee or a sub-contractor of the testing company. This technician shall abide by all the requirements of the state in which the test is being conducted. The technician shall be under the supervision of the testing company. The technician shall have, as a minimum, attended a state or federally approved radon testing course that fulfills any necessary educational requirements for state certification in the state in which the test is being performed, or shall have been continually employed for one year as a testing technician under the supervision of a state certified company.

Whole House Fan - A large exhaust fan used to ventilate the whole house. Typically the fan is installed in the ceiling or attic of the dwelling and draws air from the ceiling of the highest floor of the dwelling.

Working Level (WL) - A measurement unit of the energy that is released by the successive disintegrations of the four short term decay products that follow radon gas in a measured volume of air over a specified amount of time.

1 . 0 TESTING GUIDELINES

1.1 The guidelines of this document shall be followed unless superseded by the EPA Measurement Protocols or any regulations or certification requirements of the state in which the radon survey is being performed. The testing requirements of any state shall be followed for measurements performed in that state. The existing laws, ordinances and regulations of all governing bodies shall be complied with in any location in which business is being conducted. If any state or Federal regulations has minimum requirements and these

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guidelines exceed the state or federal regulations, then, these guidelines should be followed.

1.2 Real estate transfer radon tests in a state which has a certification program shall only be conducted by a state certified testing technician or certified testing company. In all cases the placement and retrieval of the detector for the primary measurement of a radon survey shall only be performed by a testing technician.

1.3 A radon survey shall have a minimum of one primary measurement in each lowest livable structural area of the residential dwelling. The same type or a combination of different types of detectors exposed concurrently can be implemented. The testing technician may make any number of additional or diagnostic measurements to obtain additional information. The measurement placement shall conform to the current EPA measurement protocols for screening and follow-up measurements.

1.4 The testing device shall not be moved, covered or have its performance altered during the radon survey by anyone.

1.5 Dwellings that are being tested with short term measurements shall have emphasis placed on maintaining closed-house conditions during the measurement period.

1.5.1 The testing company shall determine who is the responsible individual for the dwelling during the test period. The testing company shall inform the responsible individual of the requirements of and the need for closed-house conditions as well as all other conditions of the test before the detector is exposed.

1.5.2 When the radon survey is four days or fewer in duration, the testing technician shall inquire to determine if closed house conditions have been maintained for the twelve hours prior to the start of the test. If the testing technician discovers that closed house conditions were not maintained or discovers structural openings that are due to disrepair or structural defects and these openings allow a significant amount of ventilation, the radon survey shall not be initiated until such structural openings have been corrected and twelve hours of prior closed house conditions have been maintained including the repair of the openings mentioned. Closed house conditions prior to the start of the radon survey do not need to be maintained if the exposure period extends to at least four days with an appropriate detector.

1.5.3 Closed house conditions require that all the windows shall be kept closed and external doors shall be closed except for normal momentary entering and exiting during the test period. All windows and exterior doors shall be inspected by the testing technician at the placement and retrieval of the detector.

Heating, air conditioning, and heat recovery ventilators can be operated normally. Operation of dryers, range hoods, and bathroom fans should be kept to a minimum. The responsible

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individual, however, should be warned that over-use of an exhaust appliance may effect the final readings. Whole house fans shall not be operated. Portable window fans shall be removed from the window or sealed in place. Window air conditioning units shall only be operated in a recirculating mode. Fireplaces or combustion appliances that are not primary heat sources shall not be operated. No ceiling fans, portable dehumidifiers, portable humidifiers, portable air filters portable room air conditioners, to operate in the same room as the detector. If the dwelling contains an air handling system, the air handling system shall not be set for continuous operation.

1.5.4 For short term testing, a notification that a radon survey is in progress, with the conditions of the test stated on the notification, shall be posted in a conspicuous location at the dwelling so that all occupants shall have access to information about the test and the conditions of the test. Appendix D is an example of a testing notification form.

1.5.5 The responsible individual shall be requested to sign a non-interference agreement that indicates a knowledge of the testing conditions of this guideline and a willingness to cooperate in maintaining the required test conditions. If such an agreement cannot or will not be signed by the responsible individual, the testing company shall indicate why the signature was not obtained. Appendix A and B are examples of Non-Interference Agreements.

This signed agreement, along with an inspection of the dwelling at the placement and retrieval of the detector, the informing of the responsible individual, and the posting of a testing notification, shall fulfill a test company's minimum requirements for verifying closed house conditions. This guide does not require the testing technician to be responsible for inspecting for closed house conditions 12 hours before the start of the test or between placement and retrieval.

1.6 Test periods that are four days or less and are made immediately following the installation of a radon mitigation system shall not begin the exposure period for a minimum of 24 hours after the system is completed and operating. Closed house conditions shall be maintained for the 24 hours preceding the start of this test. Test periods that are greater than four days can, however, be started immediately after completing the radon installation.

1.7 If the radon survey is to be a long term measurement, closed house conditions do not have to be maintained. The testing individual or testing company shall, however, recommend to the owner or occupant of the dwelling that at least half the test period should be during the season that the home will most likely be operated with closed house conditions and that reasonable closed house conditions should be maintained during the test period so that the results of the test are more accurate indicators of the yearly average.

1.8 New construction shall not be tested unless the test complies

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with EPA testing protocols and the following items, if such items are part of the completed dwelling, are installed and completed before the radon survey is initiated: all insulation, all exterior doors, all windows, all fireplaces and fireplace dampers, all ceiling coverings, all interior coverings and interior trim for the exterior walls, all exterior siding, weatherproofing and caulking. If the testing technician or testing company knows work is to be done inside the dwelling during the test period which will interfere with the performance of the test, the testing company shall re-schedule the test.

2.0 QUALITY ASSURANCE

2.1 The testing individual or testing company shall have and abide by a written Quality Assurance Plan (QAP) and a written Standard Operating Procedures (SOP). The QAP and SOP shall be prepared in accordance with the EPA Measurement Protocols and ANSI N323-1978 as well as any relevant EPA, ANSI and detector manufacturers documents.

2.2 All detectors shall only be used according to manufacturers specifications for all primary measurements.

2.3 At least one or a minimum of 20% of all active detectors shall be calibrated at least once a year in a radon chamber that is inter-compared with an EPA or DOE radon chamber or shall calibrate with a source that is traceable to the National Institute of Standards and Technology (NIST). Calibrations shall be according to the manufacturers protocols and shall include all necessary checking of equipment functions.

If the calibration test "ARE" for any active detector or the "MARE" of a group of similar passive detectors is greater than 25%, then the testing company shall make any necessary corrections and repeat the comparison test as specified above, or discontinue testing service with the detector or detectors until its accuracy is confirmed by the test specified above.

2.4 All other active detectors used by the testing company will be inter-compared at least 5% of their usage with a detector calibrated according to the procedures listed in 2.3. If any of these testing company inter-comparisons produce an "ARE" greater than 10% from the calibrated detector, then the deviant detector or detectors shall be recalibrated to match the chamber calibrated detector and re-compared to the chamber calibrated detector to verify accuracy before being used again.

2.5 To assure proper operation of active instruments between calibrations, the instrument should be tested with a check source prior to each measurement survey. Ambient background radiation readings and/or blank samplers or detectors shall be obtained at the sampling frequency specified by the manufacturer.

2.6 Each active detector shall have its identification code and its latest calibration date written on the outside of the detector.

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2.7 All calibration and check source data shall be recorded and maintained by the testing company.

2.8 QAP's for testing companies that utilize passive detectors shall include a minimum of approximately 5% of each type of passive detector deployed or 25 each month, whichever is smaller, set aside as blanks. These blanks will be treated identically as similar field detectors except they will be kept sealed in a low radon environment, less than 0.5 pCi/l, during the exposure period of the field detectors and returned for analysis along with the field detectors. If one or more of the field blanks produces a measurement result that is significantly greater than the LLD or other standard specified by the manufacturer for that detector then additional blanks will be returned for analysis. If any of these blanks also have measurement results greater than the LLD commercial use of this detector type will be discontinued until correction can be made and verified by the processing laboratory.

2.10 QAP's for testing companies shall include a minimum of approximately 10% of each type of detector deployed or 50 each month, whichever is smaller, exposed as a duplicate with another detector, side by side exposure. Each duplicate shall be treated identically. If possible the duplicates shall not be identified as such to the processing laboratory. These duplicates shall be distributed throughout the radon surveys conducted during the month. If any of these duplicate measurements have greater COV than 25% from each other at radon concentrations greater than 4 pCi/l than duplicate measurements will be made with the next radon exposure of the same detector. If this duplicate measurement also produces a COV more than 25% from the duplicate detectors, then commercial use of this detector will be discontinued until the precision of the detector is verified to be within the above standard.

3.0 REPORTING TEST RESULTS

3.1 The test report shall be in writing and either mailed, faxed or handed to the client within five business days after the results are available to the testing company. All reporting statements required by this document shall be included in the test report. The client should be informed of any reporting of results to persons other than the client.

3.2 The test report shall contain all individual primary measurement results and their locations. The test report shall contain a description of the type of detector used, its manufacturer, model or type and the detector identification numbers. No average of any measurements made throughout the dwelling shall be reported. Any diagnostic measurements shall be reported as such.

3.3 If there is a visible active radon mitigation system installed in the dwelling, the testing company shall include a statement in the test report indicating the presence and operation of a mitigation system at the time of placement and retrieval of the detector. The testing

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company should include a statement that the testing company makes no claims as to the proper operation of the system.

3.4 Any readily visible structural openings shall be noted on the test report as to their presence and condition.

3.5 Any Known variation from the required test conditions during the test period that the testing company or testing technician discovers shall be included in the test report. If the testing technician or testing company discovers that the test area is not maintained at normal occupied temperatures during any portions of the test period at the time of placement or retrieval of the detector, the test report shall report this condition.

3.6 The test report should describe the general limitations of the test such as the following statements: the testing company cannot be assured that the necessary conditions of the test were interfered with or that any interference would influence the radon or radon decay product measurement; there is an uncertainty with any measurement result due to statistical variation and other factors; there are daily and seasonal variations in radon concentrations due to changes in the weather and operation of the dwelling; if a severe storm occurred during a short term test period, it may raise or lower the radon levels of the building, and it may be necessary to repeat the test.

3.7 The measurements shall be reported in units that are appropriate to the measurement method. Any test results that convert the measurements to the unit of another product shall include a statement similar to the following:

Any conversions from WL to pCi/L or pCi/L to WL are only approximate conversions and are not likely to be the true concentration of the converted value.

3.8 All test results shall include a statement which recommends that the dwelling be retested for each of the following situations whether the dwelling has or has not been mitigated:

- a) Occupancy by a new owner
- b) A period of six months since a short term test
- c) A period of three years since a long term test
- d) A new addition to the dwelling
- e) An alteration is made to the dwelling which could change the ventilation pattern of the dwelling
- f) Major cracks occur in the foundation walls or slab
- g) An unsealed penetration is made in a foundation wall or slab
- h) Significant construction blasting or earthquakes
- i) Changes are made or happen to an installed mitigation system*

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APPENDIX A

**EXAMPLE OF A NON-INTERFERENCE RADON TEST AGREEMENT
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REQUIRED CONDITIONS OF THE RADON SURVEY

Radon and radon decay product concentrations in a dwelling fluctuate. The following test recommendations were developed by the USEPA to provide standardized conditions under which a short term radon test is to be performed in order to reduce the variation in radon levels in a dwelling. These conditions will tend to maximize the radon measurement in order to determine if a dwelling has the "potential" to have an elevated radon level. If the result is elevated, the EPA recommends further testing to better determine the yearly average concentration.

The radon technician has my permission to install and retrieve radon testing devices at the property listed below. AGREE _____ DISAGREE _____

I/WE will not move, cover or try to alter or effect the performance of the test devices. AGREE _____ DISAGREE _____

I/WE will not touch, and/or remove any non-interference controls which may be used. AGREE _____ DISAGREE _____

I/WE will not operate equipment, other than a HRV, which brings fresh air directly into the building. AGREE _____ DISAGREE _____

I/WE will not use any whole house ventilating fans, wood stoves or fireplaces unless they are primary heaters. AGREE _____ DISAGREE _____

I/WE will keep all windows closed and external doors closed except for normal momentary entering and exiting. AGREE _____ DISAGREE _____

I/WE agree that the normal occupied operating temperature be maintained at the test location. AGREE _____ DISAGREE _____

I/WE will notify the testing co. during or at the test conclusion if any conditions of the agreement are violated. AGREE _____ DISAGREE _____

I/WE agree that the above conditions have been or will be maintained by all persons at the test location during the testing period. If the measurement period is four days or less I/WE verify and agree that these conditions have been or will be maintained for the 12 hours before the detector is exposed. AGREE _____ DISAGREE _____

Property Location: _____

Detector Type & Locations Testing Technician _____

1st _____ Owner _____

2nd _____ Agent _____

3rd _____ Signing Date _____

Installed Date/Time _____ Retrieval Date/Time _____

Comments:

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APPENDIX B

**EXAMPLE OF A NON-INTERFERENCE RADON SURVEY AGREEMENT
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REQUIRED CONDITIONS OF THE RADON SURVEY

Radon and radon decay product concentrations in a dwelling fluctuate from hour to hour, from day to day and from season to season. The following test recommendations were developed by the EPA to provide standardized conditions under which a short term radon test is to be performed in order to reduce the variation in radon levels in a dwelling. These conditions will tend to maximize the radon measurement in order to determine if a dwelling has the "potential" to have an elevated radon level. If the result is elevated, the EPA recommends further testing to better determine the yearly average concentration.

If the test conditions below are not adhered to, the test results may be deemed invalid. The following conditions must be read, understood and followed:

All windows must be kept closed. All doors must be kept closed except for normal, momentary entering and exiting.

The radon detector cannot be moved, covered or altered in any way.

Heating, air conditioning, dryers, range hoods, bathroom fans and attic ventilators can be operated normally. If any heating, air conditioning or ventilating equipment has a built in fresh air supply, it shall be turned off or the inlet closed. Fireplaces or wood stoves shall not be operated, unless they are a primary heat source. Whole house fans shall not be operated. Window fans shall be removed or sealed shut. The dwelling shall be maintained at its normal operating temperature.

These test conditions shall be maintained for 12 hours prior to the start of the radon detector being exposed, unless the test is longer than four days in duration.

If there are any questions, or the test conditions are not met, please contact the testing company at (Co. Phone Number)

I/We the occupant or building custodian understand and will inform all parties in this dwelling of the above conditions of the test. I/we agree to maintain these conditions during the test period.

Property Location: _____

Technician _____ Owner _____

Installed Date/Time _____ Retrieval Date/Time _____

Detector Locations _____

Date _____ Comments: _____

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APPENDIX C

NON-INTERFERENCE CONTROLS

INTRODUCTION

The following are examples of non-interference controls which may or may not be used to help deter or determine that interference has occurred during a radon survey. These examples do not provide complete assurance that a radon survey has or has not been interfered with.

This appendix is provided for reference purposes only and are not required by the guidelines to verify closed house conditions unless these examples are directly specified in the guidelines.

EDUCATION

Before the radon survey is begun, educate all parties responsible for the dwelling to be tested about the conditions of the radon survey, and the necessity to adhere to these conditions or the test results may be deemed invalid. This includes the owner and occupants of the dwelling as well as the real estate brokers or any individuals responsible for the dwelling during the test.

Inform all individuals who may or will enter the dwelling about the conditions of the test by prominently displaying a notification of a radon survey in progress and the conditions of the test, on or near all exterior doors that are normally used for entrance into or out of the dwelling or in another prominent location.

AGREEMENTS

Have the owner or the person responsible for the dwelling read and sign a non-interference agreement.

WINDOWS & DOOR SEALS

Windows, especially those in the same room as the detector, can be marked with seals placed between the window sash and the jambs to identify any movement. Some seals should be visible to help deter anyone from attempting to open the window during the test period. The window could also have invisible seals installed to reduce the chance of someone removing all the seals and later replacing the removed seals when the window is closed. Some of the possible seal materials include clear double stick tape, white paper seals, and removable non-staining adhesive caulk. The seals can be further altered to avoid tampering by using color-coded tape or coloring it at the test site, initialing or coding white paper seals or slicing the seal to make it difficult to remove or open the window without tearing the seal.

Exterior doors that are not the primary entrance into the dwelling could be sealed in a similar manner as the windows or with seals on the door hinges.

DETECTORS

A continuous radon or radon decay product detector can be used that gives interval measurements. An unusual variation in concentrations might indicate that the dwelling was ventilated or the performance of the equipment was altered or that severe weather conditions took place during the exposure period.

To determine if a detector is moved during a test period the

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detectors can be installed in a noted position or on top of a paper with a coded grid or light sensitive paper. The paper would first be installed with double stick tape to secure it in place. The detector would then be placed in a noted location on the grid so that any movement of the detector could be determined at the time of retrieval. The movement of the detector can then be documented by drawing a circle around the detector in its changed position.

The radon entry location into the detector could have a loop of double stick tape installed in such a manner that it does not obstruct the entry of radon into the detector but reduces the possibility of the entry location being covered.

The detector could be placed in or on a motion detector that does not interfere with the performance of the detector but detects any movement.

The detector could be placed to overhang the edge of its stand so that any attempt to cover it up would be difficult.

If the detector stand is portable, the stand could be taped to the floor in a manner that would indicate any attempt to move the stand.

VENTILATION EQUIPMENT

Switches which control ventilation equipment could be held in place with a double stick tape or white initialed tape. This may include the fresh air supply control for a window air conditioner. In an unoccupied home, a seal could also be placed on the electrical control panel to indicate changes in the power supply to the heating equipment.

GRAB SAMPLES

Grab samples taken of radon and/or radon decay products at the beginning and/or end of the test period can be compared to the average test results from the whole exposure period. If there is a significant difference in the readings, it might indicate the building had been ventilated either before or during the exposure period. Grab samples can be used to locate the measurement device in the highest radon location that still falls within the protocols placement location.

MEASUREMENTS of RADON and RADON DECAY PRODUCTS

If both radon and radon decay product measurements are made at the same time at the beginning and/or end of a measurement period, the equilibrium ratio between the readings can be obtained. If there is significant variation in the readings or the reading is significantly low it may indicate that excessive ventilation has taken place.

TEMPERATURE MEASUREMENTS

Temperature readings of the outdoor and the indoor testing area taken at the beginning and end or throughout the measurement period might indicate excessive ventilation if the indoor temperature is significantly closer to the outdoor temperature as compared to the normal occupied temperature of the dwelling.

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APPENDIX D

EXAMPLE OF RADON SURVEY IN PROGRESS NOTIFICATION FORM

RADON SURVEY IN PROGRESS

DO NOT REMOVE THIS NOTIFICATION

The following conditions must be maintained:

- 1) Do not open any windows. Do not open any doors except for normal momentary entering and exiting.
- 2) Do not touch, cover, move or alter the performance of any radon detectors or non-interference controls.
- 3) Do not operate any whole house fan(s). Do not use any fireplace(s) or wood stove(s) unless they are the primary heat source.
- 4) Operate heating and air conditioning normally. Turn off any equipment which supplies fresh air to the house unless it is vented supply air to a combustion appliance.
- 5) The testing locations must be maintained at their normal occupied temperature.

NOTE:

Exhaust fans such as the dryer, range hood, bathroom fan or attic ventilating fan can be operated. This equipment should only be operated normally because any exhaust fan or any combustion appliance may increase the negative pressure in the dwelling, which can raise or lower the radon concentration. Windows must be kept closed because they can create negative pressure in the lower portions of the house due to the warm air escaping or the direction of the wind, which can raise or lower the radon levels

Responsible Party: _____

From: _____

To: _____

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