How the EPA Single-Family Standards Differ from the ANSI-AARST Single-Family Standards

Brian Hanson

K-State Radon Programs

History of Radon Standards

- The U.S. EPA **RECOMMENDS** no longer using the now very dated standards
  - **RECOMMENDS** using the AARST-ANSI consensus standards

KS Radon Standards

- KDHE Division of Public Health Radiation Control Section
  - ANSI-AARST Standards Under Review for Adoption
    - Single-Family
      - ANSI/AARST MAH-2019
        Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes
      - ANSI/AARST SGM-SF-2017 with 12/2020 REVISIONS
        Soil Gas Mitigation Standards for Existing Homes
    - Large Buildings
      - ANSI/AARST MAMF-2017 with 1/2021 REVISIONS
        Protocol for Conducting Measurements of Radon and Radon Decay Products in Multifamily Buildings
      - ANSI/AARST RMS-MF-2018 with 12/2020 REVISIONS
        Radon Mitigation Standards for Multifamily Buildings
      - ANSI/AARST MALB-2014 with 1/2021 REVISIONS
        Protocol for Conducting Measurements of Radon and Radon Decay Products In Schools and Large Buildings
      - ANSI/AARST RMS-LB-2018 with 12/2020 REVISIONS
        Radon Mitigation Standards for Schools and Large BuildingsNot To-Be Adopted ANSI-AARST Standards New Construction
    - Not to be adopted
      - Radon in Water
      - Quality Assurance
      - RRNC standards

IA Radon Standards

- Iowa Department of Health and Human Services
  - Effective March 15, 2023
    - Measurement
      - ANSI/AARST MAH-2019
        Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes
      - ANSI/AARST MAMF-2017 with 1/2021 REVISIONS
        Protocol for Conducting Measurements of Radon and Radon Decay Products in Multifamily Buildings
      - ANSI/AARST MALB-2014 with 1/2021 REVISIONS
        Protocol for Conducting Measurements of Radon and Radon Decay Products In Schools and Large Buildings
      - ANSI/AARST MS-QA 2019
        Radon Measurement Systems Quality Assurance
    - Mitigation
      - EPA RMS, **and**
      - ASTM E-2121

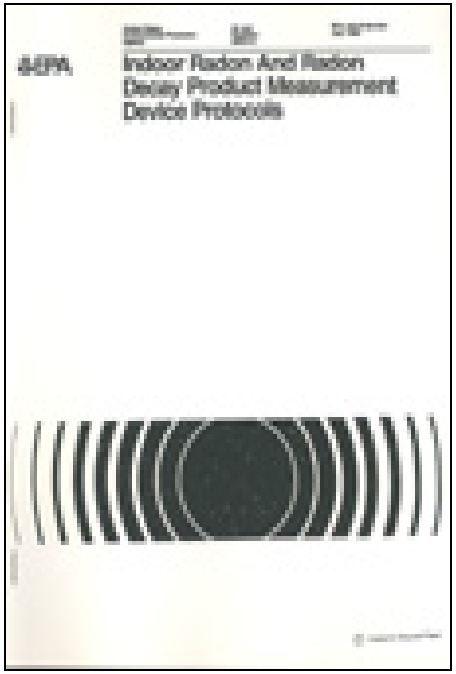
NE Radon Standards

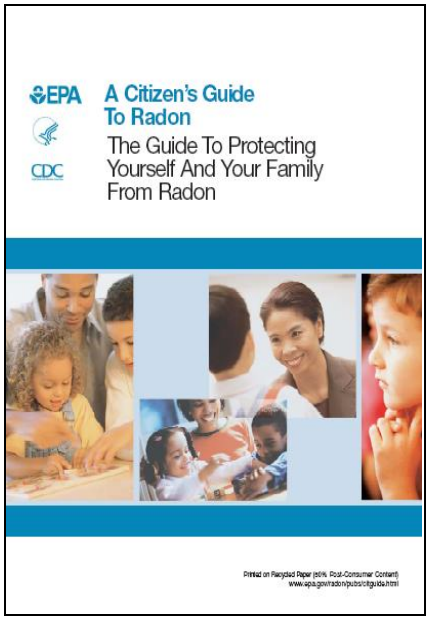
- Nebraska Department of Health and Human Services
  - ANSI-AARST Standards Under Review for Adoption
    - ANSI/AARST MAH-2019
      Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes
    - ANSI/AARST MA-MFLB 2022
      Protocol for Conducting Measurements of Radon and Radon Decay Products in Multifamily, School, Commercial and Mixed-Use Buildings
    - ANSI/AARST
      Soil Gas Mitigation Standards for Existing Homes
  - Still in the review process with no expected date
    - Specific rules/regulations to follow

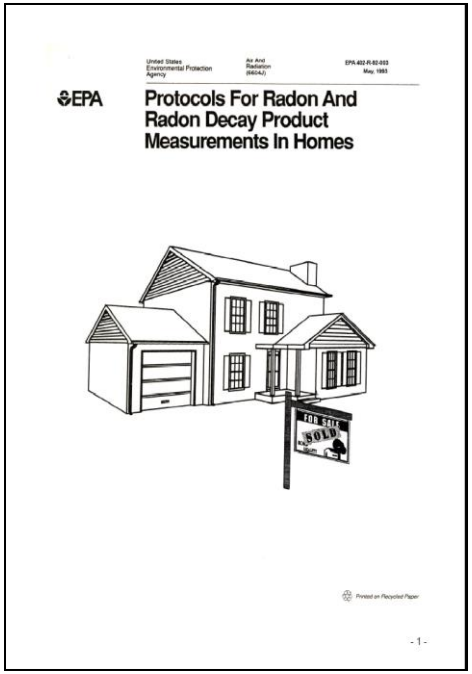
Practice changes from the EPA Measurement Protocols to the AARST MAH Standard

Pay attention to the SHOULDS that became SHALLS…

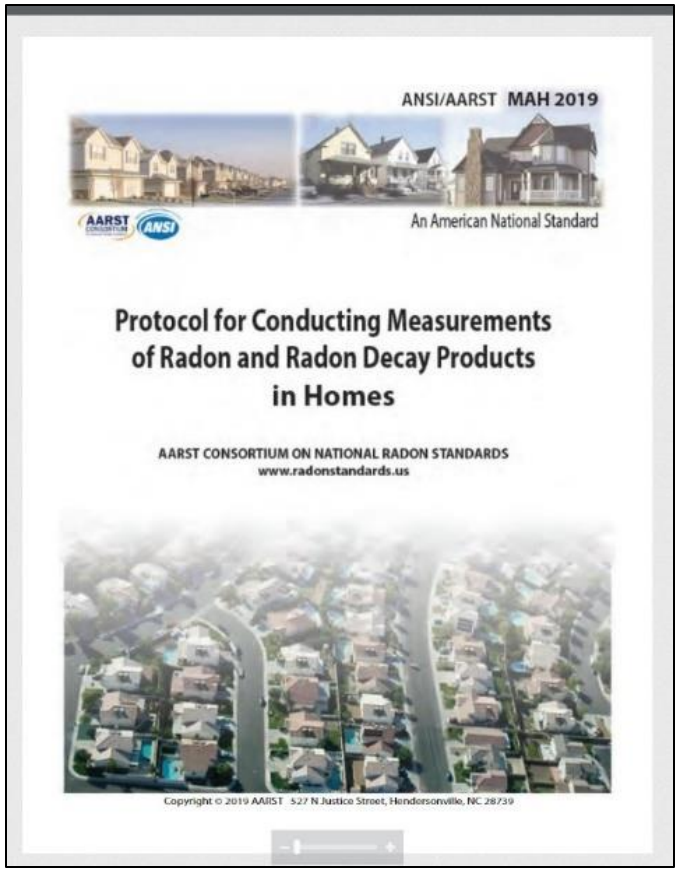
EPA Radon Measurement Protocols and Parallel Consumer Documents







AARST Radon Standards



https://standards.aarst.org/

Measurement Protocol Differences

- EPA: When to test a single-family building
  - For areas with significant closed-building habitation
    - Can be tested **ANY TIME OF YEAR**
  - For areas without any significant closed-building operation
    - Evaluate across multiple seasons
- **AARST MAH**

Informative Advisories:

2.2.1 *Test at the earliest opportunity.*
Homes can be tested at any time of the year.

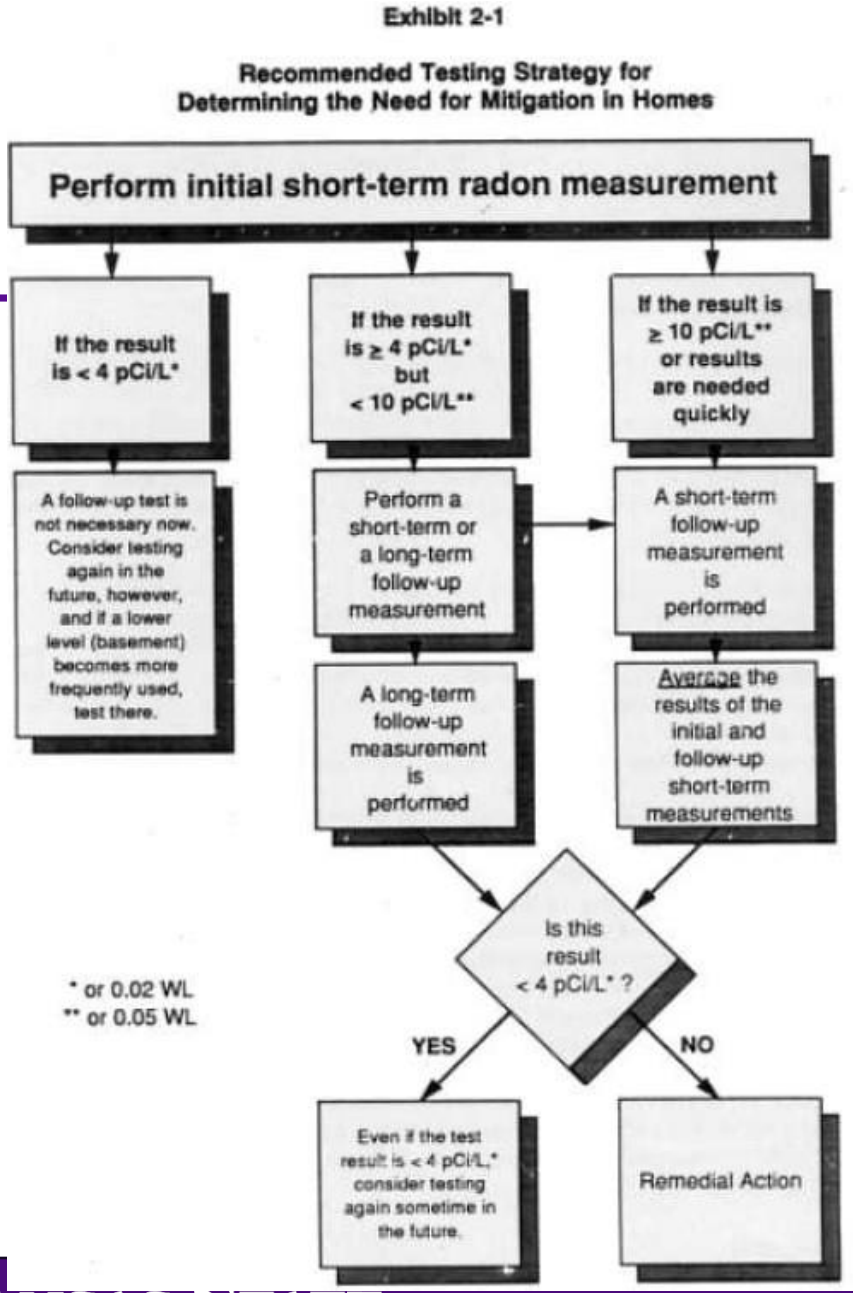
2.2.2 *Test whenever moving to a new residence*
To prevent the possibility of long-term exposure to a radon hazard, take the opportunity to test in association with moving into any new or existing home or dwelling.

2.2.3 *Severe weather*
Avoid testing during unusual local severe weather if the test period is less than 4 days. When severe conditions occur during a test, retesting may be appropriate.

2.2.4 *Seasonal considerations*
While some buildings respond differently to seasonal changes, tests conducted when a heating system operates both day and night are more likely to provide a clear characterization of potential radon hazards.

EPA Extended Testing Protocol

- Short- or long-term measurements made in the lowest **LIVED-IN** level of the house



AARST MAH Extended Testing Protocol

- Conducted in the lowest level of the home **OCCUPIED**

5.3 The Extended Testing Protocol

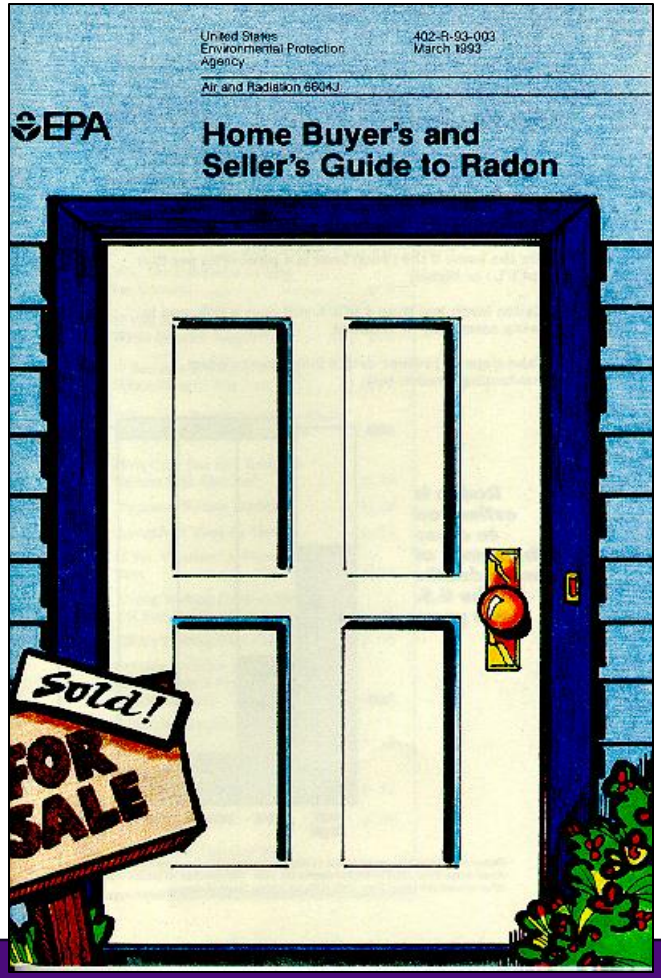
Note—This protocol builds upon protocols developed by EPA relative to EPA's "*A Citizen's Guide to Radon.*"

Table 5.3	Extended Testing Protocol (Required Procedure and Summary)
Step 1	***Single Short-Term Test*** Testing is conducted using a short-term detector at each test location.
Step 2	***Retest*** locations where the initial short-term tests meet or exceed the *action level*, e.g., 4 pCi/L.
	If the first short-term test is twice the *action level* or greater, a second short-term test is to be conducted without delay. [1]
	If the first short-term test exceeds the *action level* but is less than twice the *action level*, either a second short-term test or a long-term test is to be conducted.
Step 3	**Decisions to Fix the Building**
	Mitigation decisions are to be based on the long-term test results or the average of the two short-term test results. [2]
	Fix the building if test results meet or exceed the *action level*, e.g., 4 pCi/L. Consider fixing the building if results are greater than half the *action level*, e.g., between 2 and 4 pCi/L.

[1] Note—While decisions to mitigate at any time are not prohibited, the second test aids confidence that decisions are not being made based on a faulty test device or unexpected conditions

[2] Note—If two short-term test results disagree in terms of making a *mitigation* decision, see Section 7.2

EPA Time-Sensitive Protocol



- Options
  - Sequential testing
  - Simultaneous testing
  - Single test with Continuous Radon (CR) or Continuous Working Level Monitor (CW).
- Outlined in EPA's Home Buyer's and Seller's Guide

AARST MAH Time-Sensitive Testing Protocol

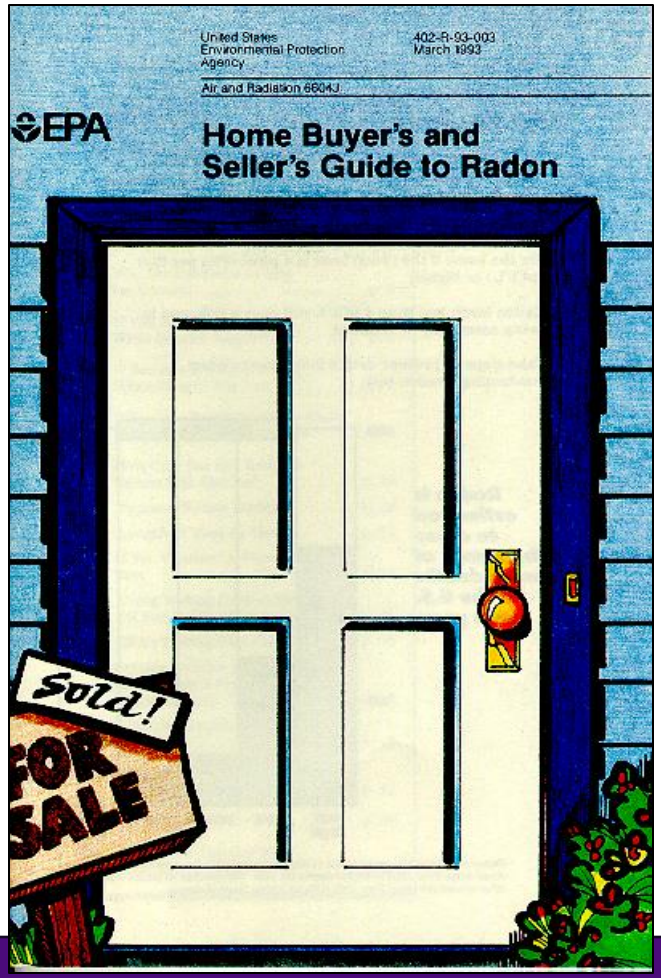
- Conducted in the lowest level of the home that **COULD** be occupied

5.2 The Time-Sensitive Testing Protocol

Note—This protocol builds upon protocols developed by EPA relative to EPA's *"Home Buyer's and Seller's Guide to Radon"*.

Table 5.2	Time-Sensitive Testing Protocol (Required Procedure and Summary)	
Step 1 Options	***Simultaneous Testing***	Tests are to be conducted using two short-term test devices at the same time in the same location, 4 to 8 inches (10-20 cm) apart.
	Continuous Monitor	Tests are to be conducted using a monitor that records retrievable hourly measurements.
Step 2	**Decisions to Fix the Building**	
	Mitigation decisions are to be based on the average result from a continuous monitor or the average of two test results conducted at the same time in the same location. [1] **Fix the building** if test results meet or exceed the *action level*, e.g., 4 pCi/L. Consider fixing the building if results are greater than half the *action level*, e.g., between 2 and 4 pCi/L.	
[1] Note—If two short-term test results disagree in terms of making a *mitigation* decision, see Section 7.2		

EPA Closed-Building Conditions



- For ANY short-term test
  - Closed-house conditions SHOULD be maintained as much as possible
  - For tests <96 hours
    - **SHOULD** be maintained 12 hours prior to the test
    - **SHOULD** be maintained during the test as much as possible

AARST MAH Closed-Building Conditions

- Closed-building conditions (per winter heating season) are **REQUIRED** when short-term results are used for mitigation decisions
  - Initiated 12 hours prior to a test <96 hours
  - Maintained thru the test for tests <91 days

Table 4-A ESSENTIAL CLOSED-BUILDING PROTOCOL REQUIREMENTS	
Windows	**Keep closed** on all levels of the building including areas not being tested
Exterior doors (except for momentary entry and exit)	
Heating and cooling systems	**Set to normal** occupied operating conditions with temperature settings between 65˚and 80˚ F (18˚ - 27˚ C)
Systems that temporarily ventilate with outdoor air for seasonal comfort or energy savings	**Set to the lowest seasonal ventilation condition that occurs during the year**
Whole-house fans	**Do not operate**
Fireplaces (that burn solid, liquid or gas fuels unless a primary/normal source of heat for the building)	
Clothes dryers, range hoods and bathroom fans	**Avoid excessive operation**
Required building operation also includes components itemized for clarification in Exhibit 1	
Table 4-B ADDITIONAL REQUIREMENTS FOR NEW CONSTRUCTION, RENOVATIONS AND REPAIRS	
All openings to the exterior (due to incomplete construction, structural defect or disrepair)	**These opening to the exterior shall be closed or sealed at least 12 hours prior to initiating the test**
Heating/cooling systems active and set to a normal occupied temperature	**These items shall be completed or installed at least 12 hours prior to initiating the test**
All windows and exterior doors installed with hardware and seals	
All insulation and exterior siding	
All wall and ceiling coverings to be completed including interior drywall or paneling; does not include decorative finishing of walls, floors or ceilings	
All fireplaces and fireplace dampers installed	

Actions Based on Test Results

Action Level Guidance

Action Level Guidance

Countries worldwide have adopted a*ction levels* for *radon* exposures. The *action level* observed should comply with the guidance of the country, state or local jurisdiction of authority where the test is being conducted.

U.S. Action Level. The following *action level* descriptions reflect guidance from the United States Environmental Protection Agency (EPA):

- **4 *pCi/L* or greater** (≥ 150 Bq/m^3)

  Fix the building. The higher the *radon* concentration, the more quickly action should be taken to reduce the concentrations.

- **Below 4 *pCi/L*** (< 150 Bq/m^3)

  Consider fixing the building if test results indicate that *radon* concentrations are greater than half the *action level*, such as between 2 and 4 *pCi/L* (75 and 150 Bq/m^3).

  With observance that hazards from *radon* are virtually the same for *radon* concentrations that are near *action level* thresholds, it is noteworthy that the World Health Organization recommends limiting *long-term* exposures to less than 2.7 *pCi/L* (100 Bq/m^3).

  When measurement devices indicate concentrations lower than about 2.0 *pCi/L* (75 Bq/m^3), test data should normally be interpreted as being lower than the test device can accurately measure.

Business Considerations

A non-comprehensive list of things to think about

- Learning the **SHALL**S that used to be **SHOULDS**
  - The standards are your new best friend (replacing the old best friend)
- Project bid development
  - 'Ask me anything BUT for time!'
  - Cost projections
    - Staffing, devices, report development
- Business practice reminders
  - Certification states **NOT LIKELY** to recognize the lower-tier measurement certification AARST-NRPP offers in non-certification states
  - Certification states **LIKELY REQUIRE** the state-certified measurement professional to be on-site during measurement work

Practice changes from the EPA Mitigation Protocols to the AARST SGM Standard

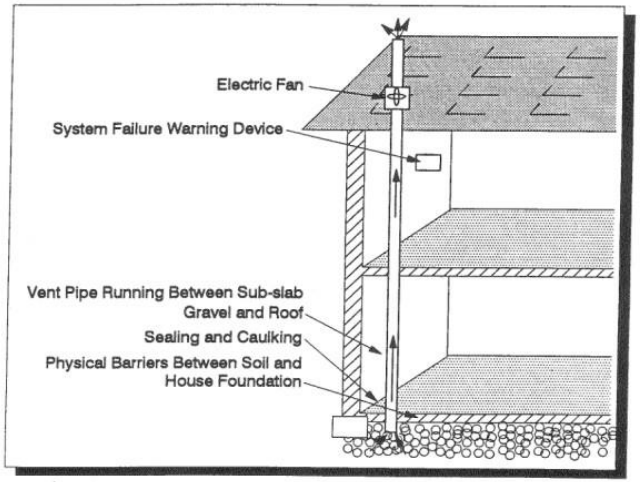
Yeah, this got a bit more complicated…

EPA Radon Mitigation Standard

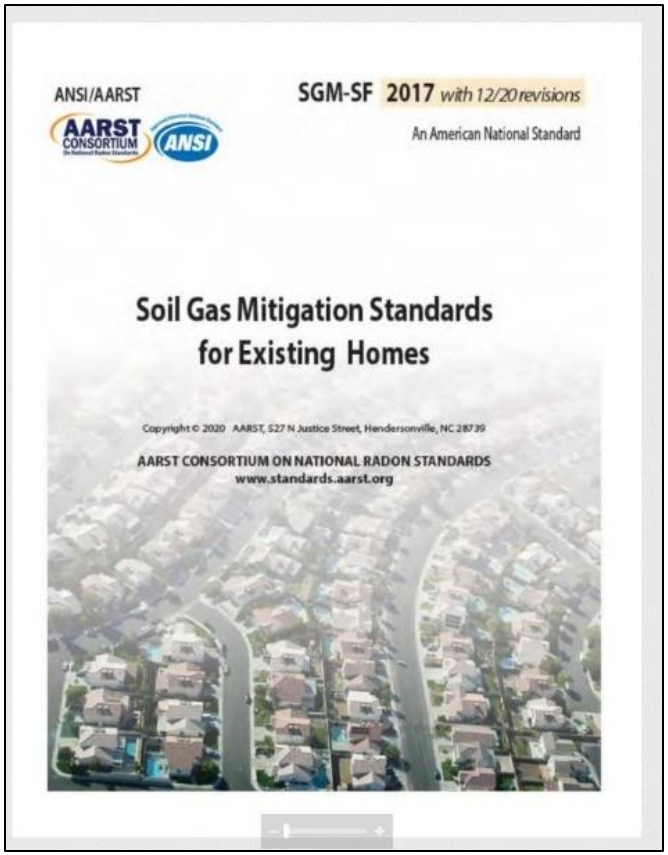
United States Environmental Protection Agency | Air and Radiation (6604J) | EPA 402-R-93-078 October 1993 (Revised April 1994)

EPA

RADON MITIGATION STANDARDS



AARST Radon Mitigation Standard



https://standards.aarst.org/

Significant SGM Mitigation Changes

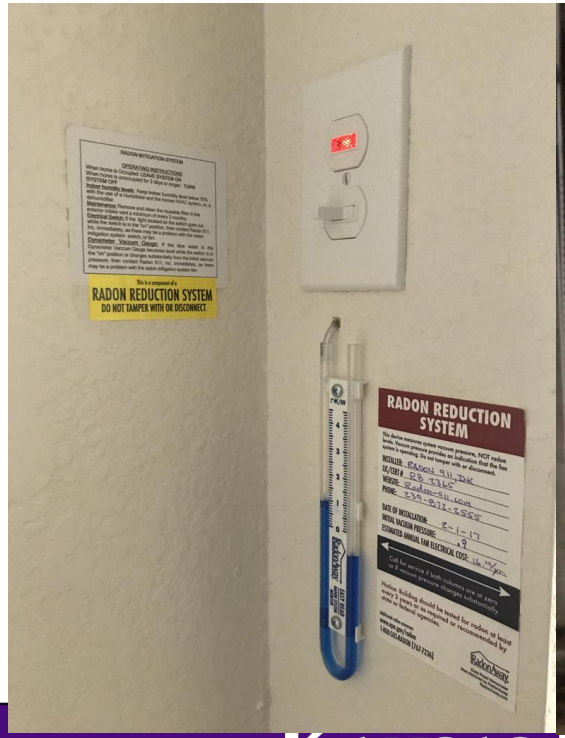
Three Significant Changes in Mitigation under the AARST-ANSI SGM

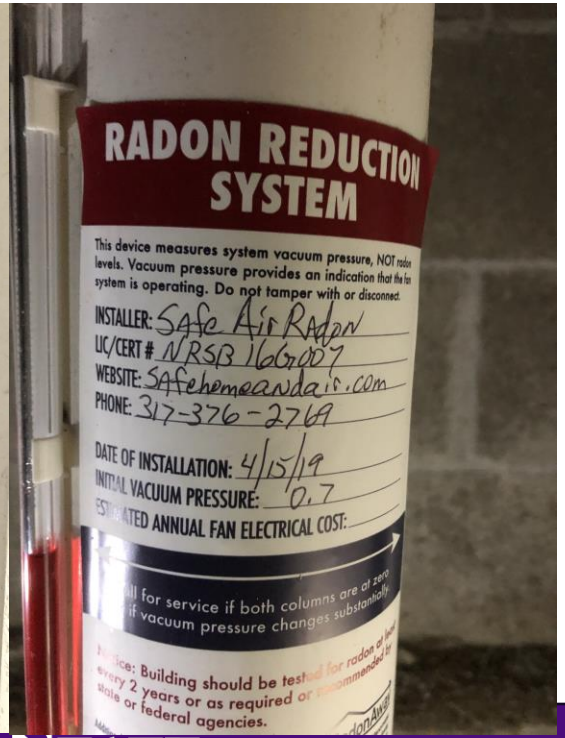
- Labeling requirements
  - All labels **SHALL**
    - Be made of durable materials
    - All lettering **SHALL** be in color contrast to the background
  - Primary labels
    - A system description label **SHALL** be placed on a primary component of each system
    - Label duct piping: interior duct piping **SHALL** be marked not less than one label per floor
    - Disconnect switches **SHALL** be labeled to indicate function
    - Sealed components **SHALL** be labeled to indicate function

Significant SGM Mitigation Changes

Three Significant Changes in Mitigation under the AARST-ANSI SGM

- Labeling requirements





Significant SGM Mitigation Changes

Three Significant Changes in Mitigation under the AARST-ANSI SGM

- System Monitoring
  - All fan-driven mitigation systems **SHALL** include a viewable operating range monitor
    - Includes a continuous display
    - Has start-up values clearly marked
  - In addition to viewable operating range features, a monitoring mechanism is **REQUIRED** that actively alerts occupants in the event of a mechanical failure, which **SHALL**
    - Provide an audible alert, or
    - Visual light alert, or
    - Telemetric notification

Significant SGM Mitigation Changes

Three Significant Changes in Mitigation under the AARST-ANSI SGM

- System Monitoring Cont.
  - **REQUIRED** for ALL system monitors
    - System monitors **SHALL** be protected from the elements and durable for the ambient environmental conditions
    - System monitors **SHALL** be labeled as such
    - Battery operated components **SHALL NOT** be used unless equipped with a low-power warning feature
    - Components requiring electricity **SHALL** be on non-switched circuits and designed to reset automatically when power is restored
    - Components requiring electricity for indication of system failure **SHALL NOT** be powered by the same branch as the system fan

Significant SGM Mitigation Changes

Three Significant Changes in Mitigation under the AARST-ANSI SGM

- System monitoring requirements

Significant SGM Mitigation Changes

Three Significant Changes in Mitigation under the AARST-ANSI SGM

- System Exhaust Discharge Changes
  - The exhaust point for all soil gas vent systems **SHALL** be located outdoors
  - Exhaust trajectories of 45 degrees **SHALL NOT** encounter openings/points of congregation within 10 ft
  - Exhaust trajectories of 11 degrees **SHALL NOT** encounter openings/points of congregation within 20 ft
  - Point of exhaust **SHALL** be located not less than 10 feet above grade
    - Not less than 10 ft horizontally AND not less than 4 ft above operable openings

Significant SGM Mitigation Changes

Three Significant Changes in Mitigation under the AARST-ANSI SGM

- System Exhaust Discharge Changes
  - The exhaust point **SHALL** be not less than 10 ft above or horizontal to the side of exterior flooring surfaces
  - The exhaust point **SHALL** be directed upward at an angle that DOES NOT deviate more than 45 degrees from vertical
  - The exhaust point **SHALL** be
    - Not less than 1 ft above a pitched roof at the point penetrated
    - Not less than 6 inches above the edge of the roof when ASD is attached to the side of the building, and
    - Not less than 18 inches above a flat roof

Significant SGM Mitigation Changes

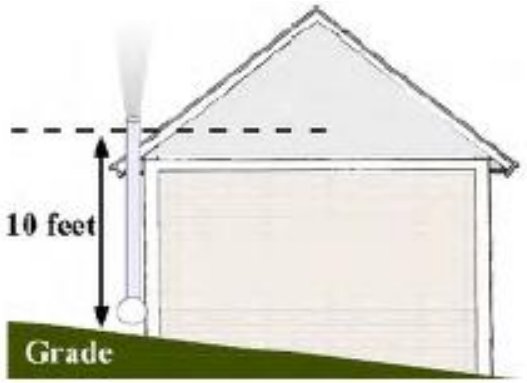
Three Significant Changes in Mitigation under the AARST-ANSI SGM

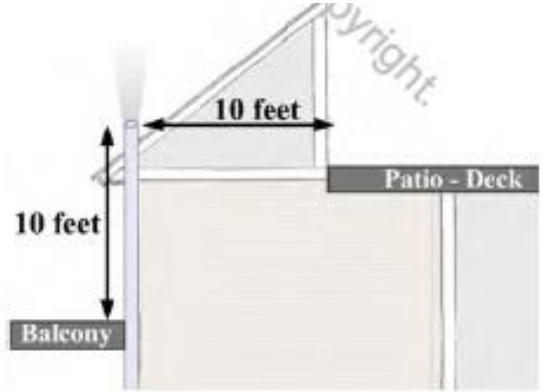
- System Exhaust Discharge Changes
  - The exhaust point **SHALL** be permitted below the edge of the roof IF all of the following are complied with
    - A written justification **SHALL** be recorded in the OM&M
    - The exhaust point **SHALL NOT** be less than 20 ft above grade
    - Testing **SHALL** be conducted within the occupiable area immediately adjoining the discharge point

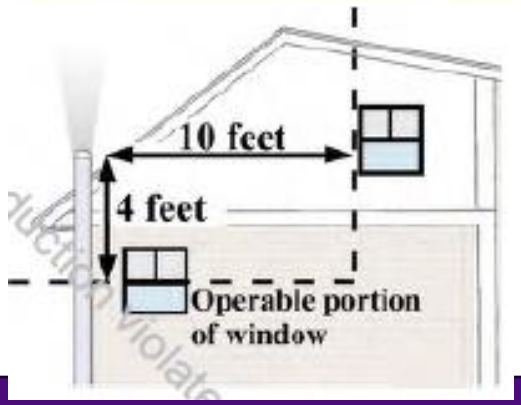
Significant SGM Mitigation Changes

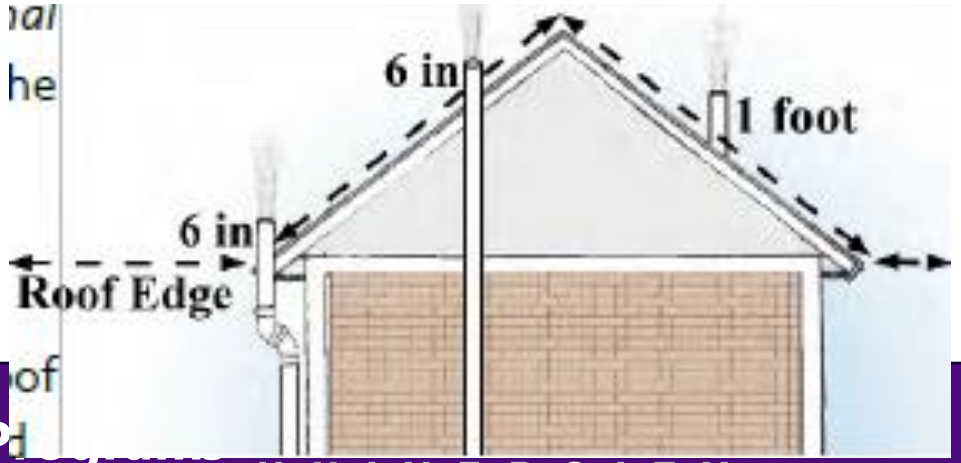
Three Significant Changes in Mitigation under the AARST-ANSI SGM

- System Exhaust Discharge Changes









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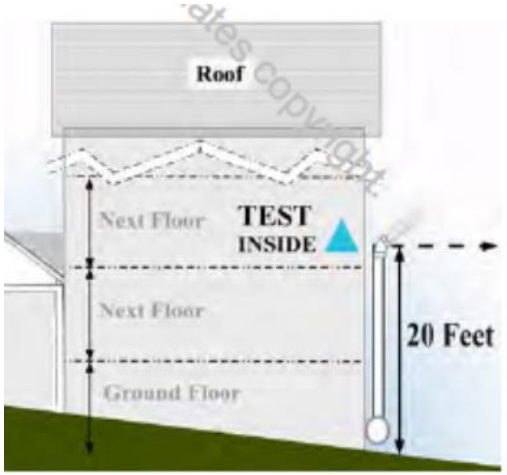

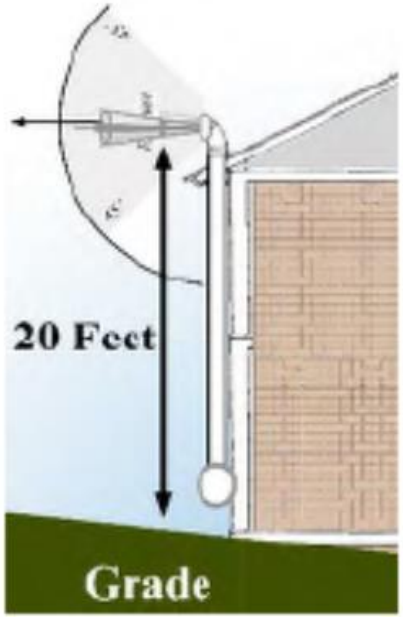

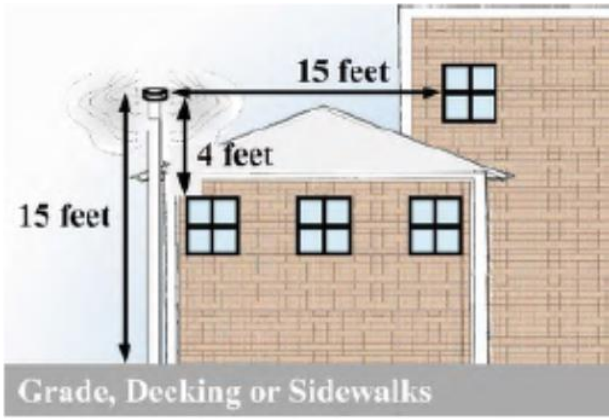

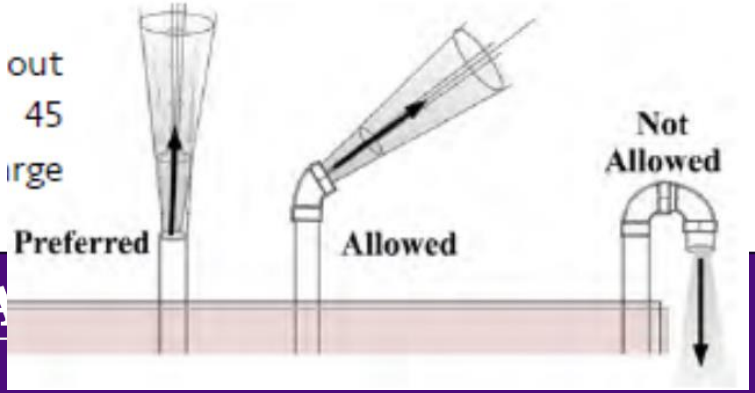

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Questions?

Cause, boy do I have answers…

Standards Update CE

The Kansas Radon Program will provide no-cost CE opportunities on these standards when they are in-place

- Single-family CE
  - 4-hour AARST-ANSI MAH standards review course (webinar)
  - 4-hour AARST-ANSI SGM standards review course (webinar)
- Large-building CE
  - 4-hour introduction to the Multi-family/Large Building Measurement Standards (webinar)
  - 4-hour introduction to the Multi-family/Large Building Mitigation Standards (webinar)

We're From the Government, We're Here to Help

Kansas Radon Chamber

www.ksuradonchamber.org

National Radon Program Services

www.sosradon.org

Kansas Radon Program

www.kansasradonprogram.org

MURC Radon Training

https://radoncourses.com/

Resources for You

- Call Kansas Radon Program
  - **800.693.5343**
  - **https://kansasradonprogram.org/home**

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