QUALITY ASSURANCE and QUALITY CONTROL PLAN for MEASUREMENT of INDOOR RADON CONCENTRATION

For Corentium Pro Continuous Radon Monitors by Airthings

COMPANY NAME

COMPANY ADDRESS

COMPANY PHONE

COMPANY EMAIL

COMPANY WEBSITE

Quality Assurance and Quality Control Plan Prepared by:

NAME

JOB TITLE

DATE

Signatures and Dates:

_____ Date
President or Principal Investigator **NAME OF PRESIDENT**

_____ Date
Quality Assurance Officer **NAME OF QA OFFICER**

_____ Date
Individual Operator or Laboratory Director **NAME OF LAB DIRECTOR**

These signatures represent the awareness of-, approval of-, and responsibility for this plan of all persons who have significant responsibility for ensuring that the provisions of this plan are implemented accurately and in a timely fashion.

Revision Date: 17/05/2022

Quality Assurance Plan Template Instructions:

This document provided is a template to be used as a basis for a thorough and effective quality assurance and quality control plan for use with your Corentium Pro radon monitor(s).

This document requires input from the Quality Assurance Officer in your company or organization to be complete. Fill out all of the applicable fields on the title page, section 1.2., 2.1., and 2.2. with the appropriate information required.

The QA Officer should thoroughly read and understand this QA Plan so that it can be implemented effectively. The QA Officer is in charge of training additional Measurement Professionals so that all persons in the Organization can maintain this QA Plan effectively, and in unison.

Add any additional requirements, appendices, or other information your Organization deems necessary for your Quality Assurance Plan and delete this instruction page. To edit this PDF beyond the fillable fields please download an appropriate PDF editor for your operating system.

Note: Many states, including Ohio, have their own rules and regulations. It is advisable to include a copy of these rules and regulations in this Quality Assurance Plan.

AIRTHINGS

1. INTRODUCTION AND DISTRIBUTION LIST

1.1. Introduction

Quality Control and Quality Assurance must be an integral part of any measurement program to ensure the validity and reproducibility of all tests. An expert professional in the field of radon measurement needs to implement and document QA/QC practices as the benefits include not only substantiating the adequacy of each measurement result but will help in a clear understanding of the techniques applied and measures to improve on it as well as procedures for monitoring the performance of equipment, supplies and operators. Documented QA/QC practices will also help to establish credibility with customers.

This Quality Assurance Plan (QA Plan) model has been developed with reference to EPA (EPA Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans [EPA 1980]; EPA Requirements for QA Project Plans [EPA 1992a]).

1.2. Distribution List

This report reflects current operations, and therefore is often updated and revised. The QA Officer has responsibility for incorporating changes, and ensuring that the changes are reviewed and approved by the management, as indicated by their dated signatures on the signature page. After significant revisions, revised copies of this QA Plan are distributed to the following key personnel:

QA PLAN DISTRIBUTION LIST

2. DESCRIPTION OF OPERATIONS & EQUIPMENT

2.1. Operation Description

("Organization") performs measurements of radon concentrations for residences, commercial buildings, and schools. In general, the number of measurements performed ranges from # 1 to 2 month.

The QA Officer is: **NAME OF QA OFFICER**

The employee(s) performing radon tests is/are:

LIST OF MEASUREMENT PROFESSIONALS

2.2. Description of Equipment Used

This Organization measures radon using the Corentium Pro by Airthings, a Continuous Radon Monitor (CRM) device approved by NRSB, device code 31828, AARST/NRPP in the USA, and CARST in Canada, device Code: CR-8233.

The Corentium Pro unit(s) used by this Organization to measure Radon has/have the following serial number(s):

EQUIPMENT SERIAL LIST

3.ORGANIZATION & RESPONSIBILITIES

All the employees of the Organization have key responsibilities in the production of radon measurement operations.

4. RADON MEASUREMENT PROCEDURES

The measurements are made in appropriate locations and test conditions consistent with the EPA recommendations and clients' needs.

4.1. Field Terms

Action Level — The threshold at which local, regional, or national authorities recommend or require mitigation to take place.

Client — Person, persons, or businesses who have contracted with the Organization to perform a radon test in a dwelling.

Occupant — A person living in a dwelling who may or may not be the owner of the dwelling and is responsible for the dwelling, such as a renter, tenant, lessee, or caretaker.

Responsible Individual — This refers to the person or persons responsible for assuring that the test conditions required by this QA Plan are being followed during a radon test. This responsible individual does not necessarily have to be the owner of the dwelling.

Qualified Measurement Professional — The person responsible for placing and retrieving the radon detector. This person may be the owner, employee or subcontractor of the test organization. The Measurement Professional follows all the EPA and AARST recommended guidelines. The Measurement Professional has been certified as a Radon Measurement Professional (RMP) with AARST/NRPP.

Radon Test — The process of a test organization following the guidelines of this QA Plan and making one or more primary measurements to sample and analyze the air in a dwelling, either passively or actively, so as to measure the radon concentration during the test period in the areas being sampled.

4.2. Measurement Types

Long-Term Measurement — Any radon measurement that is acknowledged as appropriate and acceptable in the EPA and AARST protocols and has duration of more than ninety (90) days. The detector is to be located as specified in the EPA, AARST and or NRSB Protocols. Long term measurements are normally made using a long- term measurement device exposed continuously over the exposure period. Corentium Pro is to be operated in accordance with the recommendations of Airthings.

Short-Term Measurement — Any radon measurement that is a primary measurement and has a duration of from two (2) to ninety (90) days.

> ***Note (1):*** *EPA and AARST recommend long-term measurements, but not to the exclusion of short-term measurements. Long-term measurements, especially year-long measurements provide the best estimate of annual exposure. Seasonal long-term measurements also provide greater insight into long-term exposure. However, the demand for short-term measurements is recognized. Time-sensitive, short-term measurements are also recommended.*
>
> ***Note (2):*** *Based on EPA and AARST protocols, measurement durations of LESS THAN 2 days (48/46 hours) are never acceptable to determine radon concentrations for purposes of assessing the need for remedial actions. Since radon concentrations vary over time, it is strongly recommended that the result of any short-term measurement be confirmed with a "follow-up" long-term measurement. A single short-term measurement is not a sufficient basis for a decision to mitigate. In this case a follow-up measurement is always necessary for mitigation decision-making regardless of the initial measurement result,*

except for time-sensitive measurements such as those performed during a real estate transaction.

***Note (3)**: A radon measurement has a limited shelf life. Homes, occupant activities, local geology, and other factors can and do change over time and impact the radon concentrations in buildings. Radon measurements should be repeated every 2 years for buildings with mitigation system installed or every 5 years for those without a mitigation system AND average radon level below the recommended action level.*

Follow-up Measurement — A measurement made to verify and characterize a radon problem as indicated by a previously made short-term measurement value at or above 4.0 pCi/L. The result of any initial short-term measurement (regardless of the result) should be confirmed with a long-term follow-up measurement. The follow-up measurement should be made at the same location as the initial measurement. If the result of the long-term follow-up measurement is equal to or greater than 4.0 pCi/L, then remedial action is recommended. If the result of the long-term follow-up measurement is less than 4.0 pCi/L, then remedial action is not recommended, but should be considered if the level is between 2.0 pCi/L and 4.0 pCi/L.

Post-mitigation Measurement — An initial short-term measurement using a continuous radon monitor followed by a long-term measurement made in the same location as the pre-mitigation test. The test must not be started sooner than 24 hours after the installation and start-up of the radon mitigation system. The test must have 24 hours of closed house conditions before the start of the test and closed house conditions during the test. A post-mitigation measurement is done to confirm the degree of success of the mitigation system.

Duplicate Measurement — A measurement performed with a second measurement unit located 10 - 20 cm (4 - 8 inches) away from each other for the purpose of assessing the precision of the measurement devices.

Cross-Check Measurement — A measurement performed with a second measurement unit recently calibrated in the past 30 days and located 10 - 20 cm (4 - 8 inches) from each other for the purpose of assessing the relative bias of the measurement devices. It is best to use a Corentium Pro for cross-check measurement, but if a recently calibrated Corentium Pro is not available then any NRPP-approved device may be used, including passive measurement devices.

4.3. Guidelines, State Regulations & Federal Protocols

EPA and AARST have Guidelines for Radon Measurements in Public Buildings (Schools, Large Buildings, and Multifamily Dwellings) and Residential Dwellings (Homes). Useful publications include *A Citizen's Guide to Radon,* and *Buyers' and Sellers' Guide to Radon.*

4.4. *Choosing a Testing Protocol*

Two types of protocol exist for radon measurements under different circumstances, the time-sensitive protocol, and the extended protocol. The time-sensitive protocol was developed to accommodate the fast-paced nature of real estate where it is not feasible to perform repeated tests, or a long-term test. The extended protocol was developed for normal use for radon measurement which take place outside of real estate transactions.

A. *Use the time-sensitive protocol for real estate transactions, or in any other circumstance where results are needed quickly. Under this protocol a single short-term measurement is sufficient for determining whether or not a building requires mitigation*
B. *Use the extended protocol for all other circumstances. Under this protocol an initial short-term measurement is conducted, and a follow-up measurement is recommended based on the results of the initial measurement. If the results are ≥ 4.0 pCi/L and < 8.0 pCi/L then conduct either a short-term measurement or a long-term measurement. Otherwise, if the results of the initial measurement are ≥ 8.0 pCi/L or if the results are needed quickly then a second short-term measurement should be performed immediately. Average together the two measurement results and give the appropriate recommendation to the client*

4.5. Informing Client About Test Conditions

The Organization makes reasonable efforts to determine who the responsible individual for the dwelling is during the test period. Before any measurements are begun, the responsible individual is informed about the appropriate instructions and conditions following the duration of deployment. A "*Radon Test in Progress*" notification is posted upon initiation of the test (see ***Appendix B***).

4.6. New Construction Test Conditions

Newly constructed dwellings are tested in accordance with this QA Plan. The following items, if such items are part of the completed dwelling, are installed and completed before the radon test is initiated:

A. All insulation
B. All exterior doors, and windows
C. All fireplaces, and fireplace dampers
D. All heating appliances
E. All ceiling coverings

F. All interior trim, and coverings for the exterior walls

G. All exterior siding, weatherproofing, and caulking

If the Organization knows construction work which will likely affect the test results will occur inside the dwelling during the test period, then the Organization should schedule the test during a time when such interference will not occur, or is less likely to take place.

4.7. Safety

The Measurement Professional should not enter any area or perform any test that would damage property or put the Measurement Professional's or another person's safety at risk.

4.8. Choosing a Measurement Location

Measurement locations are chosen according to the following criteria:

A. The locations are consistent with the guidelines set forth by EPA and AARST

B. Choose a room on the lowest level of the home which is currently occupied, or could easily be occupied in the future by the current or future occupants

C. The purpose of the measurement and type of building dictates the measurement strategy and location; specific EPA and AARST guidance is used for measurements for real estate and time-sensitive measurements [*Buyers' and Sellers' Guide to Radon,* and *Protocols for Radon and Radon Decay Product Measurements in Homes*], for Homeowners (*A Citizen's Guide to Radon and Indoor Radon and Radon Decay Product Device Protocols*), and in schools [Radon Measurement in Schools and Reducing Radon in Schools: A Team Approach]

D. Specific needs or requests of clients are considered

E. Additional testing locations should be considered if the area of the testing floor is greater than 2,000 square feet; if the home has multiple air handlers where radon concentrations may vary between the multiple systems; or if the structure has multiple foundations, such as a split-level home with a slab-on-grade lower level and a middle level over a crawlspace

The following general criteria are to be used in selecting the location of Corentium Pro within a room:

A. A location must be selected where Corentium Pro is not to be disturbed during the measurement period

B. The preferred Corentium Pro location is by an interior wall at a height of 0.8 m to 2 m (3 to 6.5 feet) from the floor in the typical breathing zone

C. At least 50 cm (20 inches) from the floor, at least 30 cm (12 inches) below the ceiling, and at least 10 centimeters (4 inches) from other objects or detectors *(but no more than 20 cm (8 inches) from other detectors in the case of duplicate or cross-check measurements)* so as to allow normal airflow around Corentium Pro

D. Detector should be placed at least 30 cm (12 inches) away from exterior walls, and at least 90 cm (3 feet) away from exterior windows and doors or other openings to the exterior.

E. Nothing must impede air flow around Corentium Pro

F. In general, kitchens, bathrooms, laundry rooms, root cellars, garages, closets, cupboards, crawlspaces, or sumps are not suitable measurement locations

G. Do **not** place Corentium Pro near heating, ventilating and air conditioning vents, doors, fans, windows, fireplaces, electrically powered equipment, on television sets, stereos or speakers, or in direct sunlight

H. Do not place Corentium Pro near objects which may emit radiation such as rock collections, granite countertops, slate pool tables, hearths, etc.

4.9. Corentium Pro Hardware Description

A. Reset Button. Pressing this button immediately starts a new radon measurement. This button can be disabled via software settings

B. Bluetooth Connection

C. LED Status Lights

- *Flashing green, yellow and red:* **Monitor self-test**
- *Flashing green:* **Operation mode**
- *Flashing yellow:* **Attention.** Connect to the Corentium Pro app for instructions. Often the yellow light means that the time on Corentium Pro needs to be synchronized. Simply start a measurement from the app to set the time
- *Flashing red:* **The batteries are low, or there is an error.** Connect to the Corentium Pro app for instructions
- *Blue flash and beep:* **Bluetooth connect**
- *Blue flash (once):* **Bluetooth disconnect**
- *Continuous blue:* **USB connected**

1. Kensington Lock for securing Corentium Pro
2. Battery Compartment. Holds 3 AA batteries
3. Tripod Mount
4. Calibration Label
5. Serial Number Label

4.10. Setting Up a Radon Measurement

A radon measurement is initiated by performing the following steps:

A. Perform a routine instrument check as described in ***Section 8.1.***
B. Set up Corentium Pro on a tripod, or a stable, flat surface in a location consistent with the criteria in ***Section 4.8.***
C. Either connect to Corentium Pro with the Mobile App or CRA software and schedule a measurement according to the instructions for the appropriate method; OR press button “A” on the side of the device to initiate a measurement immediately, though this method is not preferred

4.11. Detector Non-Interference

The Measurement Professional should not initiate a measurement if the occupant is moving or is planning remodeling, changes in the heating, ventilating and air conditioning (HVAC) system, or other modifications that may influence the radon concentration during the measurement period. Corentium Pro should not be

deployed if the occupant's schedule precludes termination of the measurement at the appropriate time.

Corentium Pro must not be moved, covered or have its performance altered during the radon measurement by anyone. Examples of performance alteration would be covering Corentium Pro, moving it to another location during the test period, or opening windows during a short-term measurement.

4.12. Minimum Test Condition Verification

The Organization's minimum requirements for verifying test conditions is fulfilled by the following:

A. Informing the responsible individual of the test conditions

B. Obtaining or attempting to obtain a signed non-interference agreement (see ***Section 4.5.***)

C. Conducting a visual inspection of the dwelling upon placement and retrieval of Corentium Pro

D. Posting a *Radon Test in Progress* notification (see ***Appendix B***)

E. ***Note:*** *The person performing the measurement is not responsible for inspecting for closed-building conditions 12 hours before the start of the test, nor are they responsible for inspecting for closed-building conditions between placement and retrieval of Corentium Pro (except when and where required by the local authority)*

5. CHAIN OF CUSTODY AND DOCUMENTATION

Chain of custody for each Corentium Pro includes documenting the exposure location, times and dates in and out, and persons responsible for Corentium Pros prior to-, during-, and after their exposure. The member of the Organization is responsible for ensuring that this information is properly recorded for each measurement.

It is important that enough information about each measurement be recorded on the proper forms by the Measurement Professional who deploys Corentium Pro. This data is important in case further interpretations and measurements are required at a later date.

The information called for on the data form included with Corentium Pro must be accurately completed by the Measurement Professional when Corentium Pro is placed and/or retrieved. The monitor serial number is recorded on a separate log sheet and the Measurement Professional records a description of the location in

the house where it was placed. Corentium Pro is not to be relocated during the measurement period; however, if it is necessary to do so (e.g., during a long-term test), the Measurement Professional should note the new location on all relevant log sheets.

Each device must carry a unique identification/serial number.

The information to be logged should include:

A. Building address of test, and owner or occupant name
B. Start and stop date and times of each measurement
C. Detector acquisition information
D. The detector type and unique identification/serial number for each device
E. Documentation of all readings, analyses, and other operations performed on Corentium Pro
F. Name and certification number of Measurement Professionals placing/retrieving Corentium Pro
G. Reason for the measurement (general, post-mitigation), and any special agreements (closed-building conditions, no tamper, etc.)
H. Location of the measurement room within the building
I. Other easily gathered information that may be useful, such as the type of house, type of heating system, condition of crawl space vents, etc.
J. Any remarks, with respect to the measurement, the testing conditions, etc., which the Measurement Professional may have regarding the defensibility and validity of the test

6. CALIBRATION PROCEDURES

The term **calibration** is used to describe the process to determine a conversion factor relating device or system response (in counts, voltage loss, or track density per time) to radon concentration in pCi/L.
Calibration measurements are measurements which are made in a known radon environment, such as a calibration chamber. Instruments providing immediate results, such as the Corentium Pro, are operated in a chamber to establish individual instrument calibration factors.

Every Corentium Pro is initially calibrated by the manufacturer (Airthings AS). In the United States, Airthings recommends an annual calibration performed by Airthings Lab, an NRSB and AARST/NRPP-certified performance test chamber. The Organization will arrange this annual calibration. If state regulations require more frequent calibrations, the Organization will comply with the local regulations.

Airthings Lab
99 Church Street
Whitinsville, MA 01588
Telephone: 1-833-906-1376, dial 5
www.airthings.com/calibration

6.1. Calibration Schedule

Each Corentium Pro should be calibrated on or before the calibration expiration date listed on the bottom of the unit, or if the unit is suspected to be, or is determined to be producing erroneous results. If a unit is past its calibration date, it should not be relied upon for producing radon measurement reports; another valid unit should be used in its place. If no other valid units are available, the measurement should be rescheduled for a time when a valid unit become available. Records of the calibration expiration for each unit should be centrally maintained and reviewed periodically. Each unit should also be checked before every measurement as a second line of defense to prevent it from being used past its calibration expiration date.

For additional information on calibrating Corentium Pro visit **support.airthings.com** and type “calibration”.

7. DATA CALCULATION, VALIDATION, AND REPORTING

7.1. Data Calculation & Validation

The Corentium Pro has an internal circuit board that processes the gathered data and performs the computations required to provide the indoor radon concentration for the specific measurement. The collected data can be visualized through the CRA software, developed in-house by Airthings and made available to the Organization for free. The CRA software generates a plot from the recorded measurement. The person in charge of generating the report can access the reporting tool within the CRA software in order to generate a report. The Corentium Pro mobile app is available for free for iOS and Android mobile devices. The Corentium Pro mobile app is developed in-house by Airthings.

7.2. Maintaining Records

As the effects of radiation exposure may not become apparent until many years have passed, measurement data should be maintained permanently. Corentium Pro automatically internally stores every performed measurement for up to 5 years.

Other electronic and/or printed documentation should be maintained as long as possible, or as long as required by applicable laws and regulations.

7.3. Radon Measurement Reporting

Final results are reported in units of picoCuries per liter (pCi/L), in the format provided by the Organization's test report (see sample report in ***Appendix A***). The information furnished to clients in the test report follows the recommendations made by EPA and AARST/NRPP. Values are reported to one figure after the decimal point. The QA Officer is responsible for checking the accuracy and completeness of the test reports before they are sent to the client.

The Report is in electronic format or printed to the client after the results are determined. The report shall contain the following:

A. Company name, contact information, and the Measurement Professional's certification number(s)

B. Address of the building measured

C. The start and stop date and times of each measurement

D. The detector type and serial number(s)

E. Exact location(s) of Corentium Pro(s)

F. Observed status of mitigation system(s) if present

G. Any observed structural openings, such as crawl space vents

H. Any observed deviations from required test conditions such as:

   i. Devices placed in locations inconsistent with ***Section 4.8.*** and the reason(s) for the deviation

   ii. Observed deviations from other requirements such as not maintaining closed-building conditions, or deviations from normal occupied building temperatures

   iii. Movement of, relocation of, or tampering with Corentium Pro

   iv. Damaged or broken tamper-evident seals

   v. Anomalies in Corentium Pro's data which, in the test professional's opinion, may indicate deviation from any of the testing protocols

I. Temporary conditions such as:

   i. Unusually severe storms, or periods of unusually high winds (>35 mph), etc.

J. The contact information for the local radon or health authority, and how to obtain state or federal guidance documents

K. The recommended actions for the client to take based on the radon concentration, such as another short-term or long-term test, or to have the

building mitigated

L. A statement of general limitations of the test such as the following statement:

"There is an uncertainty with any measurement result due to statistical variations and other factors such as daily and seasonal variations in radon concentrations. Variations may be due to changes in the weather, operation of the dwelling, or possible interference with the necessary test conditions."

M. Any other comment that the Measurement Professional considers appropriate and relevant

The radon measurements are reported in pCi/L. The practice of converting radon gas measurements from pCi/L to working level (WL) is forbidden.

All test results include a statement which recommends that the dwelling be retested in each of the following cases whether or not the dwelling has been mitigated:

A. Occupancy by a new owner
B. Long-term measurement should be made within two years of the system activation and at five-year intervals thereafter
C. A new addition is added
D. An alteration is made that could change the ventilation pattern
E. Major cracks or penetrations occur in the foundation walls or slab
F. Significant nearby construction blasting or earthquakes occur
G. Changes are made or happen to an installed mitigation system
H. New occupation of a ground contact area that was not previously tested

7.4. Maintaining Health and Safety Records

Radon measurements are a radiation exposure measurement. Because the effects of radiation exposure may not become apparent until many years have passed, measurement log data of exposure times for employees, mitigators and contractors should be maintained permanently.

8. INTERNAL QUALITY CONTROL (QC)

This section describes specific procedures for three types of internal quality control (QC) checks, measurements and procedures:

A. Routine instrument operation checks

B. Analysis of cross-check measurements made to assess relative bias

C. Analysis of duplicate measurements made to assess precision

8.1. Routine Instrument Operation Checks and Preventive Maintenance

The QA Officer will be responsible for checking for proper working condition of any Corentium Pro monitor, including battery levels, and LED operation. The QA Officer will also make sure that each monitor's calibration is up-to-date. Measurement Professionals should perform a routine instrument operation check before each measurement. Corentium Pro performs a 45-second self-check after scheduling a measurement. The Measurement Professional should observe that all LEDs are operating, and that the green light rapidly flashes to indicate the measurement has been successfully scheduled. If a yellow or red light is flashing after the self-check, the measurement should be postponed until the device issue has been resolved.

8.2. Cross-Check Measurements Made to Assess Bias

Any consistent bias shown by the instrument(s) is evaluated by performing regular cross-checks with a new or recently calibrated instrument. These cross-checks are performed during the 12-month interval between calibration, and approximately six months after calibration, so that no more than about six months elapse between either a calibration or a cross-check.

Cross-checks are conducted with the following procedures:

A. Please refer to ***Section 8.1.*** for the routine instrument operation check

B. The Corentium Pro unit is exposed in an environment for a minimum of 48 hours directly adjacent to a recently calibrated active monitor, when available (not necessarily the same type or model, but one that produces results in the same units **and has been calibrated within the last 30 days**), or a passive device when no recently-calibrated active monitor is available

C. The environment where the monitors are compared is, if possible, chosen for its radon stability, and in an area where radon levels are considerably greater than each unit's lower limit of detection

D. Both units measure over the same time interval, although the recently calibrated monitor can have the capability to measure in shorter intervals.

E. **If a delay of at least 4 hours is not scheduled, then the initial four hours of data should not be used in the calculation.** The results for each

monitor are averaged and analyzed in terms of percent difference (%D), as described in ***Section 9.1.***

The results of cross-checks are analyzed following the procedures described in ***Section 9.1.1.*** and recorded on a control chart as shown in ***Exhibit 1***. The QA Officer is responsible for checking the results of these cross-checks and determining the maximum amount of disagreement (upper bounds of agreement) between devices.

8.3. Duplicate Measurements Made to Assess Precision

The precision of the measurement method is evaluated on an ongoing basis through the use of duplicate measurements. The purpose of making duplicate measurement is to track the variation(s) over time that are observed between two identical measurements of the same concentration. Duplicate measurements should be placed and analyzed so that measurement precision of each measurement method/device can be evaluated and tracked.

Duplicate measurements should be made at the rate of 10% of the total number of measurement locations with a maximum of 50 per month. For example, if 10 detectors are deployed in a building, one duplicate measurement should also be made, if 20 detectors are deployed, two duplicate measurements should also be made, etc. Duplicate measurements are made by placing two detectors side-by-side 10 - 20 cm (4 - 8 inches) apart. The locations selected for duplicates should be distributed systematically throughout the entire sampling population. Such duplicate measurements provide a check on the quality of the measurement results and allow the user to make an estimate of the relative precision of their measurements. Large precision errors may be caused by detector manufacturing issues, improper data transcription, or improper handling by suppliers, laboratories or persons performing detector placement. If duplicate results differ significantly (results of the two measurements are different by a factor of 2), the problem should be reported to Airthings and/or the laboratory making the measurement and the cause investigated. The measurements for the room or area in question may have to be repeated based on the outcome of the investigation.

Active duplicates are defined as measurements made with the same type of instrument over identical time periods with adjacent air intakes. When two monitors are available at the same location, side-by-side measurements in approximately 10% of the total number of measurements, or up to 25 each month is made. If only one similar active monitor is available, one out of every 10 measurements is checked with a second device (not necessarily a recently calibrated, active instrument, but any passive or active device that is NRPP listed) placed adjacent to the active device for the same time period.

Precision error for organizations with only one monitor is therefore referenced from information provided by the manufacturer.

The results of duplicates are analyzed following the procedures described in ***Section 9.2.1.*** and recorded on a control chart as shown in ***Exhibit 2***. The QA Officer is responsible for checking the results of these duplicates and determining upper bounds for agreement between devices.

9. QUALITY ASSURANCE OBJECTIVES AND PROCEDURES FOR ASSESSING PRECISION AND BIAS

PRECISION — The measure of a variability of a process used to make repeated measurements under carefully controlled (identical) conditions. Duplicate measurements provide a check on precision.

BIAS — The degree of agreement of a measurement with an accepted reference or true value. Measurements of spiked samples provide a check on bias. Bias may be expressed in terms of percent difference.

9.1. Monitoring Bias

The objective for relative bias for the Corentium Pro is a percent difference (%D) of ± 10% at a significantly higher radon level i.e. 4.0 pCi/L or more. This relative bias is calculated as the difference between the measured and the reference value divided by the reference value.
Note that the definition of percent difference is similar to the definition of Individual Relative Error (IRE), as defined in the RMP Program Handbook (RMP Handbook [EPA 1991]), except that the numerator of the IRE is the absolute value of the difference while %D can have positive or negative values.

$$\% D = \frac{Measured\ Value - Reference\ Value}{Reference\ Value} \times 100$$

To assess the results of cross-checked measurements over time, the results are plotted on a means control chart (see ***Exhibit 1***).

9.1.1. Means Control Chart to Evaluate Relative Bias from the Results of Cross-Checks

The results of cross-checks are plotted on a means control chart (see above ***Section 9.1.***). The mean line is set at zero, and the warning and control limits are determined by calculating the sample standard deviation (sSTD) of the resultant %D values from at least 20 in-control cross-checks. (Refer to ***Exhibit 3*** for an explanation of sSTD)

The QA Officer plots the results from the cross-checks on the appropriate control chart as results are available, and checks the results as soon as they are plotted.

9.1.2. Corrective Action Based on the Determination of High Bias

The following guidelines, taken from Taylor (Taylor 1987) are used to determine whether the measurement system exhibits a bias high enough to warrant corrective action.

As the data is plotted, indicators that the measurement system may be out of control limits include:

A. Two successive points outside the warning limits (2 X sSTD)
B. Four successive points outside the one-sigma limits (1 X sSTD)
C. A systematic trend high or low

A systematic trend includes a series of points in the same direction or successive points all on the same side of the mean, even if all are within the control limits. If the data exhibit any of these indicators, the measurement system should be checked and additional QC measurements made as per the QA Officer's recommendations.

9.2. Monitoring Precision

The objective for precision of Corentium Pro is an average relative percent difference (RPD) between duplicates of 14% or less as calculated from duplicates with an average exposure of 4.0 pCi/L or greater. Relative percent difference is defined as the absolute difference between duplicates divided by their mean times 100%, also in formula below.

$$\text{RPD} = \frac{\textit{Larger Result} - \textit{Smaller Result}}{\textit{Average of Both Results}} X\ 100$$

9.2.1. The Analysis of Duplicate Measurements

To assess the range of differences between duplicates over time, the results of duplicates are plotted on a control chart (see ***Exhibit 2***). The control lines for the chart in Exhibit 2 are taken directly from EPA guidance (Protocol for Radon and Radon Decay Product Measurements in Homes, [EPA 1993], Appendix B, page B6) for measurement systems with an "in control" precision of about 14% RPD. The determination of whether the measurement system is "in control" is made following the guidelines described in ***Section 9.1.2.***, as taken from *National Radon Proficiency Program: Guidance on Quality Assurance*. The results from duplicates are plotted on the duplicate control chart as they are available, and the QA Officer checks the results as soon as they are plotted.

10. QUALITY ASSURANCE AUDITS AND REPORTS TO MANAGEMENT

The QA Officer submits a written audit report to the management of the Organization within 30 days following the audit. The audit report includes an assessment of bias and precision, and includes recommendations as appropriate.

The QA Officer conducts an audit of QA operations at least once every six months. Specific focus of the audit is on:

A. Record keeping, including results of routine instrument checks
B. An adequate number and type of QC measurements
C. The calibration schedules of all Corentium Pros used in the Organization
D. Maintenance and revisions of SOP
E. Adequate training and retraining of staff

11. CORRECTIVE ACTION

Failure of quality control measurements to be within the defined limits of this QA Plan results in immediate action to identify, correct, and document the problem. The QA Officer is responsible for ensuring timely solutions to identified problems.

12. QUALITY ASSURANCE TRAINING

The QA Officer has responsibility for reviewing the training plans for new staff and the plans for retraining when procedures change. Adequate training is given high

priority, since the implementation of this QA Plan is dependent upon the staff's understanding of its requirements.

12.1. Personnel Training

All personnel within the Organization are responsible for knowing everything in this QA Plan which falls within their particular area of responsibility as defined under ***Section 3.*** of this plan and/or their particular company Job Description. This QA Plan is the principle source document for the QA procedures and protocols which must be known and practiced by responsible organization personnel.

The QA Officer provides each employee with a copy of this QA Plan in which the specific QA activities and responsibilities for that particular employee are clearly marked and indexed. At the end of the first month of employment and at least annually thereafter, the QA Officer checks each involved employee's knowledge and understanding of their QA duties and responsibilities as defined in this Plan. If, in the judgment of the QA Officer, an employee does not adequately understand his/her responsibilities, follow-up instructions and checks are carried out until adequate understanding is demonstrated. The QA Officer notifies the employee's supervisor of each check result and these results are given prominent consideration in compensation and job advancement reviews.

13. REFERENCES

U.S. Environmental Protection Agency, 1980, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80, Office of Monitoring Systems and Quality Assurance, Office of Radiation Programs, Washington, DC 20460.

U.S. Environmental Protection Agency, 1991, "Radon Measurement Proficiency Program Handbook," EPA 520/1-91-006, Office of Radiation and Indoor Air, Washington, DC 20460.

U.S. Environmental Protection Agency, 1992, "EPA Requirements for Quality Assurance Project Plans," EPA QA/R-5, Quality Assurance Management Staff, Washington, DC 20460.

U.S. Environmental Protection Agency, June 1993 draft, "Radon Measurement Proficiency Program: Guidance on Quality Assurance," Office of Radiation and Indoor Air, Washington, DC 20460.

U.S. Environmental Protection Agency, 1993, "Protocols for Radon and Radon Decay Product Measurements in Homes," EPA 402-R-92-003, Office of Radiation and Indoor Air, Washington, DC 20460.

U.S. Environmental Protection Agency, 1997, "National Radon Proficiency Program: Guidance on Quality Assurance," EPA 402-R-95-012, Office of Radiation and Indoor Air, Washington, DC 20460

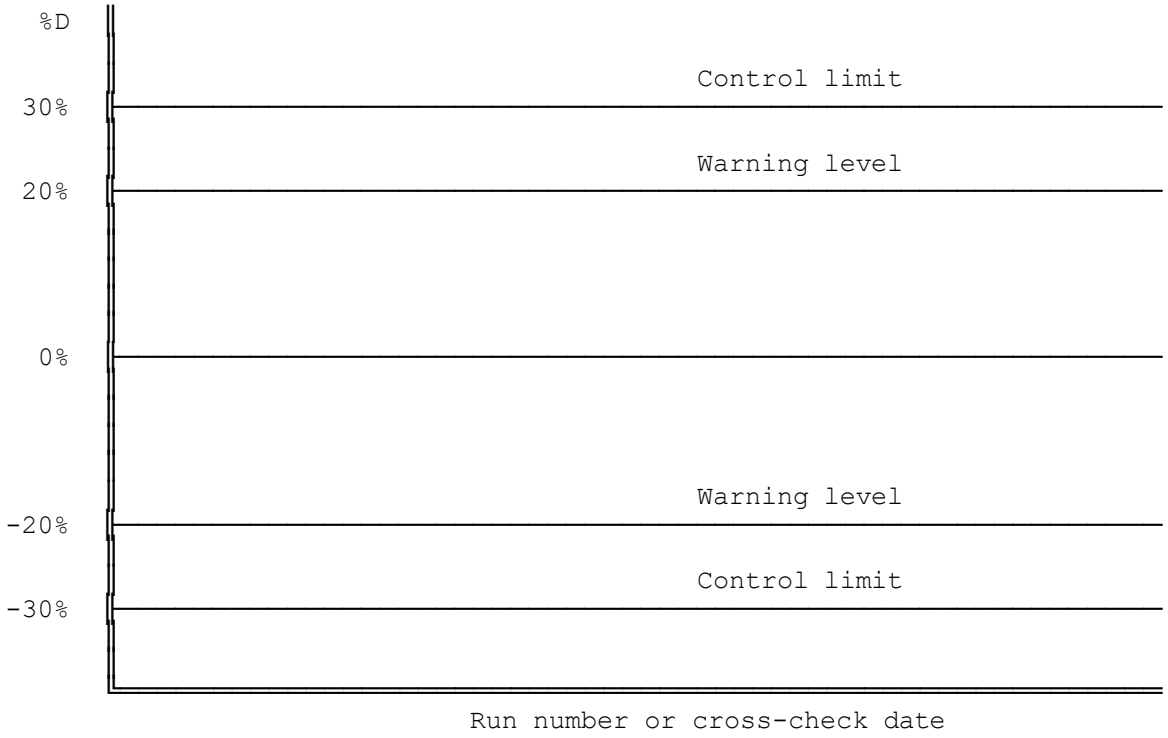
AARST Consortium on National Radon Standards/ANSI, 2014, "Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes", PO Box 2109, Fletcher, NC 28732

Sample Precision Check Documents:

Exhibit 1

$$\% D = \frac{Measured\ Value\ -\ Reference\ Value}{Reference\ Value} \times 100$$

Control Chart to determine Corentium Pro serial # <_____>
Bias from cross-checked measurements
Measured Value is the cross-checked detector measurements
Reference Value is the recently calibrated detector measurements



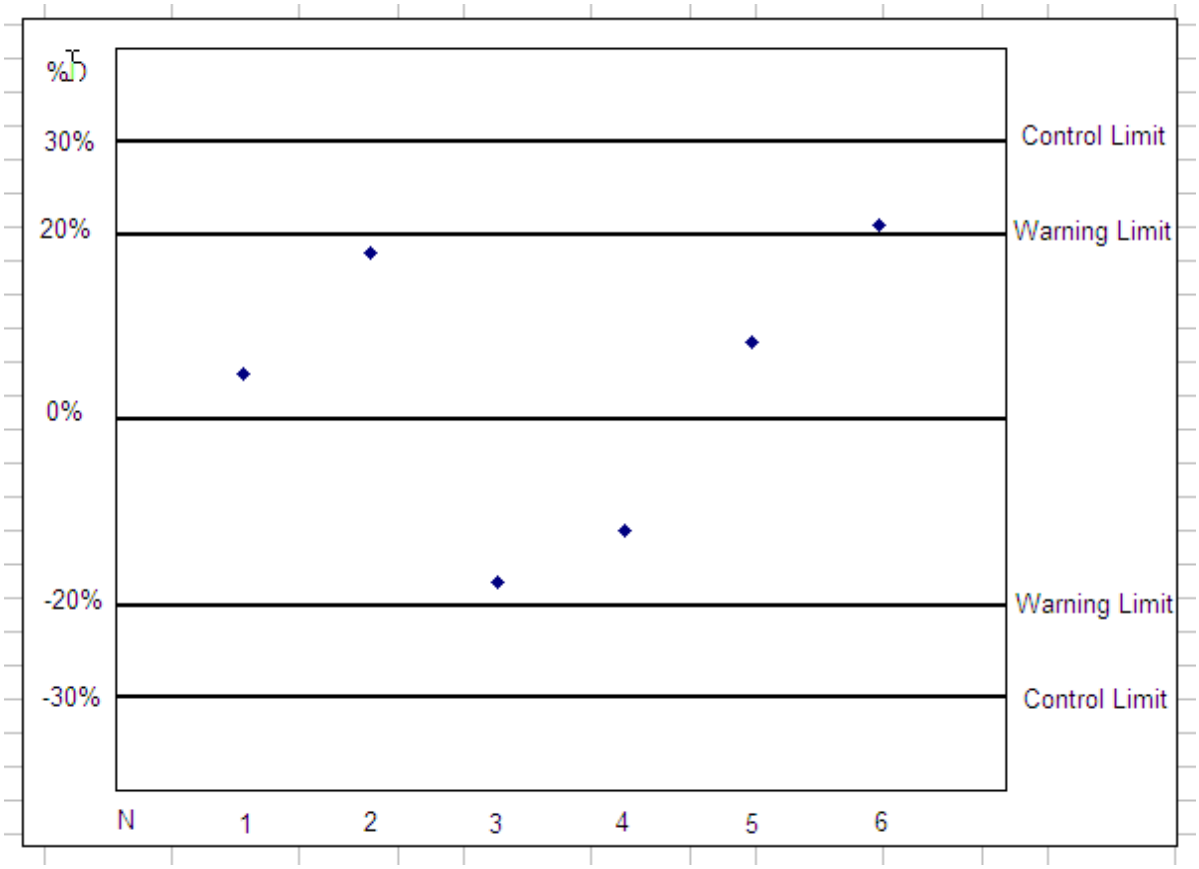
*Note: Control limits are 0 ± (3 X sSTD), and the warning levels are 0 ± (2 X sSTD). The value of sSTD may first be assumed to be 10%, and then after gathering at least 20 in-control cross-checked results (if possible, within the same range of radon concentrations) the sSTD of the %D values can be calculated. If it is significantly different from 10%, the above limits can be changed. See **Exhibit 3** to describe how to calculate the sSTD.*
Note: The value for sSTD may be different at different radon levels. If possible, assess %D values at different radon concentrations. If appropriate, keep control charts for ranges of radon levels (e.g., one chart for X, pCi/L another chart for, Y pCi/L , etc.). The need for separate charts is determined by the QA Officer.

Exhibit 1A Example

$$\% D = \frac{Measured\ Value - Reference\ Value}{Reference\ Value} \times 100$$

Example Control Chart for a single active monitor
to determine bias from cross-checked measurements
Measured Value is the cross-checked detector measurements
Reference Value is the recently calibrated detector measurements

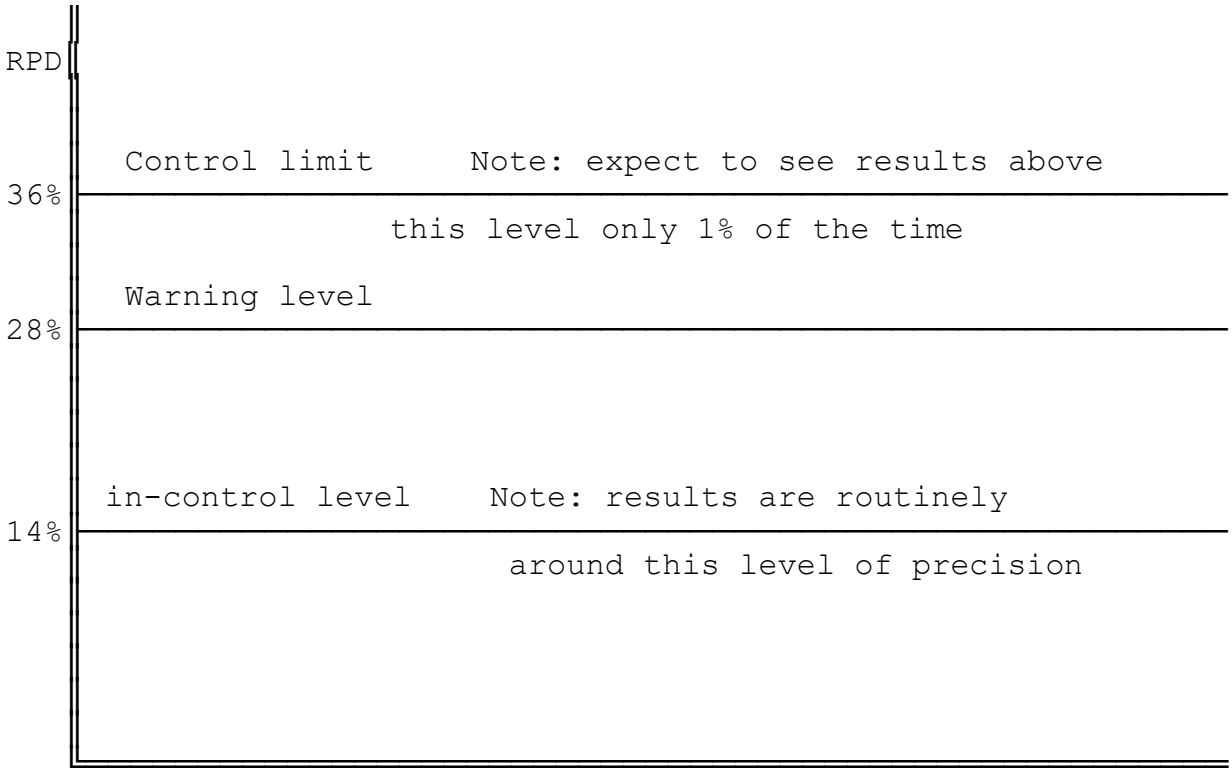
Measured Value	Reference	Bias	Date
6.3	6.0	5	1
5.9	5.0	18	2
6.2	7.5	-17.3	3
8.9	10.1	-11.9	4
8.8	8.1	8.6	5
19.6	16.1	21.7	6



Note: The sSTD of these six %D results from an individual active monitor is equal to about 17%.

Exhibit 2

Duplicate Control Chart
for determination of Corentium Pro precision



Note: Control limits are 0 ± (2.6 X sSTD), and the warning levels are 0 ± (2 X sSTD). The value of sSTD may first be assumed to be 14%, and then after gathering at least 20 in-control duplicate results (if possible, within the same range of radon concentrations) the sSTD of the RPD values can be calculated. If it is significantly different from 14%, the above limits can be changed. See ***Exhibit 3*** *for description of how to calculate the sSTD.*

Note: This chart's control limit is approximately 2.6 times the sSTD (EPA 1993), and represents a level which is expected to be exceeded by chance about 1% of the time. (If a 3 X sSTD level or 42% RPD were used it would be expected to be exceeded by chance less than 0.5% of the time). The sSTD value of 14% can be used until a sufficient number (at least 20 pairs) of duplicates that are in-control and measure greater than pCi/L have been made. If the sSTD of the RPD of these pairs is significantly different from 14%, the draft EPA guidance on QA for RMP participants (EPA 1993 draft) guidance on how to set the proper control limits is consulted to determine how to set different limits.

Exhibit 3

Calculation of Sample Standard Deviation

The sample standard deviation (sSTD) can be obtained using a spreadsheet computer program or a scientific calculator. For sSTD calculations in this QA Plan the following

$$\text{sSTD} = \frac{\sqrt{\sum_{i=1}^{n}(x_i - x_{avg})^2}}{\sqrt{n-1}}$$

formula can be used.

In this QA Plan only sSTD (sample or population standard deviation) is used. The difference between standard deviation (STD or sigma) and sSTD is that sSTD is obtained by multiplying STD by (n/n-1). Both sSTD and STD are usually obtained by using a scientific hand calculator or computer spreadsheet program. To obtain the correct control chart levels, the sSTD of at least 20 %D or RPD values, which were judged to be in-control, are computed. The control chart warning level is set at 2 times the sSTD. The out of control level is set at 3 times the sSTD for cross-checks and spikes and 2.6 times the sSTD for duplicates. Duplicates have a more stringent out-of-control level because they are only evaluating precision and not system bias.

$\sqrt{\ }$ = square root of the value

n = number of values

$\sum_{i=1}^{n}$ = the sum of whatever follows

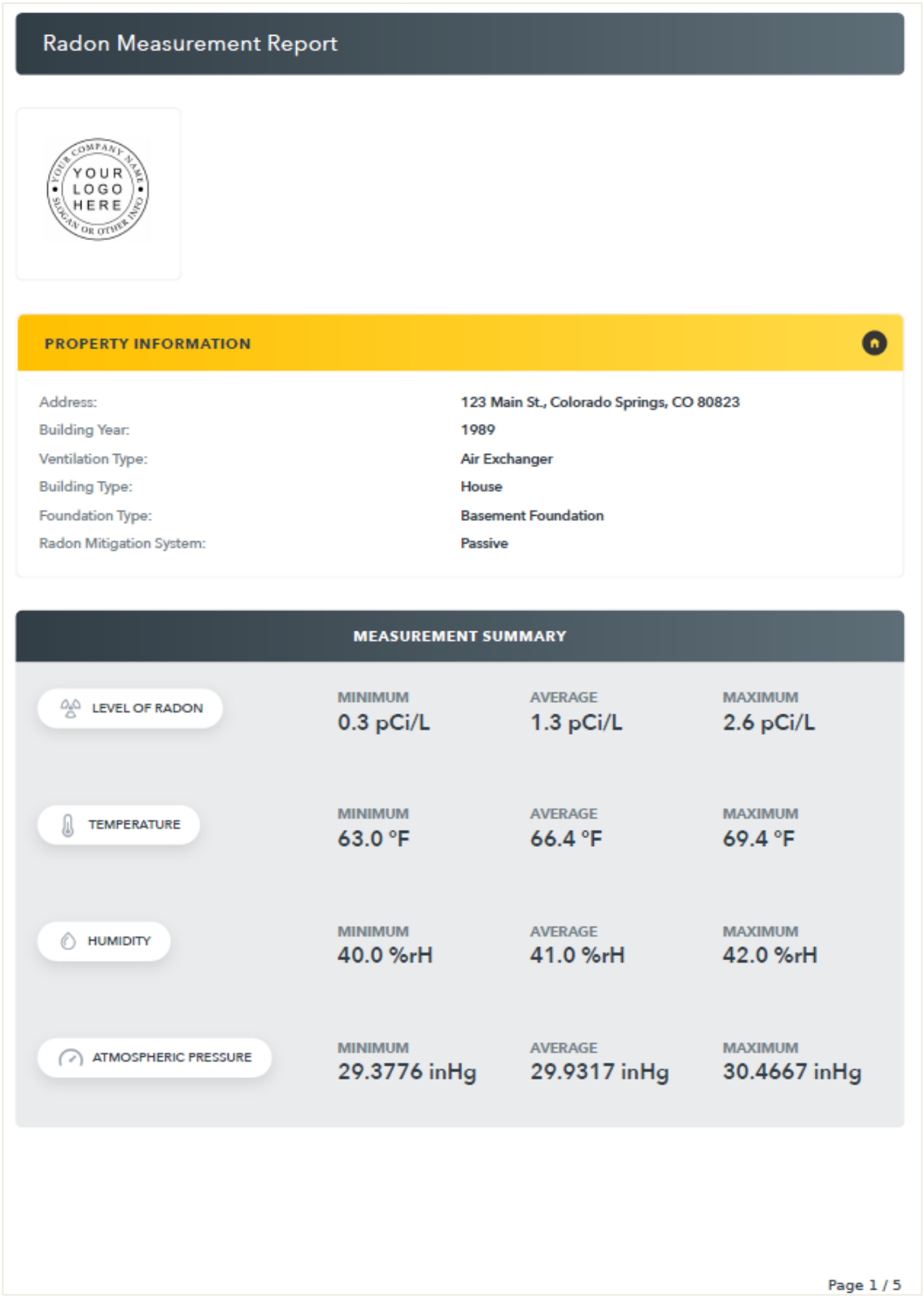
x_i = each value

x_{avg} = avg of the values

$(x_i - x_{avg})^2$ = square of each value difference from the avg

APPENDIX A

EXAMPLE OF A RADON TEST REPORT BY CORENTIUM PRO



Radon Measurement Report

YOUR LOGO HERE

PROPERTY INFORMATION

Address:	123 Main St., Colorado Springs, CO 80823
Building Year:	1989
Ventilation Type:	Air Exchanger
Building Type:	House
Foundation Type:	Basement Foundation
Radon Mitigation System:	Passive

MEASUREMENT SUMMARY

	MINIMUM	AVERAGE	MAXIMUM
LEVEL OF RADON	0.3 pCi/L	1.3 pCi/L	2.6 pCi/L
TEMPERATURE	63.0 °F	66.4 °F	69.4 °F
HUMIDITY	40.0 %rH	41.0 %rH	42.0 %rH
ATMOSPHERIC PRESSURE	29.3776 inHg	29.9317 inHg	30.4667 inHg

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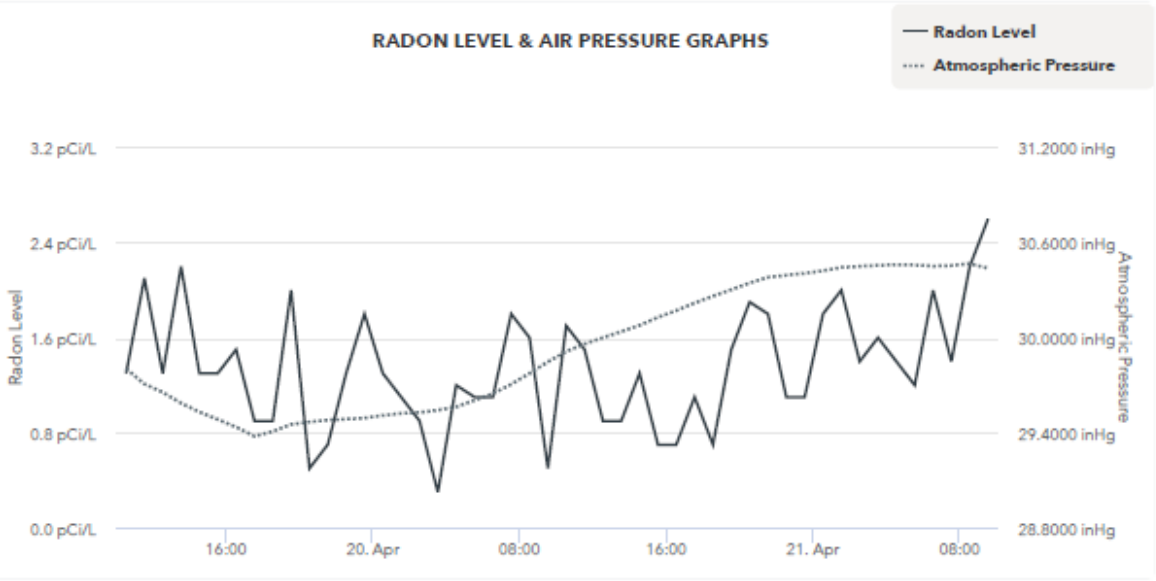
HOURLY MEASUREMENT DATA

Note : Measurements are offset by 1 hour from the start of the test. (The first hour will read 3:00 for a 2:00 start time).

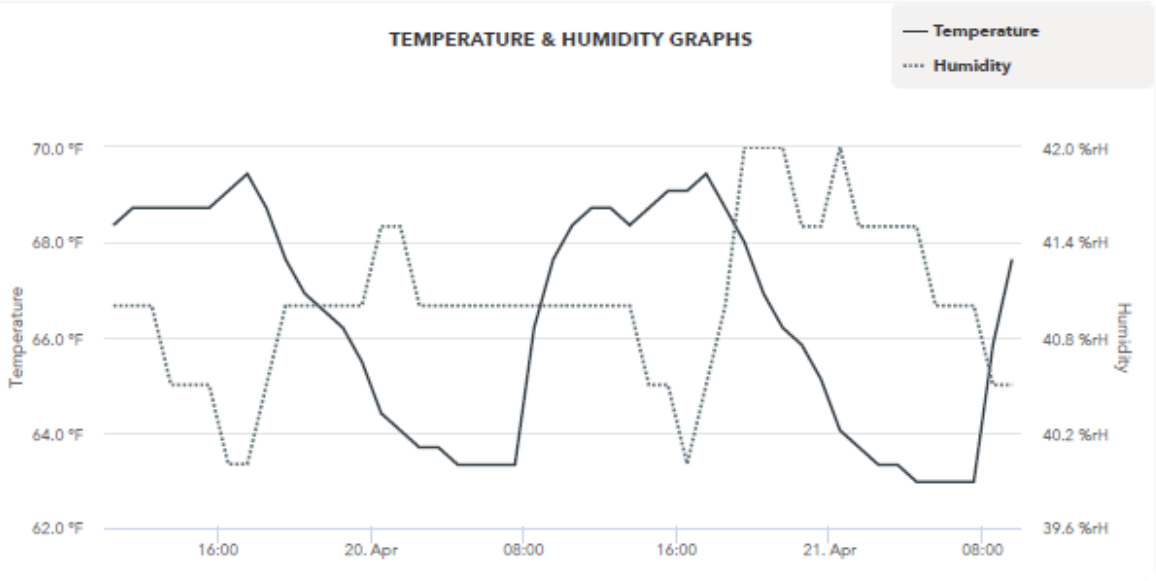
	DATE & TIME	RADON	AIR PRESSURE	TEMPERATURE	HUMIDITY
1	2022-04-19, 10:32 a.m. EDT	1.3 pCi/L	29.8040 inHg	68.4 °F	41.0 %rH
2	2022-04-19, 11:32 a.m. EDT	2.1 pCi/L	29.7078 inHg	68.7 °F	41.0 %rH
3	2022-04-19, 12:32 p.m. EDT	1.3 pCi/L	29.6552 inHg	68.7 °F	41.0 %rH
4	2022-04-19, 1:32 p.m. EDT	2.2 pCi/L	29.5867 inHg	68.7 °F	40.5 %rH
5	2022-04-19, 2:32 p.m. EDT	1.3 pCi/L	29.5306 inHg	68.7 °F	40.5 %rH
6	2022-04-19, 3:32 p.m. EDT	1.3 pCi/L	29.4839 inHg	68.7 °F	40.5 %rH
7	2022-04-19, 4:32 p.m. EDT	1.5 pCi/L	29.4355 inHg	69.1 °F	40.0 %rH
8	2022-04-19, 5:32 p.m. EDT	0.9 pCi/L	29.3776 inHg	69.4 °F	40.0 %rH
9	2022-04-19, 6:32 p.m. EDT	0.9 pCi/L	29.4083 inHg	68.7 °F	40.5 %rH
10	2022-04-19, 7:32 p.m. EDT	2.0 pCi/L	29.4526 inHg	67.6 °F	41.0 %rH
11	2022-04-19, 8:32 p.m. EDT	0.5 pCi/L	29.4680 inHg	66.9 °F	41.0 %rH
12	2022-04-19, 9:32 p.m. EDT	0.7 pCi/L	29.4792 inHg	66.6 °F	41.0 %rH
13	2022-04-19, 10:32 p.m. EDT	1.3 pCi/L	29.4857 inHg	66.2 °F	41.0 %rH
14	2022-04-19, 11:32 p.m. EDT	1.8 pCi/L	29.4928 inHg	65.5 °F	41.0 %rH
15	2022-04-20, 12:32 a.m. EDT	1.3 pCi/L	29.5093 inHg	64.4 °F	41.5 %rH
16	2022-04-20, 1:32 a.m. EDT	1.1 pCi/L	29.5217 inHg	64.0 °F	41.5 %rH
17	2022-04-20, 2:32 a.m. EDT	0.9 pCi/L	29.5276 inHg	63.7 °F	41.0 %rH
18	2022-04-20, 3:32 a.m. EDT	0.3 pCi/L	29.5424 inHg	63.7 °F	41.0 %rH
19	2022-04-20, 4:32 a.m. EDT	1.2 pCi/L	29.5631 inHg	63.3 °F	41.0 %rH
20	2022-04-20, 5:32 a.m. EDT	1.1 pCi/L	29.6050 inHg	63.3 °F	41.0 %rH
21	2022-04-20, 6:32 a.m. EDT	1.1 pCi/L	29.6469 inHg	63.3 °F	41.0 %rH
22	2022-04-20, 7:32 a.m. EDT	1.8 pCi/L	29.7060 inHg	63.3 °F	41.0 %rH
23	2022-04-20, 8:32 a.m. EDT	1.6 pCi/L	29.7745 inHg	66.2 °F	41.0 %rH
24	2022-04-20, 9:32 a.m. EDT	0.5 pCi/L	29.8477 inHg	67.6 °F	41.0 %rH
25	2022-04-20, 10:32 a.m. EDT	1.7 pCi/L	29.9127 inHg	68.4 °F	41.0 %rH
26	2022-04-20, 11:32 a.m. EDT	1.5 pCi/L	29.9605 inHg	68.7 °F	41.0 %rH
27	2022-04-20, 12:32 p.m. EDT	0.9 pCi/L	30.0001 inHg	68.7 °F	41.0 %rH
28	2022-04-20, 1:32 p.m. EDT	0.9 pCi/L	30.0385 inHg	68.4 °F	41.0 %rH
29	2022-04-20, 2:32 p.m. EDT	1.3 pCi/L	30.0781 inHg	68.7 °F	40.5 %rH
30	2022-04-20, 3:32 p.m. EDT	0.7 pCi/L	30.1289 inHg	69.1 °F	40.5 %rH
31	2022-04-20, 4:32 p.m. EDT	0.7 pCi/L	30.1714 inHg	69.1 °F	40.0 %rH
32	2022-04-20, 5:32 p.m. EDT	1.1 pCi/L	30.2192 inHg	69.4 °F	40.5 %rH

33	2022-04-20, 6:32 p.m. EDT	0.7 pCi/L	30.2623 inHg	68.7 °F	41.0 %rH
34	2022-04-20, 7:32 p.m. EDT	1.5 pCi/L	30.3031 inHg	68.0 °F	42.0 %rH
35	2022-04-20, 8:32 p.m. EDT	1.9 pCi/L	30.3456 inHg	66.9 °F	42.0 %rH
36	2022-04-20, 9:32 p.m. EDT	1.8 pCi/L	30.3811 inHg	66.2 °F	42.0 %rH
37	2022-04-20, 10:32 p.m. EDT	1.1 pCi/L	30.3946 inHg	65.8 °F	41.5 %rH
38	2022-04-20, 11:32 p.m. EDT	1.1 pCi/L	30.4065 inHg	65.1 °F	41.5 %rH
39	2022-04-21, 12:32 a.m. EDT	1.8 pCi/L	30.4224 inHg	64.0 °F	42.0 %rH
40	2022-04-21, 1:32 a.m. EDT	2.0 pCi/L	30.4437 inHg	63.7 °F	41.5 %rH
41	2022-04-21, 2:32 a.m. EDT	1.4 pCi/L	30.4507 inHg	63.3 °F	41.5 %rH
42	2022-04-21, 3:32 a.m. EDT	1.6 pCi/L	30.4572 inHg	63.3 °F	41.5 %rH
43	2022-04-21, 4:32 a.m. EDT	1.4 pCi/L	30.4608 inHg	63.0 °F	41.5 %rH
44	2022-04-21, 5:32 a.m. EDT	1.2 pCi/L	30.4590 inHg	63.0 °F	41.0 %rH
45	2022-04-21, 6:32 a.m. EDT	2.0 pCi/L	30.4519 inHg	63.0 °F	41.0 %rH
46	2022-04-21, 7:32 a.m. EDT	1.4 pCi/L	30.4555 inHg	63.0 °F	41.0 %rH
47	2022-04-21, 8:32 a.m. EDT	2.2 pCi/L	30.4667 inHg	65.8 °F	40.5 %rH
48	2022-04-21, 9:32 a.m. EDT	2.6 pCi/L	30.4383 inHg	67.6 °F	40.5 %rH

RADON LEVEL & AIR PRESSURE GRAPHS



TEMPERATURE & HUMIDITY GRAPHS



COMPANY INFORMATION

Name:	SAMPLE CO.
Phone Number:	1-833-906-1376
Email:	info@sampleco.com
Address:	Broadway St, Colorado Springs, CO, USA

CERTIFICATIONS

Name:	Number:	Expiration Date:
C-NRPP	CRT XXXXXX	01/06/2023
Name:	Number:	Expiration Date:
NRPP	XXXXX	01/07/2023

Recommended Actions

<2.0 PCI/L - W/O MITIGATION SYSTEM

The measured average radon level is below the Environmental Protection Agency (EPA) Action Level of 4.0 pCi/L. The EPA recommends having this building retested at least once every 5 years to determine if a radon mitigation system is recommended at a later date since radon levels can change over time. Performing follow-up tests during the heating season is recommended since this is when radon levels tend to be the highest. A 12-month long test, or continuous monitoring, will most accurately reflect radon exposure throughout the year.

RADON PROFESSIONAL'S SIGNATURE

This report is certified by Julie.

Electronic Signature

2022-05-17
Colorado Springs

APPENDIX B

EXAMPLE OF RADON TESTING NOTIFICATION

ATTENTION!

CONTINUOUS MONITOR
RADON TEST IN PROGRESS

CLOSED-BUILDING CONDITIONS MUST BE MAINTAINED

By entering this building you agree to maintain closed-building conditions

1. **ALL WINDOWS MUST REMAIN CLOSED**
2. **ALL EXTERIOR DOORS MUST REMAIN CLOSED EXCEPT FOR MOMENTARY ENTRY AND EXIT**
3. **VENTILATION FANS MUST NOT BE USED (This includes bathroom or kitchen exhaust fans, and whole-house ventilation fans)**

A. *CENTRAL HEATING AND AIR CONDITIONING SYSTEMS MAY BE OPERATED IN THE AUTO MODE DURING CLOSED-BUILDING CONDITIONS AND INTERIOR CIRCULATION FANS SUCH AS CEILING OR DESK FANS MAY BE USED*

B. *PERMANENT RADON MITIGATION SYSTEMS SHOULD CONTINUE TO OPERATE*

PLEASE CALL NUMBER BELOW FOR ADDITIONAL INFORMATION CONCERNING THIS TEST

APPENDIX C

EXAMPLE OF RADON EXPOSURE TRACKING RECORD

Name :	**Month(s) :**
Company name :	
Employee ID number :	**Year :**

Date	Job Site or Number	Radon Level (pCi/L)	Hours of Exposure (HR)	Method Used to Assess Exposure[(1)]	Supervisor Initials

(1) Highest Pre mitigation level (a)
On-site measurement (b)

APPENDIX D

EXAMPLE OF INITIAL CALIBRATION CERTIFICATE

CALIBRATION CERTIFICATE

Certification Document	Certificate-2700014003-2021.pdf
Instrument Serial Number	2700014003
Instrument Type	Corentium Pro
Calibration Valid Until	2022-Oct-31

The calibration procedure for this instrument is done by comparing the sensitivity of this instrument to the sensitivity of a set of minimum four reference instruments. The procedure takes place in a radon chamber for a minimum of 7 full days under test conditions listed in this certificate.

The calibration factor (multiplier) applied to the instrument is shown in the table below:

Calibration Factor Multiplier [C.F.M]	0.994

The test conditions are as follows:

Test Duration (hours)	216
Average Radon Concentration	33.7 pCi/L (1248 Bq/m³) (+/-6%)
Average Temperature	75.6°F (24.2°C)
Average Relative Humidity (%rh)	34
Average Barometric Pressure (mbar)	1000

The reference instruments are calibrated minimum once in each calendar year at **'Bundesamt fur Strahlenschutz'(BfS)** in Berlin, Germany. BfS is accredited by the 'Deutsche Akkreditierungsstelle GmbH' as calibration laboratory in the DeutschenKalibrierdienst (DKD).
Refer *http://www.bfs.de/EN/topics/ion/environment/laboratories/radon/radon.html*

The following table lists the reference instruments and the calibration dates:

Reference Instrument Serial Number	Calibration Date
2700009774	2020-12-30
2700010067	2020-12-30
2700010227	2020-12-30
2700010234	2020-12-30

QualityAssurance Responsible: *Viktor Sokolov*	Company Stamp: Airthings ASA Wergelandsveien 7 N-0167 Oslo, Norge Org. nr. 993 092 045

AIRTHINGS

Norway: Wergelandsveien 7, 0167 Oslo, Norway, +47 468 46 155

APPENDIX E

EXAMPLE OF AIRTHINGS LABS CALIBRATION CERTIFICATE

CERTIFICATE OF CALIBRATION

Airthings Lab 99 Church Street Whitinsville, MA 01588 833.906.1376

NRSB Lic. # TRC2101
NRSB Code 31828

NRPP Lic. # TC 111706
NRPP Code 8233

MONITOR INFORMATION

Device Model: Corentium Pro

Serial Number: 2700006767

Calibration Date: May 13, 2022

Next Calibration Date May 13, 2023

Instrument Type: CRM; Alpha Spectroscopy in Passive Diffusion Chamber

EXPOSURE PERIOD

Start: May 10, 2022, 9:03 a.m. EDT

End: May 13, 2022, 9:03 a.m. EDT

Test Duration in Hours: 72 hours

Average Radon Concentration: 63.77 pCi/L (2360 Bq/m3)

Average Relative Humidity: 27 %RH

Average Temperature: 70.5 F (21.4 C)

INSTRUMENTS RESULTS

Average Monitor Reading: 62.20 pCi/L (2301 Bq/m3)

Relative Error As Received: -2.4%

New Calibration Factor: 1.064

Relative Error after New CF Applied: 0.0%

Background Exposure (24hr): 0.20 pCi/L (7 Bq/m3)

CALIBRATION PERFORMED BY

Name: Lisa Laflamme

Title: Measurement Specialist

Certification Number: NRPP 103173RMP NRSB 6SS0008

The calibration procedure for this instrument was performed at Airthings Lab 99 Church Street Whitinsville, MA, 01588. That calibration procedure for this instrument is performed by comparing the sensitivity of this instrument to the sensitivity of reference monitor using document 1-MAN-0001-E.Docx Rev C September 11, 2020.

Authorized Signature: Lisa Laflamme **Date:** May 13, 2022

AIRTHINGS

Norway: Wergelandsveien 7, 0176 Oslo, Norway, +47 468 46 155