ANSI/AARST **MS-QA** 2019
An Approved American National Standard

Radon Measurement Systems Quality Assurance

Quality Assurance When Conducting and Analyzing Radon Measurements

AARST CONSORTIUM ON NATIONAL RADON STANDARDS

MS-QA Introduction

Radon Measurement Systems Quality Assurance

Scope

This standard of practice specifies minimum requirements for quality systems designed to quantify the concentration of ^{222}Rn gas in air by qualified professionals (QPs) and laboratories, whose data are intended to be used to determine the need for, or success of, radon mitigation. This standard is applicable to the wide variety of radon measurement devices used for indoor measurements, primarily in residential environments or buildings not associated with the possession or handling of radioactive materials.

The requirements build upon national and international standards for measurements of radioactive materials, including the ISO series on measuring radon in air (ISO 11665-4 and 11665-5 [ISO 2012a,b]), ASTM standard practices as described in multiple standards including ASTM D3648 (ASTM International 2014), and guidance from U.S. government agencies including the U.S. Environmental Protection Agency (EPA) (2002, 2004, 2017), Nuclear Regulatory Commission (NRC) (Maura and Briggs 2005) and international organizations such as the World Health Organization (Zeeb and Shannoun 2009). These existing guidance documents, combined with the experience of committee members and technical reviewers, provide the foundation for the requirements in this standard.

Purpose

Because there is no way to sense or predict radon concentrations in the air we breathe, protection against cancer caused by radon depends upon reliable radon measurements. Radon is the leading cause of lung cancer among nonsmokers and the second leading cause of lung cancer in the general population.[1] Radon in U.S. homes causes approximately 21,000 lung cancer deaths each year.[2] Be it at home, work or school, an individual's exposure to radon gas combines over time to increase the risk of preventable lung cancer.

Historic perspective: In the 1950s, studies confirmed increased incidence of radon-induced lung cancer for workers in underground mines. In the 1980s, studies found that exposure to radon in homes can exceed exposures found for mine workers. This discovery resulted in the Indoor Radon Abatement Act (1988) that authorized U.S. state and federal activities to reduce citizen risk of lung cancer caused by indoor radon concentrations. Since 1988, the United States Environmental Protection Agency (USEPA) and the U.S. Surgeon General have recommended that all homes be tested for radon. In 1999, with publication of BEIR VI[2], the National Academy of Science confirmed that any exposure to radiation, including any concentration of radon, carries risk. In 2009, the World Health Organization's WHO Handbook on Indoor Radon confirmed the association between indoor radon exposure and lung cancer, even at the relatively low radon concentrations found in homes.[1]

Measurement standards developed to respond to the threat of cancer caused by radon:

MAH *Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes*

MAMF *Protocol for Conducting Measurements of Radon and Radon Decay Products in Multifamily Buildings*

MALB *Protocol for Conducting Measurements of Radon and Radon Decay Products in Schools / Large Buildings*

MS-PC *Performance Specifications for Instrumentation Systems Designed to Measure Radon Gas in Air*

MS-QA *Radon Measurement Systems Quality Assurance*

These are complemented with ANSI/AARST radon mitigation standards: SGM-SF, RMS-MF and RMS-LB.

Designation of this standard: MS-QA

As used for catalogue identification, "MS-QA" stands for Measurement Systems-Quality Assurance

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[1] World Health Organization, "WHO Handbook on Indoor Radon: A Public Health Perspective" 2009

[2] National Academy of Sciences, "Biological Effects of Ionizing Radiation" (BEIR VI Report) 1999

The Consensus Process and Continuous Maintenance

The consensus process developed for the AARST Consortium on National Radon Standards and as accredited to meet essential requirements for American National Standards by the American National Standards Institute (ANSI) has been applied throughout the process of approving this document.

This standard is under continuous maintenance by the AARST Consortium on National Radon Standards for which the Executive Stakeholder Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard.

User Tools: User tools are posted online (www.RadonStandards.us) as they become available (such as templates for QC tracking, QA plans, interpretations and approved addenda updates across time).

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Notice of right to appeal: Bylaws and procedures for the AARST Consortium on National Radon Standards available at www.RadonStandards.us. Section 2.1 of Appendix B (Operating Procedures for Appeals) states, "Persons or representatives who have materially affected interests and who have been or will be adversely affected by any substantive or procedural action or inaction by AARST Consortium on National Radon Standards committee(s), committee participant(s), or AARST have the right to appeal; (3.1) Appeals shall first be directed to the committee responsible for the action or inaction."

MS-QA Contents

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Radon Measurement Systems Quality Assurance

1 SCOPE

This standard of practice specifies minimum requirements for *quality systems* designed to quantify the concentration of ^{222}Rn gas in air by *qualified* professionals (QPs) and laboratories, whose data are intended to be used to determine the need for, or success of, radon mitigation. This standard is applicable to the wide variety of radon measurement devices used for indoor measurements, primarily in residential environments or buildings not associated with the possession or handling of radioactive materials.

1.1 Limitations

1.1.1 These requirements do not directly apply to the measurements made by non-trained individuals such as homeowners because such measurements fall outside of a cohesive *quality system*.

1.1.2 These requirements apply to measurements made to determine the need for remedial action and may not be applicable to special studies conducted by researchers or scientists investigating radon phenomena.

1.1.3 Adherence to this standard does not guarantee or supersede compliance with the applicable codes or regulations of any federal, state or local agency with jurisdiction. Such jurisdictions may require additional practices.

1.1.4 This edition of the standard does not address interference from radon isotopes other than ^{222}Rn, radon decay product measurements, grab sampling methods, or radon dynamics or diagnostic measurements. Although the performance criteria could be adopted for use in a certification program, the specifications for such a program are beyond the scope of this standard.

1.1.5 This standard uses definitions and terms consistent with ANSI/AARST *MS-PC* including total uncertainty, imprecision and, importantly, *minimum detectable concentration*. However, the performance criteria limits specified in *MS-PC* are outside the scope of this standard; this standard provides criteria for *quality systems* used by QPs working in homes, schools, laboratories and work places.

1.1.6 This standard specifies requirements for *quality systems*, but not all specific procedures (such as compensating for various possible contributions to background) are specifically addressed. Such procedures are left to the implementation of the *qualified professional* (QP), as long as (a) the procedures are included in the documentation that is part of the *quality system* including a *Quality Assurance Plan* (QAP); (b) the *quality control* (QC) and other operations described in this standard are routinely conducted and documented; and (c) the other provisions of this standard are met.

1.2 Applicability

1.2.1 *Adoption and Use*

These standards of practice can be adopted as requirements for contractual relationships or adopted as recommendations or requirements of an authority or jurisdiction.

1.2.2 *Provisions Which Are Not Mandatory*

The terms "Note–" and "Informative advisory—" indicate provisions considered helpful or good practice, but which do not contain a mandatory requirement.