An Introduction to the ANSI-AARST Large Building Standards

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K-State Radon Programs

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History of KS Radon Standards

Kansas became a **REGULATORY** state for radon July 1, 2011

- KDHE Division of Public Health Radiation Control Section
  - Adopted the original 1993 U.S. EPA radon standards by regulation
  - Measurement Standards
    - Indoor Radon and Radon Decay Product Measurement Device Protocols
    - Protocols for Radon and Radon Decay Product Measurements in Homes
  - Mitigation Standards
    - Radon Mitigation Standards

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History of KS Radon Standards

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

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History of KS Radon Standards

Kansas became a **REGULATORY** state for radon July 1, 2011

- KDHE Division of Public Health Radiation Control Section
  - In 2021, began the regulatory process to replace the U.S. EPA radon standards with the ANSI-AARST Standards
  - Adoption process expected to be complete 1st Quarter 2023

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History of KS Radon Standards

Kansas became a **REGULATORY** state for radon July 1, 2011
- KDHE Division of Public Health Radiation Control Section
  - ANSI-AARST Standards Categories
    - Single-Family Buildings
    - Large Buildings
      - Multi-Family
      - Schools and other Large Buildings
    - New Construction
    - Radon in Water
    - Quality Assurance
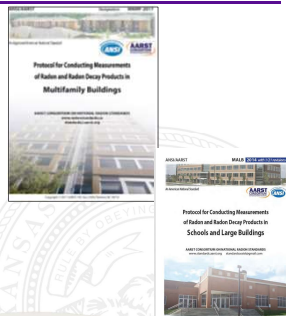
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I don't have 118 CRMS…

HOW DOES LARGE BUILDING MEASUREMENT DIFFER FROM SINGLE-FAMILY STRUCTURES?

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AARST Radon Measurement Protocols

- AARST Protocol for Radon Measurement in Multi-family Buildings
- Protocols for Conducting Measurements of Radon and Radon Decay Products in Schools and Large Buildings
- AARST-ANSI Standards
  - https://standards.aarst.org/

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Informative Exhibits

Normative Appendices
A. Reporting Building Operating Conditions
B. Evaluation of Occupied v Unoccupied Concentrations
C. Radon Sources Other Than Soil Gas

Consensus Body Members

Companion Guidance
CG-1 Introduction to Radon
CG-2 Guidance to Building Managers
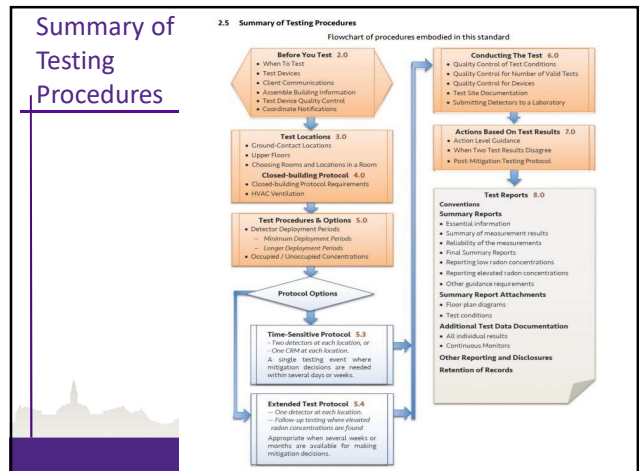CG3-Descriptions of Test Devices
CG-4 Chain of Custody

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Measurements in Large Buildings

Primary differences between single-family and large building measurements

- When to test a large building
  - Buildings that **ARE** significantly occupied day and night
    - Can be tested **ANY TIME OF YEAR**
    - Residential-only or mixed use residential/other
  - Buildings that **ARE NOT** significantly occupied day and night
    - Measurements **SHALL** be conducted at a time representative of normal occupied conditions

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Summary of Testing Procedures

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Measurements in Large Buildings

Primary differences between single-family and large building measurements
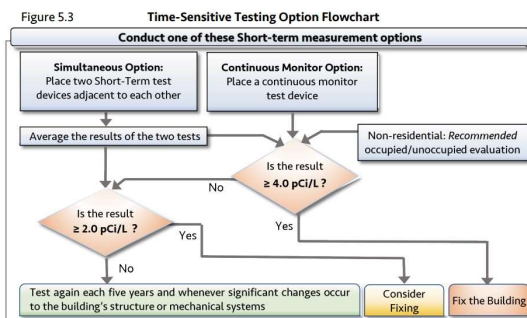
- Client communications
  - Not only between you and your client, but **ALL** occupants of the structure being measured
- Building investigation
  - Identification of **ALL** HVAC zones
  - Identification of **ALL** identified measurement locations (and devices needed for coverage)
    - **INCLUDING** QC devices
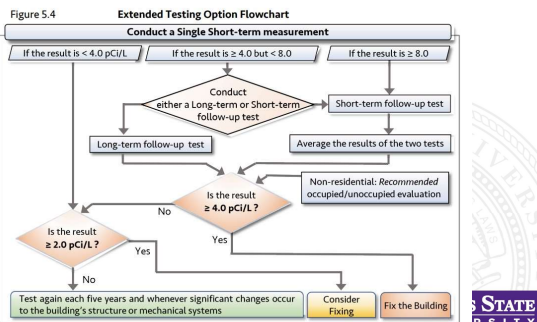
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U N I V E R S I T Y

Testing Procedures & Options

Time-Sensitive Testing Option

Figure 5.3   **Time-Sensitive Testing Option Flowchart**

Conduct one of these Short-term measurement options

Simultaneous Option: Place two Short-Term test devices adjacent to each other

Continuous Monitor Option: Place a continuous monitor test device

Average the results of the two tests

Non-residential: *Recommended* occupied/unoccupied evaluation

Is the result ≥ 4.0 pCi/L ?   No

Is the result ≥ 2.0 pCi/L ?   Yes   Yes

No

Test again each five years and whenever significant changes occur to the building's structure or mechanical systems   Consider Fixing   Fix the Building

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Testing Procedures & Options

Extended Testing Option

Figure 5.4   **Extended Testing Option Flowchart**

Conduct a Single Short-term measurement

If the result is < 4.0 pCi/L   If the result is ≥ 4.0 but < 8.0   If the result is ≥ 8.0

Conduct either a Long-term or Short-term follow-up test   Short-term follow-up test

Long-term follow-up test   Average the results of the two tests

Non-residential: *Recommended* occupied/unoccupied evaluation

Is the result ≥ 4.0 pCi/L ?   No

Is the result ≥ 2.0 pCi/L ?   Yes   Yes

No

Test again each five years and whenever significant changes occur to the building's structure or mechanical systems   Consider Fixing   Fix the Building

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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/m³*)

  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/m³*)

  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/m³*).

  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/m³*).

  When measurement devices indicate concentrations lower than about 2.0 *pCi/L* (75 *Bq/m³*), test data should normally be interpreted as being lower than the test device can accurately measure.

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Business Considerations

A non-comprehensive list of things to think about
- Device types (and numbers)
  - Purchase and storage of large numbers of devices
    - QC associated with those devices
- Project bid development
  - 'Ask me anything BUT for time!'
  - Cost projections
    - Staffing, devices, report development
- Business practice changes
  - Insurance levels
  - Permanent/temporary staffing concerns

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AARST Radon Mitigation Protocols

- AARST Radon Mitigation Standards for Multifamily Buildings
- AARST Radon Mitigation Standards for Schools and Large Buildings
- AARST-ANSI Standards
  - https://standards.aarst.org/

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Mitigation in Large Buildings

Primary differences between single-family and large building mitigation activities

- Standards' scope
  - Addresses WHOLE building consideration
    - Apply when implemented TO PORTIONS of a large building, or
    - Individual unit/dwelling of a large building
  - When building portions include
    - Non-residential purposes and/or
    - Elaborate HVAC systems
    - Refer to RMS-LB schools/large buildings

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Mitigation in Large Buildings

Primary differences between single-family and large building mitigation activities

- Building investigation
  - Collect ALL known radon measurement reports
    - ID any measurement data insufficiencies
  - Identification of **ALL** HVAC zones
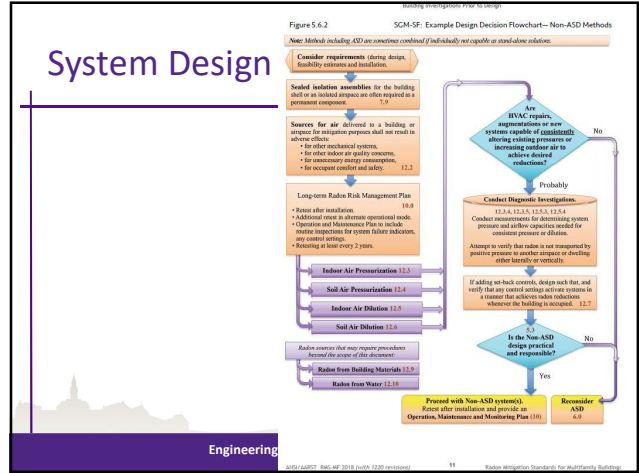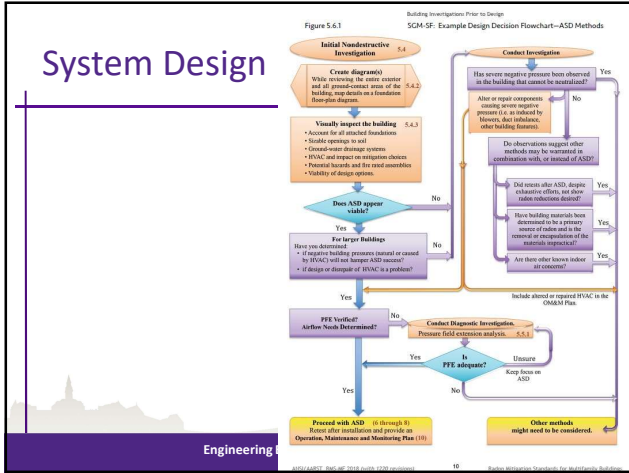 - Identification of **ALL** foundational zones

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Mitigation in Large Buildings

Primary differences between single-family and large building mitigation activities

- Proposal/bid issues
  - Provide the client a statement regarding extent of **ALL** building investigations needed to design an appropriate mitigation strategy/system
- Client communication

"Occupant Advisory: Common construction sealants used to prevent radon entry at foundations and other locations will normally emit vapors that contain modest amounts of certain chemicals generally referred to as volatile organic compounds. The emissions occur mostly during application, but also to a lesser extent as they dry to form an airtight bond. While these chemicals are commonly used, some sensitive individuals may experience discomfort or other health effects when exposed to such chemicals.

Symptoms that may indicate sensitivity to these vapors may include: nausea, headaches, dizziness, drowsiness and/or an allergic reaction. Special consideration should be made for the very young or elderly who cannot communicate symptoms experienced. Safety Data Sheets (SDS) are available upon request.

If symptoms are observed: Leave the area immediately to breathe fresh air. Avoid further exposure. If symptoms persist, get medical attention."

(See notice examples in Exhibits A-1 and A-3.)

The notification to clients regarding hazardous materials shall include: a general description of the hazardous materials; symptoms that might indicate sensitivity to the materials; and actions to take if symptoms are observed.

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System Design

Figure 5.6.1   SGM-SF: Example Design Decision Flowchart—ASD Methods

System Design

Figure 5.6.2   SGM-SF: Example Design Decision Flowchart— Non-ASD Methods

Documentation

Table 10.5 Part 1

Table 10.5 Operation, Maintenance and Monitoring (OM&M) Plan Requirements		
Documentation **Controls and Mechanical System Monitors**	**Maintenance Inspections** **of Controls and Monitors**	**Frequency of Inspection**
Document Startup Details A description shall be provided for the fan monitors, control settings and other operating parameters that existed at the time successful *mitigation* was initially achieved. Note—The description should include explicit detail for comparison during inspections and repair, including: a) descriptions of equipment labeling and annotations for fan monitors, control settings and other operating parameters; b) exact locations of fan monitors, electronic telemetry/monitoring equipment, electrical disconnects and other components; c) instructions for equipment sufficient to interpret labels, annotations and the designed operating parameters for the equipment. When applicable, include manufacturer instructions; d) a list of appropriate actions for the *client(s)* to take if fan monitor devices or inspections indicate a system is not operating as designed; and e) documented measurements for balance of airflow in and airflow out of *HVAC* system(s) when a component of a *mitigation* system.	The following inspections shall be written into the OM&M plan as required actions: a) inspection of fan monitors, control settings and other operating parameters to ensure systems are operating as designed; b) investigation and correction of any conditions that are found to indicate component failure or inconsistencies with designed operating parameters; c) recording and maintenance of records that are to be assimilated into the overall building *OM&M* documentation; and d) The plan shall stipulate that a qualified professional should perform these inspections and if performed by in house maintenance staff, such staff shall be trained in system operations.	The plan shall stipulate recommendations and any requirements for the frequency of inspections, as deemed by the *contractor* as appropriate to the situation. Note 1—It is recommended that the plan stipulate inspections be conducted at least quarterly of all fan monitors, controls, and as applicable, filters and vent openings. Note 2—The plan should recommend inspections subsequent to: a) system shutdown due to building power failure or emergency; and b) any catastrophic event that could damage system components.

Documentation

Table 10.5 Part 2

Documentation **Mechanical Equipment**	**Mechanical Equipment Inspections**	**Frequency of Inspection**

Equipment Details and Instructions
a) Include manufacturer instructions and instructions specific to design configurations, as appropriate;
b) Include exact locations of fans, electrical disconnects and other components; and
c) Include a list of appropriate actions for the *client(s)* to take if the fan monitor warning device indicates system degradation or failure.
d) Include a list of potential repair items for *ASD* systems that should include:
  i. fan monitor repair or replacement (e.g., reconnect or replace oil in U tube);
  ii. electrical repair;
  iii. fan or boot replacement; and
  iv. sealing openings to soil or piping connections.
	The OM&M plan shall observe that mechanical equipment inspections should include all seals, straps, fasteners, electrical system (including switch operation), boots, performance indicators, labels, pipe condition, filters, inlet grills and fan operation.
	When *HVAC* is a component of the *mitigation* system(s), provide a list of inspection items that includes:
	  i. *HVAC* airflow in and airflow out of the air handler;
	  ii. functionality of *HVAC* filters;
	  iii. room differential pressure test;
	  iv. fresh-air damper settings; and
	  v. verification for supply air into rooms of interest.
		The plan shall stipulate that a detailed inspection of all components is to be conducted at least every 2 years by a qualified professional.

Monitoring Continued Effectiveness
The plan shall include notice of applicable retesting guidance found in ANSI/AARST publication MAMF: *Protocol for Conducting Measurements of Radon and Radon Decay Products In Multifamily Buildings.*

Business Considerations

A non-comprehensive list of things to think about

- Project bid development
  - 'Ask me anything BUT for time!'
  - Costs of bid production
  - Cost projections
    - Staffing, devices, report development
- Business practice changes
  - Insurance levels
  - Permanent/temporary staffing concerns

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Cause, boy do I have answers…

QUESTIONS?

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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/

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Resources for You

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

- Brian Hanson
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