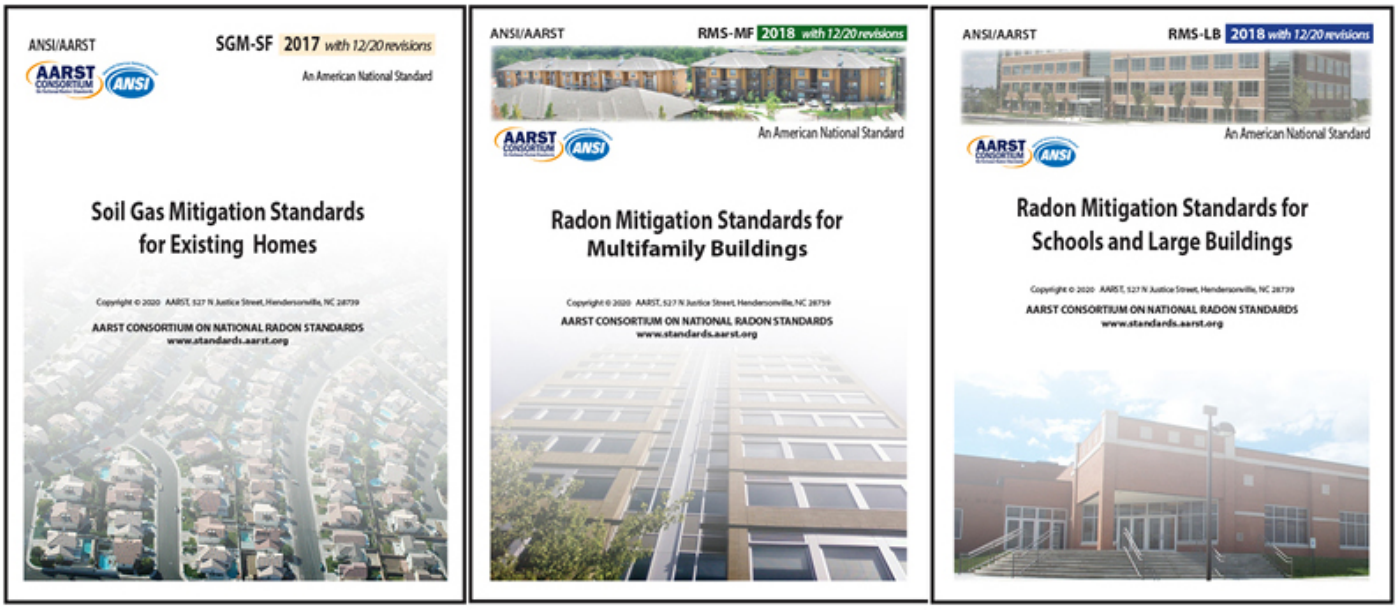
Harmonization effort for

SGM-SF, RMS-MF and RMS-LB Mitigation Standards

Continuous maintenance efforts to improve these standards are currently ongoing.



Read me

The work, as contained herein, resulted in harmonized updates that would replace Sections **1**, **2**, **3**, **4** and **10** to read the same in SGM-SF (existing homes); RMS-MF (multifamily buildings) and RMS-LB (schools and large buildings).

These proposed revisions are applicable to:

- SGM-SF 2017 rev12/20
- RMS-MF 2018 rev12/20
- RMS-LB 2018 rev12/20

Latest published versions of those standards are available for comparison at www.standards.aarst.org where all ANSI/AARST standards can be found for review at no charge and for purchase.

The current work project includes (1) harmonization, where possible, for all portions of these documents to read the same for the same tasks; (2) update based on new experiences, and (3) renderings that are more conductive to stakeholders who are involved in compliance assessment.

Public Review: SF-MF-LB *05-21*

COMMENT DEADLINE: **July 12th, 2021**

REQUESTED PROCESS AND FORM FOR FORMAL PUBLIC REVIEW COMMENTS

Submittals (MS Word preferred) may be attached by email to StandardsAssist@gmail.com

1) Do not submit marked-up or highlighted copies of the entire document.

2) If a new provision is proposed, text of the proposed provision must be submitted in writing. If modification of a provision is proposed, the proposed text must be submitted utilizing the strikeout/underline format.

3) For substantiating statements: Be brief. Provide abstract of lengthy substantiation. (If appropriate, full text may be enclosed for project committee reference.)

REQUESTED FORMAT

Title of Public Review Draft: **SF-MF-LB 05-21**

- **Name:** Affiliation:
- **Clause or Subclause**:
- **Comment/Recommendation**:
- **Substantiating Statements**:
- [___] Check here if your comment is supportive in nature and does not require substantive changes in the current proposal in order to resolve your comment.

Repeat the five bullet items above for <u>each</u> comment.

Requested registration of your contact information and copyright release.

ONE TIME REGISTRATION
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NOTE: AARST Consortium on National Radon Standards encourages original commentary on its standards. Commenters that choose to submit comments without an author's signature (due to difficulties in timeliness, proximity or other) shall be deemed to have done so at their sole discretion and have thereby acknowledged and accepted the copyright release herein. If commenters submit comments authored by others, those comments must also be accompanied by a signed copyright release from the author of the original comment. The original comment author and representing commenters may be asked to engage in dialog supporting their position.

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Notice regarding unresolved objections: While each committee seeks to resolve objections, please notify the committee responsible for an action or inaction if you desire to recirculate any unresolved objections to the committee for further consideration. Notice of right to appeal. (See Bylaws for the AARST Consortium on National Radon Standards - Operating Procedures for Appeals available at www.radonstandards.us, Standards Forum, Bylaws): (2.1) 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.

AARST Consortium on National Radon Standards

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The Consortium Consensus Process

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.

Continuous Maintenance

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.standards.aarst.org/public-review) as they become available (such as templates for field notices, inspection forms, interpretations and approved addenda updates across time).

Notices

Notice of right to appeal: Bylaws for the AARST Consortium on National Radon Standards are available at www.standards.aarst.org/public-review. Section 2.1 of Operating Procedures for Appeals (Appendix B) 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."

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SGM-SF/RMS-MF/RMS-LB
Radon and Soil Gas Mitigation Standards for Existing Buildings

1.0 SCOPE

1.1 This standard of practice specifies minimum requirements for methods that *mitigate* risks to occupants posed by the presence of *radon* gas and chemical vapors or gas within existing homes, multifamily buildings, schools and other non-residential or mixed use buildings.

Note to reviewers

Decisions have not been made to merge these standards. For your convenience however, content proposed to harmonize and be stated the same words in all three standards are being combined for ease of your review.

Homes (SGM-SF)

This standard of practice is applicable to existing low-rise residential structures often classified as single-family structures[1] and individual dwellings within a shared structure that contain not more than four attached *dwelling* units on a contiguous foundation.

Multifamily Buildings (RMS-MF)

This standard of practice is applicable to a wide range of multifamily buildings including, among others, buildings or structures, or a portion thereof used as townhouses, apartment houses, convents, dormitories, military congregate residences, fraternities and sororities, and boarding houses, hotels, live/work units, monasteries, motels and vacation timeshare properties. [3]

Schools and Large Buildings (RMS-LB)

This standard of practice is applicable to a wide range of schools and large buildings including, among others, the use of a building or structure, or a portion thereof for: Business occupancies (Group B) including for offices, educational and training facilities, professional services or service-type transactions; and Educational occupancies (Group E) including for religious and educational purposes through the 12th grade and day care facilities.

The scope of this standard also includes: Assembly occupancies (Group A) including for the gathering of persons for purposes such as civic, social or religious functions; Factory occupancies (Group F) including for fabrication or manufacturing, repair or processing; High-hazard occupancies (Group H); Institutional occupancies (Group I) including for where people are cared for or live in a supervised environment be it under restraint or security, detained in a penal institution, or for medical, surgical, psychiatric, nursing, custodial care or for child care facility purposes; and, Mercantile occupancies (Group M) including for the sale of merchandise, goods, wares or merchandise incidental to such purposes and accessible to the public.

1.2 Limitations

1.2.1 *Source materials*

This standard does not address practices associated with characterization, possession, handling, containment, generation or disposal of radioactive or chemically contaminated source materials.

1.2.2 *Mitigation methods*

While this standard of practice addresses virtually all methods that reduce occupant exposure to *radon* or chemical vapors and gas in indoor air, it does not specify requirements related to removal or encapsulation of radioactive or chemical sources.

As such, this standard of practice does not specify requirements for practices related to:

[1] As point of reference, see the International Residential Code (IRC) Section R101.2 and the International Building Code (IBC) Section 310 for Residential Group R3 (as published by the International Code Council).

a) Removal of *radon gas* or chemicals from water or outdoor air;

b) Biological or chemical methods that seek to neutralize toxicity of contaminated soil; and

c) Soil Vapor Extraction (*SVE*), including contaminant capture and disposal methods.

Informative advisory—Active soil gas depressurization (ASD) methods prescribed in this standard *mitigate* occupant risk by preventing soil gas entry into occupied spaces. These designs need only address soil gas volumes that would otherwise intrude into a building. SVE designs that extract volatile organic compounds (VOC) mass from the soil are not inherently designed to mitigate the current risk to occupants unless also demonstrating functional performance as required in Section 9 *Post-mitigation*.

1.2.3 *Combustible gas*

This standard addresses some, but not all practices that may be required for *mitigation* of potentially combustible soil gases.

1.2.4 *Jurisdictional compliance*

This standard of practice does not contain all code or other requirements of the jurisdictions where the *mitigation* system is being installed. Adherence to this standard does not guarantee or supersede compliance with the applicable codes or regulations of any federal, provincial, state or local agency with jurisdiction.

1.2.5 *Safety*

This standard of practice is not intended to address all of the safety concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices, and to determine the applicability of regulatory limitations prior to use.

1.2.6 *Design and warranties*

This standard of practice is not intended to be used as a complete design manual, and compliance with its provisions will not guarantee reduction of indoor *radon* or soil gas to any specific concentration.

2.0 APPLICABILITY

2.1 Mandatory Conventions

The terms "shall", "required" and "normative" indicate provisions herein that are considered mandatory. Terms such as "should," or "recommended" and provisions prefaced by the term "Note" or "Informative" indicate provisions that are considered to be helpful or good practice, but which are not mandatory.

2.2 Prior Systems

This standard shall not apply to *radon* or soil gas *mitigation* systems installed prior to its effective date, except when a previously installed system is altered. This standard shall apply to only the aspects of the system that are altered, and the *contractor* shall recommend to the *client* in writing that the noncompliance items be upgraded or altered to meet current standards. For the purposes of this standard, altering a *radon* or soil gas *mitigation* system does not include activities such as replacing worn out equipment while leaving the remainder of the system unchanged.

2.3 Use

To the extent minimum requirements of this document exceed local, state, provincial or federal requirements for the locale in which the *mitigation* is conducted, minimum requirements in this document shall be followed.

3.0 QUALIFIED CONTRACTORS

3.1 Contractors, Teams and Qualifications

The term "*Contractor*" within this standard shall refer to persons or contracting firms, regardless of the organizational structure of the entity, that engage in *mitigating* occupant risk from *radon* gas or chemical vapors and other soil gases that are present in indoor air.

To be considered qualified, the *contractor*, *contracting* team, or management team shall include at least one "*qualified mitigation professional*" as defined by:

a) Section 3.2, where mitigating occupant exposure to *radon* gas; and

b) Section 3.3, where mitigating occupant exposure to chemical vapors or other soil gases.

3.2 Radon Mitigation Professionals

A *"qualified radon mitigation professional"* is defined as:

"An individual who has demonstrated a minimum degree of appropriate technical knowledge and skills specific to design and installation of systems that mitigate occupant exposure to *radon* gas in existing homes (SGM-SF) / multifamily (RMS-MF) / schools and large buildings (RMS-LB):

Note to reviewers: As applicable to the respective standard

a) as established in certification requirements of the National Radon Proficiency Program (NRPP) or the National Radon Safety Board (NRSB); and

b) as required by local statute, state or provincial licensure or certification programs that evaluate individuals for radon-specific technical knowledge and skills."

3.2.1 *Responsibilities*

Responsibilities for *qualified* ***radon*** *mitigation professionals* shall include compliance with all provisions in this standard except where identified within a provision as specific to only mitigation of chemical vapors or other soil gases.

3.3 Soil Gas Mitigation Professionals

A *"qualified soil gas mitigation professional"* is defined as:

"An individual who has demonstrated a minimum degree of appropriate technical knowledge and skills specific to design and installation of systems that mitigate occupant exposure to hazardous chemicals vapors and gas in existing homes (SGM-SF) / multifamily (RMS-MF) / schools and large buildings (RMS-LB):

a) as established in certification requirements of the National Radon Proficiency Program (NRPP) or the National Radon Safety Board (NRSB); and

b) as required by local statute, state or provincial licensure or certification programs that evaluate individuals for soil-gas-specific technical knowledge and skills."

3.2.1 *Responsibilities*

Responsibilities for *qualified* ***soil-gas*** *mitigation professionals* shall include compliance with all provisions in this standard except where identified within a provision as specific to only *mitigation* of radon gas.

3.4 Quality Management

Qualified mitigation professionals shall establish, maintain and follow a written quality management program. The program shall include *standard operating procedure* (*SOP)* documents, relative to the scope of services the *mitigation contractor* provides, to address important tasks based on commitments to quality goals. The program shall:

a) establish at least one *SOP* document that addresses materials and installation procedures applicable to each method and system design installed; and

b) retain records of training and experience for all individuals who participate in physical installation of the *mitigation system(s)*.

3.4.1 *Quality control oversight*

The quality management program shall identify individuals, as authorized by the *qualified mitigation professional(s)* and as permitted by statute, state licensure or certification program, who are responsible for mitigation activities in accordance with requirements in a), b) and c) of this Section 3.4.1.

a) Quality of mitigation design
Program records shall include currently valid certifications/licenses for persons identified as *qualified mitigation professionals,* in accordance Sections 3.2 or 3.3, who are to be responsible for the quality of *mitigation* design and effectiveness.

b) Oversite of jobsite activities
For quality management programs that allow *journeyman installers* to oversee various jobsite activities while working under the responsible charge of a *qualified mitigation professional*, oversight duties shall not be authorized until quality management records include:

1. The identity of the installer and scope of their oversight authority, to include authorization to temporarily stop work if quality or safety is being compromised; and
2. Currently valid certifications/licenses or educational benchmarks, as established by authorities identified in Sections 3.2 or 3.3, that demonstrate a minimum degree of technical knowledge and skills specific to installation of basic *mitigation* system components.

c) Related trades
Where trade specialists, such as electricians, are responsible for quality and oversight of their apportioned tasks, QC records shall include copies of their licenses or other evidence of qualification.

3.4.2 *Jobsite logs*

Jobsite logs, specific to each individual mitigation effort and system design, installation and modification, shall be retained in *quality control (QC)* records that include:

a) The identity of the *qualified mitigation professional* responsible for design and effectiveness;
b) The identity of the *qualified mitigation professional* or authorized journeyman installer physically present at each jobsite event who is responsible for quality oversight of the event;
c) Solutions derived during design or installation that are custom to the building and therefore are not addressed or applied in program *SOPs* as the same basic design feature for every building; and
d) As otherwise required in this standard.

3.4.3 *Managing quality*

The quality management program shall include a written commitment to quality goals and identify a *qualified mitigation professional* who, in coordination with management, is responsible to complete and document a review of *QC* records and efforts to improve *quality control* no less than annually.

Note—See https://www.iso-9001-checklist.co.uk/9.3-management-review.htm)

3.4.3.1 The quality management program, jobsite logs and other *(QC)* records shall be available to credentialing authority auditors upon request or as otherwise required by the credentialing authority.

3.4.3.2 Quality Goals

Informative advisory—For identifying problems and guiding improvements to procedures and quality over time, two different levels of quality commitment are needed:

a) Physical Quality: Mitigation systems that are compliant with standards, codes and statutes, while aspiring to achieve customer satisfaction; and
b) The Quality Objectives: Mitigation designs that reduce concentrations attributable to soil gas hazards to below the target action levels, while aspiring to minimize known soil gas hazards.

4.0 GENERAL PRACTICES

4.1 Assemble Building Information

Prior to providing proposals, the *contractor* shall obtain or attempt to obtain information that includes:

a) The objective of the *mitigation*, be it *radon* gas, *chemicals of concern (COCs),* flammable gas or proactive *mitigation* efforts due to suspected hazards;

b) The results of any *radon* measurements or measurements of *chemicals of concern* with information relative to action levels, toxicology, site classification and any other concurrent remedial actions;

c) Any *diagnostic* procedures and measurements that have been conducted for each building or the common portion(s) of the building(s) to be mitigated; and

c) Building details regarding design and construction practices for each attached foundation area.

4.1.1 *Insufficient data*

The *contractor* shall advise the *client* in writing when additional testing or diagnostics are required to characterize dynamics of *radon* or soil gas entry into the building, particularly as it relates to capacity for either:

a) Design of appropriate *mitigation* system(s); or

b) Protection for all occupants of the building.

The *contractor* is permitted however to proceed with *mitigation* designs and installations when extenuating circumstances warrant immediate action.

4.1.2 *Diagnostic proposals*

The *contractor* shall advise the *client* in writing when diagnostic procedures are required prior to mitigation system installation.

4.2 Proposals

Contractors shall provide *clients* the following written information prior to initiation of the work:

a) The Qualified Mitigation Professional's name, address and phone number; relevant *radon mitigation* certification and/or licensing number; and signature (manual or electronic in conformance with the Electronic Signatures in Global and National Commerce [E-SIGN] Act);

b) A description of the proposed *mitigation* system(s) and the elements of the long-term *operation, maintenance, and monitoring plan (OM&M)* applicable for the proposed *mitigation* design.

c) A statement that describes options for initial post-*mitigation* testing, including the option of third-party testing;

d) An estimate of total ownership costs including installation costs and the annual operating costs with the understanding that costs for energy, replacement and repair items, labor, and testing may change in the future; and

e) The conditions of any warranty or guarantee including whether the *contractor* warrants that the proposed system(s) will or will not reduce the *radon* or soil gas concentrations below a specified threshold.

f) The *contractor* shall clearly state in proposals and post-mitigation documentation any limitations that the *contractor* places on the scope of work and any limitations on professional obligations.

Note—Upon completion of an installation and initial retest, it is standard practice that all obligations for implementation of an *OM&M* plan and any perceived professional obligations for risk management are transferred to the *client* or property owners in writing.

4.3 Notification and Hazards

4.3.1 *Owner occupied—Ventilation*

The *client* shall be informed, prior to starting work, of the need to ventilate work areas during and after the use of sealants, caulks or bonding chemicals containing volatile solvents.

4.3.2 *Not owner occupied*

Where occupants are not the property owner, action is required in accordance with requirements in a) and b) of this Section 4.3.2.

a) Access Notices

The *contractor* shall request that the *client(s)* provide notices to occupants no less than 24 hours before entering the building and in a manner that meets existing owner agreements and local laws.

Note—See Exhibit A-1 for a sample "Contractor to Client" notice; and Exhibits A-2 and A-3 for a sample "Management to Facilitating Staff" and "Management to Occupant" notices.

b) Occupant Advisories

The *contractor* shall request in writing that notices to occupants include instructions, warnings or guidance for specific disruptive or hazardous situations, including:

1. Disruptive Activities

   Whenever disruptive procedures are required to complete building investigations, installations or other work that might include entrance to rooms for drilling into concrete floors and other installation or maintenance needs; and

2. Ventilation

   Whenever application of sealants, caulks, or bonding agents that warrant ventilation of work areas is anticipated. For this situation, the *contractor* shall request that the *client(s)* provide notices to occupants that include: a general description of the hazardous materials; symptoms that might indicate sensitivity to the materials; actions to take if symptoms are observed; and a local or federal reference where further information can be obtained.

   Note—The following text example is also shown in Exhibits A-1 and A-3 example notices.

> *"*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 persons who may include the very young or elderly or persons with disabilities 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. For further information, see: https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality"*

4.3.2.1 *Informative advisory*—For all jobsites, it is recommended that the *contractor* post or leave similar notices for affected occupants when using sealants. Exhibit B provides an example of such a notice.

4.3.3 *Material safety data sheets (SDS)*

The *contractor* shall provide the *client* upon request the published safety data sheets for materials used.

4.3.4 *Jobsite Hazards*

Prior to commencing mitigation work, the *contractor* shall obtain, or attempt to obtain, information regarding known safety hazards for the property and adjacent or nearby properties, as required in a) and b) of this Section 4.4.

a) Where multiple residential, non-residential or mixed use occupancies share a structure:
The *contractor* shall request in writing that the *client* provide information regarding known safety hazards, to include asbestos, lead paint, silica, fire hazards, underground utility dangers or other known hazards.

Informative advisory—It is recommended, when appropriate, to contact the safety officer or facility manager of the property to help identify known hazards.

b) Prior to mitigating any structure for chemical vapor intrusion or explosive gas:
The *contractor* shall request in writing that the *client* provide a written statement confirming any need, or if there is not a need, for special considerations regarding site conditions and handling or control of hazardous substances, to include:

1. Worker Exposures (relative to maximum concentrations that workers should expect to encounter from inhalation, ingestion and dermal exposures to hazardous substances);
2. Handling of Toxic Soil and Groundwater (including groundwater that might be found in *sump* wells or intruding above slabs or into *crawl spaces)*; and
3. Flammable or Explosive Gasses or Vapors.

Note—The health and safety practices needed can depend identifying known hazards at the jobsite(s). If *client* does not furnish appropriate information and guidance related to known chemical or explosive gas hazards, the *contractor,* who is ultimately responsible for jobsite safety, is denied the capacity to institute safe practices.

4.4 Jurisdictional Authorities

4.4.1 *Jurisdictions*

The *contractor* shall comply with all applicable testing, *mitigation* and reporting requirements issued by the federal, provincial, tribal, state or local jurisdiction that apply to the contract where the *mitigation* is being performed.

4.4.2 ***Local jurisdictions*** (*informative*)

Radon—Information to locate State Radon Offices in the United States can be found at www.epa.gov/radon/find-information-about-local-radon-zones-and-state-contact-information#stateradon

Vapor Intrusion—Information to locate State Offices in the United States can be found at www.itrcweb.org/Team/Public?teamID=50

4.4.2 *Building codes, licenses and permits*

All components of the *mitigation* work shall be in compliance with the applicable mechanical, electrical, building, plumbing, energy and fire prevention codes, or any other regulations of the jurisdiction where the work is performed. For localities having no relevant code requirements, the most recent version of nationally published codes shall be observed to help ensure the safety of occupants and building integrity. Licenses and permits required by the local jurisdiction shall be obtained.

SECTION 10: NEXT PAGE

10.0 DOCUMENTATION—ALL SYSTEMS AND METHODS

10.1 Long-Term OM&M Plan Required

A long-term operation, maintenance and monitoring (*OM&M*) *plan* is required for all *mitigation* systems and methods applied. The *OM&M plans* shall be provided in an *information packet,* in accordance with Section 10.2, or in an *OM&M manual*, in accordance with Sections 10.5.

10.2 Owner-Occupied Maintenance

The *contractor* shall provide an *information package* that contains *OM&M plan* essentials for *ASD* systems installed where the *dwelling* or *unit* is both individually owned and occupied by the person(s) responsible for *OM&M*. The information package shall be:

a) labeled "Radon Reduction System," "Soil Gas Reduction System" or as otherwise labeled to describe the purpose of the *information package*; and

b) securely attached to the system piping in a visible location within interior spaces.

Exception 1: If no portion of the system is visually accessible within interior spaces, the *information package* shall be securely mounted in another interior location where it is visually and physically accessible, such as in a mechanical room.

Exception 2: Where the *information package* is electronically available on a website for a period of not less than 6 years at no additional cost to current or future person(s) responsible for *OM&M*. When exercising this exception, the primary system labeling, required in Section 8.4.2.1, shall include instructions for how to electronically obtain the *information package.*

10.2.1 *Information package*

The *information package* shall include content that complies with a), b), c), d) and e) of this Section 10.2.1.

a) Essentials

Consistent with owner-occupied labels in Section 8.4.2.1, the information package shall include:

1. The date of installation;
2. Maintenance and monitoring instructions applicable to the *mitigation* purpose, to include:
   a. A description of system monitors and actions to take if system monitors indicate system degradation or failure; and
   b. A recommendation to verify continued system effectiveness over time, such as:
      — a recommendation to conduct a radon test at least every 2 years, or
      — other monitoring procedures as specified in a comprehensive *OM&M manual*, such as required for *chemical vapor intrusion* and non-ASD *mitigation* methods;
3. State, provincial, federal and, if applicable, local informational resources, to include websites or phone numbers; and
4. Contact information for service inquiries to include the name, address, phone number and email address of the service provider and relevant certification or license number(s) of the *qualified mitigation professional(s)* responsible for quality and standards compliance.

b) System descriptions

A description of the *mitigation system(s)* as installed shall be provided to include:

1. System components labeled on a floor plan sketch or portrayed in narrative that describes system components and locations.
2. Basic operating principles;
3. An approximation of the annual operating costs; and

4. Fan equipment model(s) and startup parameters, including system monitor pressure gauge readings and any control settings that existed at the time *mitigation* goals were achieved.

c) Adverse or extenuating circumstances
A description shall be provided of important observations that have potential to adversely affect the *mitigation system(s)* or other building systems; and

d) Warranty
Warranty information shall be provided that is consistent with proposals Sections 4.2 e and f.

e) Additional OM&M Guidance
The following or equivalent guidance shall be provided in the information packet:

> "Testing to verify continued effectiveness is to be conducted in conjunction with any sale of a building and after any of the following events occur:
> - ✓ New adjoining additions, structures or parking lots, or building reconfiguration or rehabilitation
> - ✓ A ground contact area not previously tested is occupied or a home is newly occupied;
> - ✓ Heating or cooling systems are altered with changes to air distribution or pressure relationships;
> - ✓ Ventilation is altered by extensive weatherization efforts;
> - ✓ Sizable openings to soil occur due to:
>   - — groundwater or slab surface water control systems or sewer lines are added or altered (e.g., *sumps*, drain tiles, shower/tub retrofits, etc.) or
>   - — natural settlement causing major cracks to develop;
> - ✓ Earthquakes, blasting, fracking or formation of sink holes nearby; or
> - ✓ An installed *mitigation system* is altered."

10.3 Non-ASD Systems

Regardless of whether the owner or an independent party is responsible for maintenance, an *OM&M manual* compliant with Section 10.5 shall be provided where non-*ASD mitigation* designs are employed.

10.4 Independent Maintenance

Where maintenance and monitoring of *mitigation* components are the responsibility of someone other than the occupants, the *contractor* shall provide the *client* a written *OM&M manual* after *mitigation* that complies with all provisions of Section 10.5.

10.5 OM&M Manuals

OM&M manuals shall include all content required in Section 10.2 for owner-occupied *information packages*. In addition, the *OM&M manual* shall comply with all portions of this Section 10.5.

10.5.1 *Stewardship*

OM&M manuals shall recommend post-mitigation testing and provide instructions regarding long-term stewardship of mitigation systems, to include requirements in a) and b) of this Section 10.5.1.

a) Stewardship Statement
The *OM&M manual* shall prominently provide the following or equivalent message:

> *"Stewardship Required.*
> *It is incumbent upon property owners and managers to maintain and monitor system effectiveness for the life of the building. Current and future occupants or purchasers of the property should be able to verify by documentation that the minimum requirements of an operation, maintenance, and monitoring plan (OM&M) have been maintained. Essential requirements for long-term risk management are satisfied when building owners and managers comply with this OM&M manual."*

b) Ownership/Management Changes

The OM&M manual shall instruct that:

1. Whenever the party responsible for system maintenance and monitoring changes to another party who is not the owner-occupant of the property:
   a. The OM&M manual and logs are to be provided to the newly responsible party, and
   b. Newly responsible parties are to update system labels; and
2. Whenever the responsibility for *mitigation* maintenance and monitoring changes from an independent party to an owner-occupant, the system is to be relabeled to comply with Section 8.4.2.1 and an updated *OM&M manual* is to be provided to the owner(s).

10.5.3 *System components*

The *OM&M manual* shall provide detailed operating instructions and information on essential mitigation equipment and components to facilitate inspections and repairs, to include:

1. Manufacturer model numbers for fans and equipment and, where applicable to operation and maintenance, manufacturer instructions;
2. Locations of fan monitors, electronic telemetry/monitoring equipment, permanent test ports, electrical disconnects and other components unique to the system;
3. Instructions for equipment and descriptions on how to interpret labels and annotations relative to control settings and other designed operating parameters for the equipment; and
4. A list of common maintenance and repair tasks associated with the system, such as:
   — Fan and fan monitor replacement or repair;
   — Duct piping connections; and
   — Sealing and closure of openings between soil and indoor air.

10.5.4 *Historical Information*

The *OM&M manual* shall include pre-and post-*mitigation* test data, if available, and a summary of the pre- and post-*mitigation* investigation(s).

10.5.5 *Maintenance inspection checklists*

OM&M manuals shall provide instructions regarding maintenance inspections, in accordance with requirements a), b) and c) of this Section 10.5.5.

a) Visual Operational Inspection Checklist

The *OM&M manual* shall define a list of items that are to be visually inspected on a frequent basis to verify continued operation of fans and other mechanical components, such as system monitors, controls, labels, vents and filters.

b) Mechanical Inspection Checklist

The *OM&M manual* shall define a list of equipment to inspect when conducting mechanical performance inspections that include:

1. Performance indicators, labels and fan operation;
2. Seals, straps, fasteners, fan boots, pipe connections and any permanent PFE test ports;
3. Electrical components (including switch, GFCI or disconnect operation); and
4. Other related building systems, as applicable, such as sump pumps and combustion appliances.

c) *Vapor Intrusion*

Where the purpose mitigation includes *mitigation* of *chemical vapor intrusion*, the mechanical inspection shall additionally include recorded measurements of pressure field extension and whole system vacuum strength and air volume exhausted, as measurement within *main trunk* duct piping.

10.5.6 *Frequency of inspections for functionality*

The *OM&M manual* shall instruct that stewardship obligations require:

a) Visual operational inspections conducted quarterly; and

b) Mechanical inspections to verify continued performance of equipment, as designed, conducted annually by a *qualified professional*.

10.5.7 *Repairs and retention of records*

The *OM&M manual* shall instruct that stewardship obligations require correction and repair of any conditions that are found to indicate component failure or inconsistencies in operating parameters.

10.5.8 Monitoring concentrations

The *OM&M manual* shall instruct that stewardship obligations require a regimen of ongoing radon or soil gas measurements to verify continued systems effectiveness as required in a) and b) of this Section 10.5.8.

a) Radon Measurements
The *OM&M manual* shall instruct that stewardship obligations require a routine schedule of ongoing measurements for radon gas where systems are known to mitigate radon gas.

b) Chemical Vapor or Gas Measurements
The *OM&M manual* shall instruct that stewardship obligations require a routine schedule of ongoing chemical vapor or gas measurements where systems are known to mitigate hazardous concentrations of chemical vapor or other hazardous soil gas. While guidance shall be provided in the contractor's *OM&M manual*, a *client's overseeing team* will normally review, amend and integrate opinions of qualified environmental professionals into a final *OM&M Plan*.

10.5.9 *Retention of OM&M records*

The *OM&M manual* shall also instruct that all maintenance logs, records of repairs and measurement reports for radon and soil gas concentrations be retained and assimilated into the *OM&M manual*.

10.6 Inadvertent *Collateral Mitigation*

Where *mitigation* is not conducted in all attached units or *dwellings* in a shared building, both the following statement and example notice in Figure 10.7 shall be prominently included with *information packets and OM&M manuals* to inform the *client* of inherent obligations to neighboring occupants:

> "*There are inherent obligations to occupants of adjoining dwellings regarding disclosure of elevated radon concentrations found and potential effects on adjoining dwellings as a result of the mitigation system.*
>
> *In accordance with the ANSI/AARST standards, mitigation firms are obligated to advise the client of inherent obligations to neighboring occupants.*
>
> *It is strongly recommended to distribute the following message in writing to occupants of adjoining dwellings and, if applicable, to the homeowners association or management firm that provides stewardship for neighboring properties."*

Figure 10.6 **Example Notice to Neighboring Property Owners and Occupants**

From: _____

Elevated radon concentrations were found at (addresses) _____

A mitigation system [ ] has been installed, or [ ] is planned to be installed.

In the interest of health protection, we have been advised to provide you the following messages:

1) Test your home for radon — it's easy and inexpensive. Testing all homes located below the third floor is recommended. For further guidance see federal publications such as the U.S. EPA's

   "A Citizen's Guide to Radon"
   www.epa.gov/radon/citizens-guide-radon-guide-protecting-yourself-and-your-family-radon

   "A Radon Guide for Tenants"
   www.epa.gov/radon/radon-guide-tenants

2) The radon reduction system installed or planned for installation in our dwelling can inadvertently move air and extend a vacuum under some adjoining units or dwellings with the intent to stop radon entry into our dwelling. It is recommended that occupants of adjoining units:
   a) Seek to maximize radon reductions and energy conservation by closing openings to soil (e.g., closed covers over sumps and large holes).
   b) Check for any adverse impacts such as flue gas spillage from combustion appliances.

3) We cannot warrant any degree of radon reductions nor can we be responsible for maintaining radon reductions, maximizing energy conservation or checking for unlikely yet possible environmental impacts for adjoining units.

   For additional guidance, it is recommended to contact the state or local radon office. Sources in the U.S. include the national radon hotline at 1-800-SOS-RADON (1-800-767-7236) and state radon offices that can be found at: www.epa.gov/radon/find-information-about-local-radon-zones-and-state-contact-information.