

*DRAFT Standard N42.50 -  
Performance Specifications for  
Measurement Systems Designed  
to Measure Radon Progeny in  
Atmospheres, Revision 4.07,*

Robert B. Hayes PhD, CHP, PE

20<sup>th</sup> Meeting of the AMUG, Las Vegas NV

April 30, 2008

- 1 SCOPE - 99%
- 2 OVERVIEW - 99%
- 3 NORMATIVE REFERENCES - 95%
- 4 DEFINITIONS & ACRONYMS - 95%
- 5 UNITS & CONVERSIONS - 90%
- 6 CLASSIFICATION OF INSTRUMENTS AND INSTRUMENT SYSTEMS – 95%
- 7 PERFORMANCE AND TESTING CRITERIA
  - 7.1 Unattached Fraction – 35%
  - 7.2 Radiation Response – Radon Progeny as Target Measurands – 80%
  - 7.3 Radiation Response – Radon Progeny as Interfering Radionuclides – 40%
  - 7.4 Sampling System Design – 95%
  - 7.5 Electronic Criteria – 95%
  - 7.6 Interfering Responses – 95%
  - 7.7 Mechanical Criteria – 95%
  - 7.8 Environmental Criteria – 90%
  - 7.9 Calibration and Maintenance – 25%
  - 7.10 User Documentation – 95%
- 8 CLASS SPECIFIC PERFORMANCE & TESTING CRITERIA
  - 8.1 Grab Sampling Instruments – 90%
  - 8.2 Continuously Sampling Instruments – 90%
  - 8.3 Integrating Sampling Instruments – 0%
- 9 DOCUMENTATION REQUIREMENTS – 80%
- 10 BIBLIOGRAPHY – 80%
- 11 ANNEXES
  - 11.1 Radon Decay Chain – 75%
  - 11.2 Radon and Radon Progeny Equilibrium – 0%
  - 11.3 Aerosol Sampling Considerations – 0%
  - 11.4 Filter Selection – 0%

# Sec 7.1 – Unattached Fraction

- This section needs to be flushed out with a summary of the NCRP 78 to support our requirement that these issues should be addressed in a technical basis document for the instrument.

## **Sec 7.3 - Radiation Response – Radon Progeny and Interfering Radionuclides.**

- There is still some discussion amongst the committee members as to whether this topic should be moved into an Annex. Assuming that it remains within the body of the standard, the topic of beta interference needs to be completed.

# Sec 7.9 Calibration and Maintenance.

- Following discussions on Monday 4/28/08 we concluded that we should make a clear distinction between the requirements for Type Testing and those for Periodic Maintenance and Calibration.
- Type testing will require that a type calibration be conducted on a minimum of two example instruments using a well characterized test atmosphere of radon and thoron progeny. The manufacturer may develop and document in a technical basis document, and equivalency standard that would be suitable for periodic calibration of individual instruments, once the type calibration against the radon progeny test atmosphere was completed and documented. Such an equivalency standard could, but is not required to be an electroplated source of specified composition and activity for certain types of detector technologies, such a spectral alpha.

# Sec 7.9 Calibration and Maintenance

## cont.

- We still need to work out the minimum set of parameters that define a well characterized radon progeny test atmosphere, as well as the range of values within which the testing shall be conducted. Probable candidates include:
  - - Temperature
    - Relative humidity
    - Atmospheric pressure
    - The aerodynamic median diameter (AMD) of the aerosol
    - The particle number concentration of the aerosols used
    - Rn-222 and Rn-220 activity concentration
    - PAEC Rn-222 and PAEC Rn-220
    - The equilibrium factor for Rn-222 and Rn-220
    - The equilibrium equivalent concentration EEC for both Rn-222 and Rn-220

# Sec 7.9 Calibration and Maintenance cont.

- We also need to reach consensus regarding the number of test conditions required to qualify the two instruments, i.e. as few as two different test conditions to a large matrix of test conditions. We understand that while a large matrix provides a more complete picture of the operating envelope of the subject instruments, it would be prohibitively expensive and result in few instruments being in compliance with the standard.
- We also need to reach consensus regarding the agreement required between the individual instrument responses and the conventionally true value for the radon progeny parameter under test, as well as the allowed variance for the two instruments. Currently proposed values lie in the range of +/- 15% to +/- 25%

# Sec 7.9 Calibration and Maintenance cont.

- We also need to decide if we will develop different ranges of these parameters depending for instruments typically used in outdoor, indoor, underground, or highly filtered air atmospheres. The latter would most likely be restricted to type testing of radon progeny interference with CAMs.
- We also need to address the topic of the reference method that shall be used to quantify the PAECs of the radon progeny test atmosphere during the type testing, i.e. would we recommend the approach that Bowser Morner uses, periodic grab sampling to calibrate some sort of continuous radon progeny monitor, or develop a different basis for the conventionally true value of the PAECs.



# Sec 8.3 Integrating Sampling Instruments

- This section addresses the additional requirements and testing for instruments that rely on the measurement of the integral over a defined sampling and measurement time of the atmosphere sampled and/or the measurand. This section has not been started.

# **Sec 11.2, 11.3, & 11.4 – Annexes**

- Other than to identify the general topic areas for the Annexes, we have not made significant headway on the technical content of the annexes. We have planned to work on the Annexes after completing the main body of the standard, while it is under review by the complete committee.

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