

**EPA RADON MITIGATION STANDARDS**  
**A STATUS REPORT**

David M. Murane  
USEPA, Radon Division

**ABSTRACT**

Interim Radon Mitigation Standards were published in November 1991 to provide performance standards for radon mitigators under EPA's Radon Contractor Proficiency (RCP) Program, and guidance to states for evaluating the performance of those contractors. Over the past year, EPA, in cooperation with AARST, has been developing final Radon Mitigation Standards that contain more detailed and comprehensive coverage of the mitigation techniques that are considered mandatory for contractors who are listed in the RCP Program. This paper provides information on the status of this final standard, highlights its basic provisions, and provides examples of specific requirements included in the standard.

**INTRODUCTION**

Interim Radon Mitigation Standards were published by EPA in November 1991 to provide performance standards for radon mitigators under EPA's Radon Contractor Proficiency (RCP) Program, and guidance to states for evaluating the performance of those contractors. Over the past six years, the effectiveness of the basic radon mitigation techniques set forth in the "Interim Standards" have been validated in field applications throughout the United States. These techniques now serve as the basis for the more detailed, final Radon Mitigation Standards (RMS) set forth in the draft document soon to be published by EPA.

The basic purpose of the RMS is to provide radon mitigation contractors with uniform requirements that will ensure quality and effectiveness in the design, installation, and evaluation of radon mitigation systems in detached and attached residential buildings three stories or less in height. The RMS is intended to serve as a model set of requirements which can be adopted or modified by state and local jurisdictions to fulfill objectives of their specific radon contractor certification or licensure programs. It also provides a yardstick for evaluating consumer complaints and will help EPA to evaluate the status of the radon industry nationwide. Its application throughout the country will produce real risk reduction by providing the prescriptive elements for quality radon mitigation work.

The RMS, as currently drafted, is the product of a melding and consolidation of earlier drafts developed by the Radon Division staff and AARST. Both of those earlier drafts had evolved from lengthy and detailed discussions with individual mitigation contractors who brought a wealth of experience to the process. In addition, comments were solicited from many experienced individuals in the radon industry at large. Following accommodation of the many comments received during this first review, a final draft was again circulated for comment. A final version of the RMS is currently in the final stages of internal EPA review prior to publication.

The purpose of this paper is to provide a status report on the development of the document, outline its current structure, and provide some examples of its specific provisions. Copies of the final draft of the RMS will be available following this presentation.

The RMS contains introductory sections covering Purpose, Participants, Scope, Assumption, Implementation, Limitations, Reference Documents, and Terminology. The body of the standard contains sections covering the functional categories of contractor activity, including General Practices, Building Investigation, Worker Health and Safety, Systems Design, Systems Installation, Materials, Monitors and Labeling, Post-Mitigation Testing, and Contracts and Documentation. Appendix A contains a sample form for recording information on mitigation projects.

To provide you with a brief overview of the RMS, the following extracts are examples of the guidance contained in each of the sections.

## **PARTICIPANTS**

This section sets forth the requirement that contractors participating in the RCP Program shall have completed all of its training and examination requirements, be listed in the current RCP Listing Report, and shall agree to follow the provisions of the RMS.

## **SCOPE**

This section presents the broad categories of contractor activity previously mentioned, such as Building Investigation and Systems Installation.

## **ASSUMPTION, IMPLEMENTATION, LIMITATIONS**

These sections include statements such as:

It is assumed that appropriate radon/radon decay product measurements have been performed and that the owner has decided that radon remediation is necessary.

To implement the RMS, states or local jurisdictions may adopt its provisions in their regulations and/or use it as a reference during inspection of in-progress or completed radon mitigation work.

The implementation section also includes a requirement for RCP listed contractors to personally perform, directly supervise, or conduct follow-up inspection of any radon mitigation work conducted by their firm or by sub-contractors.

Also included is a statement that provisions of the RMS considered to be mandatory are prefaced by the term "shall," while provisions considered good practice but which are not mandatory are prefaced by the terms "should" or "recommended."

As a limitation, the RMS shall not apply to radon mitigation systems installed prior to its adoption.

This section also includes guidance for cases when deviation from the RMS provisions is necessary, and includes a performance standard to be applied when new, innovative radon mitigation methods are employed.

The RMS does not include standards for installing systems to mitigate radon in water.

## **REFERENCE DOCUMENTS, DESCRIPTION OF TERMS**

These sections contain a list of the most current documents suggested for reading by contractors participating in the RCP Program, and an extensive list of terms unique to radon mitigation activity.

## **THE BODY**

In the body of the RMS, each of the basic functional categories of radon mitigation activity, mentioned above, are covered in numbered paragraphs. This approach permits a contractor to make quick reference to any of the particular phases of a radon mitigation job, and in a sequence that is typically used by experienced contractors. The categories of activity and examples of requirements contained in each category are outlined in the balance of this paper.

## **GENERAL PRACTICES**

This section includes four general requirements. For example:

Contractors shall recommend a retest for radon whenever it is determined that previous tests were not conducted by an RMP listed firm, using RMP approved test devices, or that tests were not made in accordance with EPA protocols or state requirements.

The contractor shall advise the client on the health risk associated with the radon level found in the building and the appropriate action to take based on guidance contained in "A Citizen's Guide to Radon (Second Edition)," the "Consumer's Guide to Radon Reduction," or subsequent revisions of those documents.

## **BUILDING INVESTIGATION**

This section includes five requirements. For example:

The contractor shall conduct a thorough visual inspection of the building prior to initiation of any radon mitigation work to identify any unique building characteristics, configurations or operational conditions that may affect the design, installation, and effectiveness of radon mitigation systems.

Diagnostic tests are "recommended" to assist in identifying suspected radon sources and entry points, and to evaluate the existence of, or the potential for, backdrafting of natural draft combustion appliances. A checklist for conducting a backdrafting test is included.

## **WORKER HEALTH AND SAFETY**

This section contains a requirement to conduct radon mitigation projects in compliance with existing Occupational Safety and Health Administration (OSHA) standards. It also includes ten additional requirements specifically applicable to the typical work conditions of radon mitigation contractors. For example:

When it is impractical to ventilate work areas and radon levels are greater than 30 pCi/L, contractors shall ensure that respiratory protection is available on the job site.

Contractors shall also ensure that employees are exposed to no more than 4 working level months (WLM) over a 12 month period.

## **SYSTEMS DESIGN**

This section contains four requirements. For example:

All radon reduction systems shall be designed and installed as permanent, integral additions to the building.

All radon mitigation systems shall be designed to maximize radon reduction and in consideration of the need to minimize excess energy usage, to avoid compromising moisture and temperature controls and other comfort features, and to minimize noise.

## **SYSTEMS INSTALLATION**

This section is the most extensive part of the RMS. It includes eight sub-sections that cover the different functional types of mitigation installations. The following are examples of requirements in each of the sub-sections:

### General Requirements

This sub-section contains six requirements. For example:

All components of radon mitigation systems shall be installed in compliance with this Standard and the applicable mechanical, electrical, building, plumbing, energy and fire prevention codes and regulations of the local jurisdiction.

#### Radon Vent Pipe Installation Requirements

This sub-section contains nine requirements. For example:

Radon vent pipes shall be installed in a configuration that ensures that any rain water or condensation that may accumulate within the pipes drains downward into the ground beneath the slab or soil-gas-retarder membrane.

The RMS includes four requirements for positioning of the point of discharge from radon vent pipes: (1) be above the roofline, (2) be ten feet or more above ground level, (3) be ten feet or more from any window, door, or other opening into conditioned spaces of the structure that is less than two feet below the exhaust point, and (4) be ten feet or more from any opening into an adjacent building. The RMS also includes a statement that "Whenever possible, the exhaust point should be positioned above the highest eave of the building and as close to the roof ridge line as possible."

#### Radon Vent Fan Installation Requirements

This sub-section contains eight requirements. For example:

Radon vent fans used in active soil depressurization systems shall not be installed below ground nor in the conditioned (heated/cooled) spaces of a building, nor in any basement, crawlspace, or other interior location directly beneath the conditioned spaces of a building. Acceptable locations for radon vent fans include attics not suitable for habitation (including attics over living spaces and garages), garages that are not beneath conditioned spaces, or on the exterior of the building.

Radon vent fans shall be installed in a configuration that avoids condensation buildup in the fan housing. Whenever possible, fans should be installed in vertical runs of the vent pipe.

#### Suction Pit Requirements for Sub-slab Depressurization (SSD) Systems

This sub-section contains only one requirement.

To provide optimum pressure field extension of the sub-slab communication zone, a minimum of 1 cubic foot of material shall be excavated from the area immediately below the slab penetration point of SSD system vent pipes. This minimum requirement applies regardless of the type of material found beneath the slab.

#### Sealing Requirements

This sub-section contains eight requirements. For example:

Where a Block Wall Depressurization (BWD) system is used to mitigate radon, openings in the tops of such walls and all accessible openings or cracks in the interior surfaces of the walls shall be closed and sealed with polyurethane or equivalent caulks, expandable foams, or other fillers and sealants.

Any seams in soil-gas retarder membranes used in crawlspaces for SMD systems shall be overlapped at least 12 inches and should be sealed. To enhance the effectiveness of SMD systems, the membrane should also be sealed around interior piers and to the inside of exterior walls. In cases where both the basement and the adjacent crawlspace areas are being mitigated with active SSD and SMD systems, sealing of the membrane around interior piers and to the inside of exterior walls is not required.

#### Electrical Requirements

This sub-section contains seven requirements. For example:

Wiring may not be located in or chased through the mitigation installation ducting or any other heating or cooling ductwork.

Radon mitigation fans installed on the exterior of buildings shall be hard-wired into an electrical circuit. Plugged fans shall not be used outdoors.

#### Drain Installation Requirements

This sub-section contains four requirements. For example:

Perimeter (channel or French) drains shall be sealed with backer rods and urethane or comparable sealants in a manner that will retain the channel feature and not interfere with the effectiveness of the drain as a water control system.

#### HVAC Installation Requirements

This sub-section contains six requirements. For example:

Modifications to an existing HVAC system, which are proposed to mitigate elevated levels of radon, should be reviewed and approved by the original designer of the system (when possible) or by a licensed mechanical contractor.

In HRV installations, supply and exhaust ports in the interior shall be located a minimum of 12 feet apart. The exterior supply and exhaust ports shall be positioned to avoid blockage by snow or leaves and be a minimum of 10 feet apart.

### **MATERIALS**

This section contains ten requirements relating to equipment and supplies used in radon mitigation systems. For example:

When sealing holes for plumbing rough-in or other large openings in slabs and foundation walls that are below the ground surface, non-shrink mortar, grouts, expanding foam, or similar materials designed for such application shall be used.

Plastic sheeting installed in crawlspaces as soil-gas-retarders shall be a minimum of 6-mil (3-mil cross-laminated) polyethylene or equivalent flexible material. Heavier gauge sheeting should be used when crawlspaces are used for storage, or frequent entry is required for maintenance of utilities.

### **MONITORS AND LABELING**

This section contains five requirements. For example:

All active radon mitigation systems shall include a mechanism to monitor system performance and warn of system failure. The mechanism shall be simple to read or interpret and be located where it is easily seen or heard by building occupants and protected from damage or destruction.

Electrical radon mitigation system monitors (both visual and audible) shall be installed on non-switched circuits and be designed to reset automatically when power is restored after service or power supply failure. Battery operated monitoring devices shall not be used unless they are equipped with a low-power warning feature.

The circuit breakers controlling the circuits on which the radon vent fan and system failure warning devices operate shall be labeled "Radon System."

### **POST-MITIGATION TESTING**

This section contains five requirements. For example:

To provide an initial measure of effectiveness, the contractor shall conduct a short-term radon measurement in accordance with EPA testing protocols or state requirements no sooner than 24 hours nor later than 30 days following completion and activation of the mitigation system(s). To avoid conflict of interest, the contractor shall also recommend to the client that a confirmatory test be conducted by an independent RMP listed or state certified testing firm or by the client. The contractor should obtain a copy of the confirmatory test report from the client or the independent testing firm. The client shall be advised that all testing should be conducted in accordance with current EPA radon test protocols or state requirements.

Immediately after installation and activation of any active (fan-powered) SSD or BWD system in buildings containing natural draft combustion appliances, the building shall be tested for backdrafting of those appliances. Any backdrafting condition that results from installation of the radon mitigation system shall be corrected before the system is placed in operation.

## **CONTRACTS AND DOCUMENTATION**

This section contains five requirements that lay out the specific information and documentation that contractors should provide to clients before initiation of radon mitigation work and after the job is completed. It also includes requirements for contractor record keeping and an Appendix containing a suggested standard format for compiling mitigation project records.

As indicated earlier, the purpose of this paper is to provide a general overview of the current structure of the new Radon Mitigation Standards and a sampling of some of its most significant provisions. I welcome your comments and questions both now and in the future, after you have reviewed the document in more detail.