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Soil Gas Control Systems in New Construction of Multifamily, School, Commercial and Mixed-Use Buildings

AARST CONSORTIUM ON NATIONAL STANDARDS
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CC-1000

Soil Gas Control Systems in New Construction of Multifamily, School, Commercial and Mixed-Use Buildings

Scope Summary and Introduction

The provisions in this standard provide prescriptive minimum requirements for the construction of any building intended for human occupancy, except for 1 and 2 family dwellings, in order to reduce occupant exposure to radon and other hazardous soil gases.

Updates for 2023

This standard of practice was first published in 2017 and experience since that time was considered in 2023 updates. The title was changed for clarity and improvements include:

- Inspections cited during various stages of construction are no longer optional,
- Clarity on qualified professionals needed to implement diagnostic events and effective designs,
- Clarity on sealing and soil gas retarder products and installation for completing an air barrier between soil and indoor air, and
- Integration of existing and improved vapor intrusion design features into sections where items apply.

While recommended for immediate use, the effective date for compliance with this standard is **December 1st, 2023**.

Significance of Purpose

This document contains minimum requirements and guidance designed to respond to the health threat of radon gas, chemical vapors, and other hazardous soil gases.

Radon Gas: Radon is the second leading cause of lung cancer in the general population and the leading cause of lung cancer among nonsmokers.[1] Radon exposure is the cause of approximately 21,000 U.S. lung cancer deaths each year.[2] This risk is largely preventable. 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.

Vapor Intrusion: The risk of adverse health effects from inhalation of toxic chemicals in the form of vapor entering a building along with other soil gases can also be significant. The level of concern depends upon the nature, frequency, and duration of exposure to the chemical(s). Where chemicals of concern are present in soils adjoining a building, mitigation methods for chemical vapor concentrations in indoor air are similar to those for radon.

Historical Perspective (Radon)

Since the early 1990s, the U.S. Environmental Protection Agency (EPA) has advised all U.S. schools to test for radon and to reduce levels to below 4 pCi/L[3]. In 1999, the National Academy of Sciences confirmed that any exposure to radon holds a degree of risk with publication of BEIR VI. [2] In addition, the Academy's BEIR VII committee stated that 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 levels found in residential buildings.[1]

Normative References

National standards for materials, practices, and building codes are identified in Section 13 (Normative References)

Designation of the standard: MA-MFLB

For catalogue identification, "CC-1000" stands for Construction Code for thousands of different building designs.

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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

[3] USEPA, "Radon Measurement In Schools", July 1993 (EPA-402-R-92-014)

ANSI/AARST standards developed to respond to the threat of cancer caused by radon:

ANSI/AARST SGM-SF	(Soil Gas Mitigation in Existing Homes)
ANSI/AARST SGM-MFLB	(Soil Gas Mitigation in Existing Multifamily, School, Commercial and Mixed-Use Buildings) *Note—Previously published as ANSI/AARST RMS-MF and RMS-LB and now harmonized and consolidated into a single standard.*
ANSI/AARST CCAH	(Reducing Radon in New Construction of One & Two Family Dwellings and Townhouses)
ANSI/AARST RRNC	(Rough-in of Radon Control Components in New Construction of 1 & 2 Family Dwellings and Townhouses)
ANSI/AARST MAH	(Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes)
ANSI/AARST MA-MFLB	(Protocol for Conducting Measurements of Radon and Radon Decay Products in Multifamily, School, Commercial and Mixed-Use Buildings) *Note—Previously published as ANSI/AARST MAMF and MALB and now harmonized and consolidated into a single standard.*
ANSI/AARST MW-RN	(Protocol for the Collection, Transfer and Measurement of Radon in Water)
ANSI/AARST MS-QA	(Radon Measurement Systems Quality Assurance)
ANSI/AARST MS-PC	(Performance Specifications for Instrumentation Systems Designed to Measure Radon Gas)

The Consensus Process

The consensus process developed for the AARST Consortium on National 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.

Continuous Maintenance

This standard is under continuous maintenance by the AARST Consortium on National 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.standards.aarst.org/public-review), such as exhibit templates for field notices, inspection forms and, across time, interpretations, and approved addenda updates.

AARST Consortium on National Standards

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CC-1000

Soil Gas Control Systems in New Construction of Multifamily, School, Commercial and Mixed-Use Buildings

SECTION 1: SCOPE

1.1 General

The provisions in this standard provide prescriptive minimum requirements for the construction of any building intended for human occupancy, except for 1 and 2 family dwellings[4,5] in order to reduce occupant exposure to *radon* and other *hazardous soil gases*.

This standard and informational supplements address construction of buildings that include, among others, the use of a building or structure, or a portion thereof for multifamily or congregate residential occupancies, educational occupancies, and commercial occupancies.

1.2 Significance of Use

This standard of practice stipulates requirements to:

a) ensure buildings are capable of mitigating soil gas entry;

b) provide a means for qualified personnel to inspect and evaluate installed mitigation systems; and

c) provide responsible practices that can be recommended or adopted for use as requirements of a contract or local jurisdiction.

1.3 Applicability

This standard can be adopted as requirements for contractual relationships or as recommendations or requirements of an authority or jurisdiction.

1.4 Limitations

1.4.1 *1- and 2-family dwellings and townhouses*

While this standard expands into technological specifics associated with any *radon* resistant construction effort, more simplistic minimum requirements for dwellings with a footprint of less than 2,500 square feet are provided in other standards[5].

1.4.2 *Action levels and guarantees*

Compliance with provisions herein do not guarantee reduction of soil gas entry to the degree needed to achieve compliance with federal, state, or local jurisdiction action levels for *radon* or soil gas hazards.

1.4.3 *Passive qualities for reducing soil gas entry*

Informative—Building designs intended to optimize passive benefits can require more soil gas vent systems than the minimum requirements herein. In 1994, EPA recommended to rough-in active soil depressurization (ASD) systems during construction of schools and large buildings but did not recommend using passive systems. [6]

1.4.5 *Hazardous soil gases other than radon*

While methods and techniques employed in this standard are applicable for most soil gases, this standard does not include all design and safety features that can be required for soil gas or vapors other than *radon*.

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[4] As point of reference, see (as published by the International Code Council) the International Building Code (IBC) for occupancy groups A, B, E. F, H, I, M and R unless regulated by the International Residential Code (IRC).

[5] For 1 & 2 Family Dwellings, see ANSI/AARST CCAH "Reducing Radon in New Construction of 1 & 2 Family Dwellings and Townhouses"

[6] "Radon Prevention in the Design and Construction of Schools and other Large Buildings" EPA/625/R-92/016