Oregon
John A. Kitzhaber, MD, Governor

Department of Consumer and Business Services
Building Codes Division
1535 Edgewater Street NW
P.O. Box 14470
Salem, OR 97309-0404
503-378-4133
Fax: 503-378-2322
www.bcd.oregon.gov

Modified
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Radon Mitigation Standards – Effective April 1, 2011

Passage of Senate Bill 1025 required that the Division adopt radon mitigation standards for public buildings, Group R-2, and R-3 occupancies constructed in *Baker, Clackamas, Hood River, Multnomah, Polk, Washington and Yamhill Counties*. The effective date for implementation of radon mitigation standards for Group R-2 and R-3 occupancies is April 1, 2011. Radon mitigation is not required in public buildings until April 1, 2013.

With input from stakeholders, the Division adopted an amended version of Appendix F, "Radon control methods", effective April 1, 2011 for Group R-3 structures and OSSC, Section 1812 for Group R-2 structures regulated under Appendix N. The approved standards are available on our website, formatted for insertion into your codebook, at the following links:
http://www.bcd.oregon.gov/programs/residential/2008ORSC/2008_ORSC_Radon_Memo_and_Appendix-F_eff-040111.pdf

http://www.bcd.oregon.gov/programs/structural/2010ossc_amendments/2010_OSSC_Radon_Section_1812_eff-040111.pdf

Without an effective way to test a site prior to construction, Appendix F provides a reasonable standard for radon mitigation applicable to all newly constructed R-3 occupancies, throughout the seven counties – whether radon is present or not.

There are many radon mitigation strategies that exceed the requirements adopted in the building code. The discussion in this document is intended to help Building Officials understand the adopted code requirements of Appendix F applicable to Group R-3 structures located in the specified counties.

The following options are applicable when constructing buildings **with crawlspace foundations:**

a) A mechanical crawlspace ventilation system;
b) A crawl space mitigation system; or
c) A passive sub-membrane depressurization system.

Mechanical crawlspace ventilation systems:
Radon mitigation can be satisfied by mechanically ventilating the crawlspace in accordance with Section R408.2, exception 3.

Crawl space mitigation system:
Provide crawlspace foundation ventilation with a minimum of 1 sq. ft. of opening area per 150 sq. ft of underfloor area. Conduct a blower door test to ensure building tightness

meets 5.0 air changes per hour or less and provide a building ventilation system in accordance with Chapter 11 or ASHRAE 62.2.

Passive sub-membrane depressurization system:
Provide standard foundation ventilation per the ORSC, Section R408.1. Install a continuous layer of 6-mil polyethylene, lapped 12 inches at joints. Polyethylene is required to extend to all foundation walls enclosing the crawlspace. A "Tee" fitting or other approved connection shall be installed below the polyethylene and connected to a 3 or 4 inch diameter vertical vent pipe. The vent pipe needs to extend to a termination point 12 inches above the roof in a location that is a minimum of 10 feet from windows or other openings into the conditioned space less than 2 feet below the exhaust point.

The following provisions are applicable to **basement and slab-on-grade** construction:

Passive subslab depressurization system:
A "T" fitting located beneath the polyethylene film needs to be provided and connected to a 3-inch vertical vent pipe prior to concrete casting. The vent pipe is required to be continuous to a termination point at least 12 inches above the roof of the building and at least 10 feet away from windows or other openings into the conditioned space.
In buildings where interior footings separate the sub-slab aggregate or other gas-permeable material, each area needs to include an individual vent pipe. The individual vent pipes can be connected into a single exhaust stack prior to termination above the roof or be terminated individually. All concrete control joints, isolation joints and construction joints need to be sealed with caulk or other sealant.

*Additional requirement applicable **ONLY** to concrete slabs or other floor systems that directly contact the ground:*

- Subfloor preparation requires installation of a layer of gas-permeable material (can be crushed rock, sand or other methods as identified in Appendix F).

Additional requirements applicable to all methods:

- Under floor area shall be covered with a 6 mil polyethylene over the gas-permeable layer of material, lapped 12 inches and fitted tight around penetrating items.
- Floor openings around bathtubs, showers, water closets, pipes or other objects providing entry points shall be sealed.
- Condensate drains shall be trapped or routed through non-perforated pipe to daylight.
- Air-handling units located in crawl spaces shall be sealed to prevent air from being drawn into unit.
- Ductwork passing though or beneath slabs shall be sealed per M1601.4.
- Ductwork located in crawlspaces or under slabs shall be performance tested.
- Crawl space access doors located in assemblies separating conditioned space from the crawl space shall be gasketed.

The information provided in this communication is intended to serve as a tool for developing a basic understanding of the requirements of Appendix F "Radon Mitigation Standards".

For more information please contact Mike Ewert at (503)373-7529 or mike.d.ewert@state.or.us

APPENDIX F

RADON CONTROL METHODS

The provisions contained in this appendix are not mandatory, except for areas specified in AF101.1

SECTION AF101
SCOPE

AF101.1 General. This appendix contains requirements for new construction in Baker, Clackamas, Hood River, Multnomah, Polk, Washington and Yamhill counties where radon-mitigating construction is required. Additional counties may be added as specified in Chapter 83, 2010 Oregon Laws (Senate Bill 1025), Section 2.

Chapter 83, 2010 Oregon Laws (Senate Bill 1025) is not part of this code but is reproduced here for the reader's convenience:

SECTION 2. (1) The Building Codes Structures Board and the Residential and Manufactured Structures Board shall adopt design and construction standards for mitigating radon levels in new residential buildings that are identified under the structural specialty code as Group R-2 or R-3 buildings and new public buildings. In adopting the standards, the boards shall give consideration to any standards recommended by the United States Environmental Protection Agency for radon mitigation systems in buildings.

(2) The boards shall make the design and construction standards for mitigating radon levels applicable in:

(a) Baker, Clackamas, Hood River, Multnomah, Polk, Washington and Yamhill Counties; and

(b) Any county for which the boards, after consultation with the Oregon Health Authority, consider the standards appropriate due to local radon levels.

(3) The Director of the Department of Consumer and Business Services may authorize a municipality that administers and enforces one or more building inspection programs under ORS 455.148 or 455.150 to also administer and enforce any applicable standards for mitigating radon that are adopted by the boards.

(4) The director, in consultation with the boards, may adopt rules for the implementation, administration and enforcement of this section.

SECTION AF102
DEFINITIONS

AF102.1 General. For the purpose of these requirements, the terms used shall be defined as follows:

SUBSLAB DEPRESSURIZATION SYSTEM (Passive). A system designed to achieve lower sub-slab air pressure relative to indoor air pressure by use of a vent pipe route through the conditioned space of a building and connecting the sub-slab area with outdoor air, thereby relying on the convective flow of air upward in the vent to draw air from beneath the slab.

SUBSLAB DEPRESSURIZATION SYSTEM (Active). A system designed to achieve lower sub-slab air pressure relative to indoor air pressure by use of a fan-powered vent drawing air from beneath the slab.

DRAIN TILE LOOP. A continuous length of drain tile or perforated pipe extending around all or part of the internal or external perimeter of a basement or crawl space footing.

RADON GAS. A naturally-occurring, chemically inert, radioactive gas that is not detectable by human senses. As a gas, it can move readily through particles of soil and rock and can accumulate under the slabs and foundations of homes where it can easily enter into the living space through construction cracks and openings.

SOIL-GAS-RETARDER. A continuous membrane of 6-mil (0.15 mm) polyethylene or other equivalent material used to retard the flow of soil gases into a building.

SUBMEMBRANE DEPRESSURIZATION SYSTEM. A system designed to achieve lower-sub-membrane air pressure relative to crawl space air pressure by use of a vent drawing air from beneath the soil-gas-retarder membrane.

SECTION AF103
REQUIREMENTS

AF103.1 General. The following construction techniques are intended to mitigate radon entry in new construction. These techniques are required in areas where designated by AF101.1.

AF103.2 Subfloor preparation. A layer of gas-permeable material shall be placed under all concrete slabs and other floor systems that directly contact the ground and are~ within the walls of the living spaces of the building, to facilitate' future installation of a sub-slab depressurization system, if needed. The gas-permeable layer shall consist of one of the following:

1. A uniform layer of clean aggregate, a minimum of 4 inches (102 mm) thick. The aggregate shall consist of material that will pass through a 2-inch (51 mm) sieve and be retained by a ¼-inch (6.4 mm) sieve.
2. A uniform layer of sand (native or fill), a minimum of 4 inches (102 mm) thick, overlain by a

layer or strips of geo-textile drainage matting designed to allow the lateral, flow of soil gases.
3. Other materials, systems or floor designs with demonstrated capability to permit depressurization across the entire sub-floor area.

AF103.3 Soil-gas-retarder. A minimum 6-mil (0.15 mm) [or 3-mil (0.075 mm) cross-laminated] polyethylene or equivalent flexible sheeting material shall be placed on top of the gas-permeable layer prior to casting the slab or placing the floor. assembly to serve as a soil-gas-retarder by bridging any cracks that develop in the slab or floor assembly and to prevent concrete from entering the void spaces in the aggregate base material. The sheeting shall cover the entire floor area with separate sections of sheeting lapped at least 12 inches (305 mm). The sheeting shall fit closely around any pipe, wire or other penetrations of the material. All punctures or tears in the material shall be sealed or covered with additional sheeting.

AF103.4 Entry routes. Potential radon entry routes shall be closed in accordance with Sections AF103.4.1 through AF103.4.10.

AF103.4.1 Floor openings. Openings around bathtubs, showers, water closets, pipes, wires or other objects that penetrate concrete slabs or other floor assemblies shall be. filled with a polyurethane caulk or equivalent sealant applied in accordance with the manufacturer's recommendations.

AF103.4.2 Concrete joints. All control joints, isolation joints, construction joints and any other joints in concrete' slabs or between slabs and foundation walls shall be sealed with a caulk or sealant. Gaps and joints shall be cleared of loose material and filled with polyurethane caulk or other elastomeric sealant applied in accordance with the manufacturer's recommendations.

AF103.4.3 Condensate drains. Condensate drains shall be trapped or routed through non-perforated pipe to daylight.

AF103.4.4 Sumps. Sump pits open to soil or serving as the termination point for sub-slab or exterior drain tile loops shall be covered with a gasketed or otherwise sealed lid. Sumps used as the suction point in a sub-slab depressurization system shall have a lid designed to accommodate the vent pipe. Sumps used as a floor drain shall have a lid equipped with a trapped inlet.

AF103.4.5 Foundation walls. Hollow block masonry foundation walls shall be constructed with either a continuous course of solid masonry, one course of masonry grouted solid, or a solid concrete beam at or above finished ground surface to prevent passage of air from the interior of the wall into the living space. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be sealed. Joints, cracks or other openings around all penetrations of both exterior and interior surfaces of masonry block or wood foundation walls below the ground surface shall be filled with polyurethane caulk or equivalent sealant. Penetrations of concrete walls shall be filled.

AF103.4.6 Dampproofing. The exterior surfaces of portions of concrete and masonry block walls below the ground surface shall be dampproofed in accordance with Section R406 of this code.

AF103.4.7 Air-handling units. Air-handling units in crawl spaces shall be sealed to prevent air from being drawn into the unit.

Exception: Units with gasketed seams or units that are otherwise sealed by the manufacturer to prevent leakage.

AF103.4.8 Ducts. Ductwork passing through or beneath a slab shall be of seamless material unless the air-handling system is designed to maintain continuous positive pressure within such ducting. Joints in such ductwork shall be sealed to prevent air leakage and shall be performance tested to demonstrate conformance to ODOE duct performance standards.

Ductwork located in crawl spaces shall have all seams and joints sealed by closure systems in accordance with Section M1601.4.1. Ductwork shall be performance tested to demonstrate conformance to ODOE duct performance standards.

AF103.4.9 Crawl space floors. Openings around all penetrations through floors above crawl spaces shall be caulked or otherwise filled to prevent air leakage.

AF103.4.10 Crawl space access. Access doors and other openings or penetrations between basements and adjoining crawl spaces shall be closed, gasketed or otherwise filled to prevent air leakage.

AF103.5 Crawl space mitigation system. In buildings with crawl space foundations, a system complying with AF103.5.1 or AF103.5.2 shall be installed during construction.

Exception: Buildings in which an approved mechanical crawl space ventilation system or other equivalent system is installed.

AF103.5.1 Passive sub-membrane depressurization system.

AF103.5.1.1 Ventilation. Crawl spaces shall be provided with vents to the exterior of the building The minimum net area of ventilation openings shall comply with Section R408.1 of this code.

AF103.5.1.2 Soil-gas-retarder. The soil in crawl spaces shall be covered with a continuous layer of minimum 6-mil (0.15 mm) polyethylene soil-gas-retarder. The ground cover shall be lapped a minimum of 12 inches (305 mm) at joints and shall extend to all foundation walls enclosing the crawl space area.

AF103.5.1.3 Vent pipe. A plumbing tee or other approved connection shall be inserted horizontally beneath the sheeting and connected to a 3- or 4-inch-diameter (76 mm or 102 F·2 mm) fitting with a vertical vent pipe installed through the sheeting. The vent pipe shall be extended up through the building floors, terminate at least 12 inches (305 mm}above the roof in a location at least 10 feet (3048 mm) away from any window or other opening into the conditioned spaces of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings.

AF103.5.2 Crawl space ventilation and building tightness.

AF03.5.2.1 Ventilation. Crawl spaces shall be provided with vents to the exterior of the building that comply with Section R408.1 of this code. The minimum net area of ventilation openings shall not be less than 1 sq. ft. (0.0929 m^2) for each 150 sq. ft. (14 m^2) of underfloor space area.

AF103.5.2.2 Ventilation openings. Ventilation openings shall comply with Section R408.2. Operable louvers, dampers, or other means to temporarily stop the ventilation shall not be permitted.

AF103.5.2.3 Building tightness. Dwellings shall be tested with a blower door, depressurizing the dwelling to 50 Pascal's from ambient conditions and found to exhibit no more than 5.0 air changes per hour. A mechanical exhaust, supply, or combination ventilation system providing whole-building ventilation rates specified in Table N1101.1(3) or ASHRAE 62.2 shall be installed within the dwelling unit.

AF103.6 Passive subslab depressurization system. In basement or slab-on-grade buildings, the following components of a passive sub-slab depressurization system shall be installed during construction.

AF103.6.1 Vent pipe. A minimum 3-inch-diameter (76 mm) ABS, PVC or equivalent gas-tight pipe shall be embedded vertically into the sub-slab aggregate or other permeable material before the slab is cast. A "T" fitting or equivalent method shall be used to ensure that the pipe opening remains within the sub-slab permeable material. Alternatively, the 3-inch (76 mm) pipe shall be inserted directly into an interior perimeter drain tile loop or through a sealed sump cover where the sump is exposed to the sub-slab aggregate or connected to it through a drainage system.

The pipe shall be extended up through the building floors, terminate at least 12 inches (305 mm) above the surface of the roof in a location at least 10 feet (3048 mm) away from any window or other opening into the conditioned spaces of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings.

AF103.6.2 Multiple vent pipes. In buildings where interior footings or other barriers separate the sub-slab aggregate or other gas-permeable material, each area shall be fitted with an individual vent pipe. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

AF103.7 Vent pipe drainage. All components of the radon vent pipe system shall be installed to provide positive drainage to the ground beneath the slab or soil-gas-retarder.

AF103.8 Vent pipe accessibility. Radon vent pipes shall be accessible for future fan installation through an attic or other area outside the habitable space.

Exception: The radon vent pipe need not be accessible in an attic space where an approved roof-top electrical supply is provided for future use.

AF103.9 Vent pipe identification. All exposed and visible interior radon vent pipes shall be identified with at least one label on each floor and in accessible attics. The label shall read: "Radon Reduction System."

AF103.10 Combination foundations. Combination: basement/crawl space or slab-on-grade/crawl space foundations shall have separate radon vent pipes installed in each type of foundation area. Each radon vent pipe shall terminate above the roof or shall be connected to a single vent that terminates above the roof.

AF103.11 Building depressurization. Joints in air ducts and plenums in unconditioned spaces shall meet the requirements of Section M1601. Thermal envelope air infiltration requirements shall comply with the energy conservation provisions in Chapter 11. Firestopping shall meet the requirements contained in Section R602.8.

AF103.12 Power source. To provide for future installation of an active sub-membrane or sub-slab depressurization system, an electrical circuit terminated in an approved box shall be installed during construction in the attic or other anticipated location of vent pipe fans. An electrical supply shall also be accessible in anticipated located of system failure alarms.

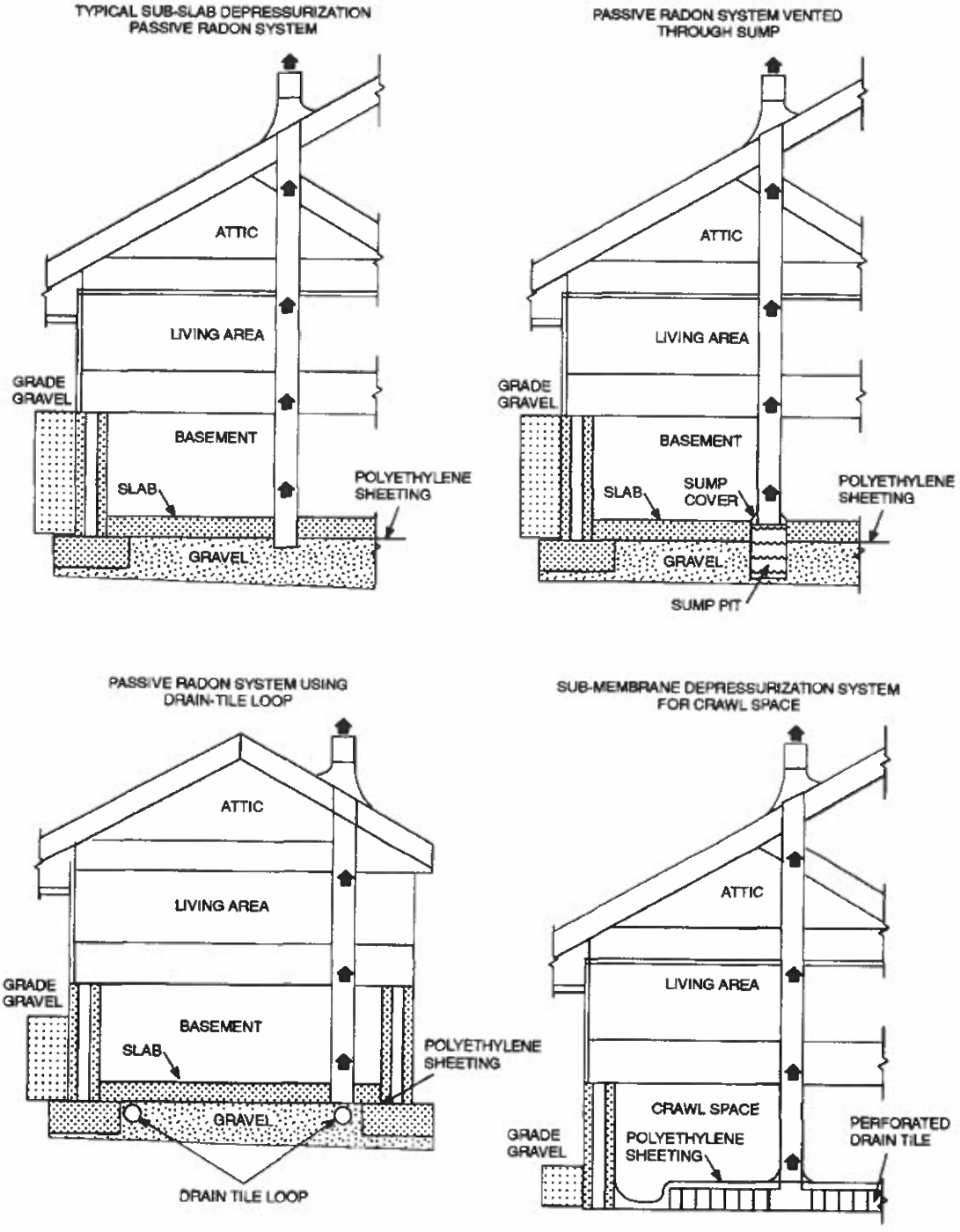


FIGURE AF102
RADON-RESISTANT CONSTRUCTION DETAILS FOR FOUR FOUNDATION TYPES

Residential Radon Mitigation
Commentary
(A section by section discussion of the new radon requirements)

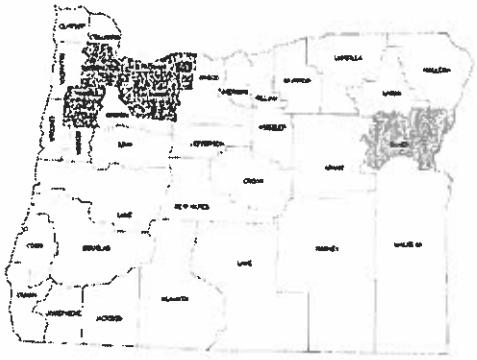
The 2010 Oregon Legislature adopted Senate Bill 1025 which mandated the adoption of a radon mitigation standard with an effective date of April 1, 2011. The new law affects new residential and commercial construction in specific Oregon counties. This commentary reflects the requirements applicable to residential work regulated by the *Oregon Residential Specialty Code* (ORSC), which includes one- and two-family dwellings and townhouses.

Structures regulated under the *Oregon Structural Specialty Code* (OSSC), and apartments (R-2 & R-3 occupancies) under OSSC, Appendix N, are addressed in the OSSC, Sections 1811 and 1812. Section 1811 deals with public buildings, and will not go into effect until January 1, 2013. All occupancies classified as R-2 or R-3 regulated under Appendix N will be regulated under OSSC, Section 1812. Section 1812 has an effective date of April 1, 2011.

Except for general formatting styles, the provisions in Section 1812 are substantially identical to Appendix F, with a couple of exceptions. Section 1812 only provides two methods for crawl space radon mitigation, where as Appendix F provides a third option. Section 1812 also limits the area that can be served by a single vent stack to a maximum of 2,000 sq. ft., where-as Appendix F does not have an area limitation. Therefore for simplicity reasons, this commentary will focus on and make reference to the provisions for radon mitigation as found in ORSC, Appendix F.

Appendix F is broken into three specific sections. Section AF101 establishes the scope of the appendix and includes SB 1025 in a box for reference. Section AF102 defines the specific terms related to the appendix, and Section AF103 discusses the construction techniques for radon mitigation.

Section AF101 mandates radon mitigation in the following Oregon counties; Baker, Clackamas, Hood River, Multnomah, Polk, Washington and Yamhill.



Radon mitigation required for new construction in these counties

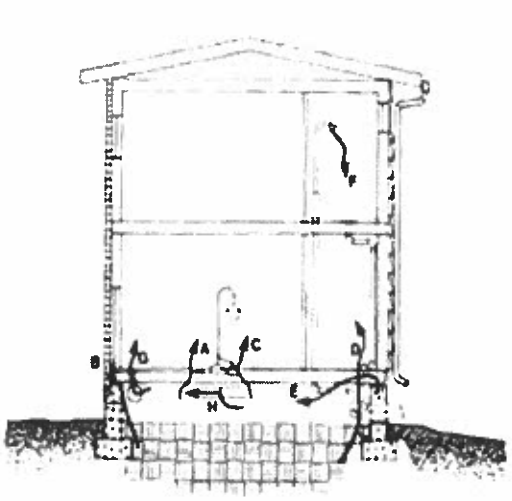
Section AF103 is broken down into several subsections, but can be categorized into two main construction categories; slab-on-grade or slab-below-grade (basements) and crawl space construction. Slab-on grade and slab-below-grade construction includes concrete slabs as-well-as any other floor system with direct contact to the ground.

Section AF103.2 specifically deals with sub-grade preparation for slabs. When a sub-slab depressurization system is to be used, it is necessary to correctly prepare the base prior to the installation of a soil-gas-retarder. The use of aggregate, or sand overlaid with drainage matting, or any other approved gas-permeable material or system is required beneath all concrete slabs or similar floor systems in direct contact with the ground. The layer of material must be located so that it protects all interior floor areas of the building. Where aggregate or sand are used, they must be placed in a uniform layer at least 4 inches thick. The sand must also be overlaid with a drainage matting material that will assist in causing the soil gases to travel in a lateral direction.

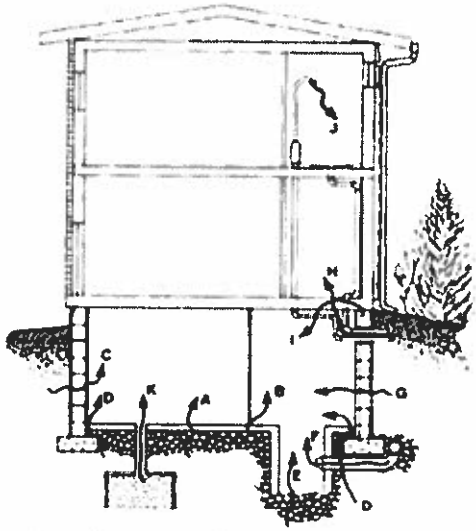
Section AF103.3 deals with the soil-gas-retarder materials. An acceptable sheeting material must be installed on top of the gas-permeable base layer. The material is to be a minimum 6-mil polyethylene membrane or any other flexible sheeting that provides equivalent protection. The soil-gas-retarder resists the vertical flow of radon gas into the slab or other type of floor assembly. Therefore, the membrane must cover the entire floor area of the building with joints adequately lapped and penetrations tightly sealed. Any tears, rips, or punctures are to be adequately repaired with additional sheeting material.

Section AF103.4 (and ensuing subsections) identifies the various points at which radon may enter the building and specifies the appropriate methods for sealing or otherwise protecting the potential entry routes. This section applies to both a slab or crawl space.

Ways that Radon can enter the home.



A. Cracks in subflooring and flooring
B. Spaces behind stud walls and brick veneer walls that rest on uncapped hollow-block foundation
C. Electrical penetrations
D. Loose-fitting pipe penetrations
E. Open tops of block walls
F. Water (from some wells)
G. Heating duct register penetrations
H. Cold-air return ducts in crawl space



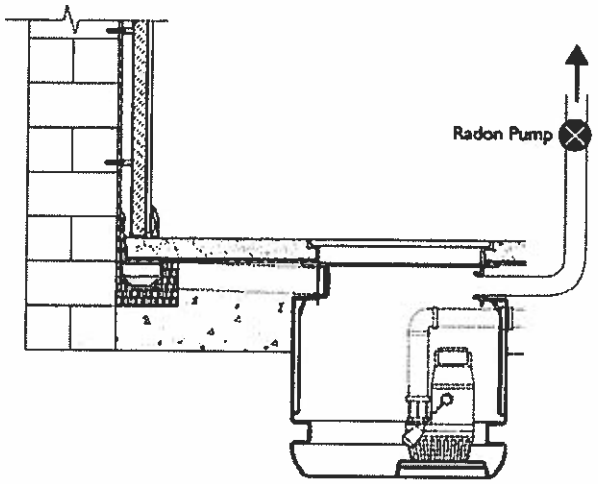
A. Cracks in concrete slabs
B. Cold joint between two concrete pours
C. Pores and cracks in concrete blocks
D. Floor-to-wall crack or French drain
E. Exposed soil, as in a sump
F. Weeping (drain) tile, if drained to open sump
G. Mortar joints
H. Loose fitting pipe penetrations
I. Open tops of block walls
J. Water (from some wells)
K. Untrapped floor drain to a dry well or septic system

It is typical for a floor slab or other type of floor assembly to be penetrated by plumbing, mechanical and electrical components. Polyurethane caulk or an equivalent sealant material must be installed at all penetrations created by the passage of piping, vents, conduit, cable, or other items penetrating the floor. The sealant is to be installed in accordance with the recommendations of the caulking manufacturer.

Where joints occur within a concrete slab floor or at the point where the floor intersects the foundation walls, they must be filled with an appropriate caulk or sealant material. All loose material must be removed prior to installation of the sealant material. Polyurethane caulk or any other type of elastomeric sealant will allow for slight movement of the penetrating items without reducing the integrity of the seal.

Condensate drains that pass through the floor system are to be run to the exterior using non perforated pipe or must be provided with an approved trap.

A gasketed or sealed lid must be provided on any sump pit that serves as the end point for a sub-slab or exterior drain tile loop system. Such a lid is also required if the sump pit is open to the soil. The sump lid must be designed to accommodate the vent pipe where the sump is used as the suction point in a sub-slab decompression system. Where used as a floor drain, the sump pit lid is to be equipped with a trapped inlet.



Where ductwork passes through or is installed beneath a concrete floor slab, the ducts must be free of seams that may allow air and gas to enter the duct system. Seams are only permitted where it can be demonstrated that the air-handling equipment will maintain continuous positive pressure within the ducting. In such situations, the seams must be sealed to eliminate any air leakage. All duct work must be performance tested in accordance with ODOE duct testing standards. Ductwork passing through a crawl space must have seams and joints sealed by one of the methods prescribed in Section M1601.3.1. This will allow the use of fibrous glass and seamed metal ducts and field fabricated ductwork. Again, all duct work must be performance tested in accordance with ODOE duct testing standards.

In addition to above penetrations, crawlspace access under Section R408.3, under-floor mechanical equipment access per Section M1305.1.4, or any other access point from the habitable space into the crawl space, such as doors or panels must be closed and gasketed to create an airtight separation.

It's important to remember, the requirements for sealing of all penetrations as addressed in Section AF103.4 is mandatory, and are in addition to any of the following specific requirements found in Sections AF103.5 and AF103.6.

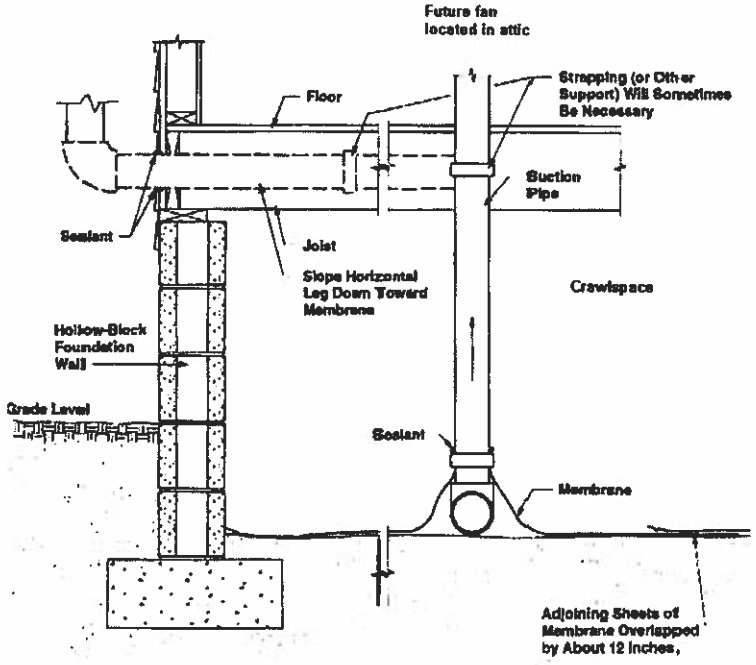
Section AF103.5 specifically addresses crawl spaces, and provides three ways to accommodate radon mitigation.

The first method is found in the exception under AF103.5. This method allows for a mechanically ventilated crawlspace system as described in Section R408.2, Exception 2. This exception does not require any further mitigation other than the sealing requirements found in AF103.4, as discussed above.

R408.2, Exception 2;

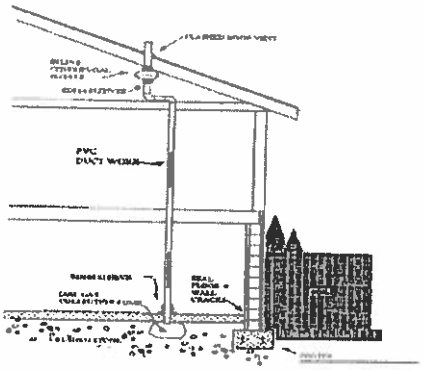
2. Ventilation openings are not required in the foundation when a continuously operated mechanical ventilation system is installed. The system shall be designed to have the capacity to exhaust a minimum of 1.0 CFM (0.5 L/s) for each 50 square feet (4.6 L/s) of under-floor area. The ground surface shall be covered with an approved ground cover material.

The second method is described in Section AF103.5.1 and is called a "Passive sub-membrane depressurization system". This system requires foundation ventilation, installation of a soil-gas-retarder, and a vent stack. The vent stack is not required to be fan assisted, but is required to be accessible for later installation of a fan. This method also requires the installation of an electrical supply for that future fan, and must be pre-wired for a "system failure" alarm (See Section AF103.12).



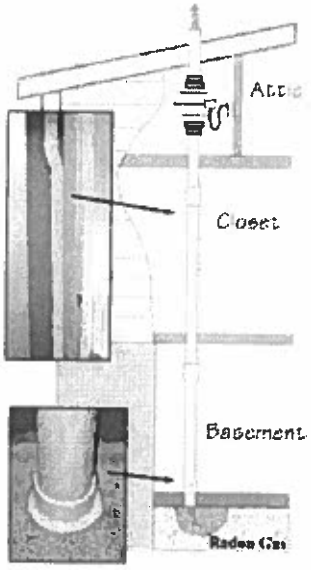
The third method requires foundation ventilation per R408.1 ($^1/_{150}$ with no further reductions.), foundation ventilation openings per R408.2 (Operable louvers, dampers, or other means to temporarily close-off vent openings are not allowed.), the testing of building tightness with a blower door test, and the installation of a whole-house ventilation system. A mechanical exhaust, supply, or combination system providing building ventilation rates per Chapter 11, Table N1101.1(3) or ASHRAE 62.2 will meet this requirement. Obviously the blower door test will need to be performed prior to final approval and after all other aspects of the house construction are completed.

SUB - SLAB SUCTION

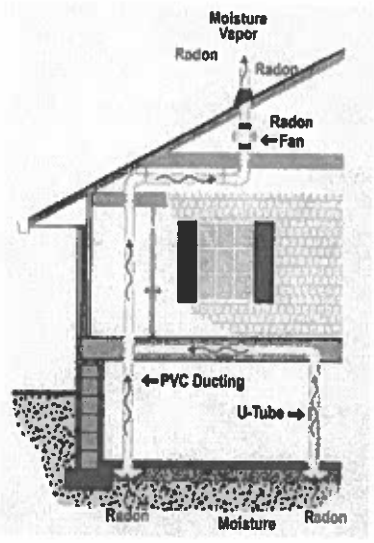


Section AF103.6 specifically addresses basements and slab-on-grade construction.

This section provides one basic method of radon mitigation, by use of a vent stack system. As with the vent stack described above (AF103.5.1.3), the minimum requirement is a "Passive sub-membrane depressurization system". Section AF103.6.1 describes in detail several options including inserting a vent pipe into the sub-slab aggregate materials by use of a "T" fitting or equal embedded in the aggregate, or the use of an interior perimeter drain tile loop or through a sump. This section also addresses the use of multiple vents (Sub-section AF103.6.2) when interior footings or other barriers separate the sub-slab aggregate. When multiple venting is required, the vent pipes may terminate individually above the roof or may be connected to a single vent stack.



Single Stack



Double Stack

The remaining sections are generic in nature and apply to both slab and crawl-space construction.

(Section AF103.7) When a "Passive sub-membrane depressurization system" is used, whether for a slab or crawl-space, the ground beneath the floor slab or soil-gas-retarder shall be properly prepared to provide positive drainage to the stack location.

(Section AF103.8) To accommodate the future installation of a fan, access to the radon vent stack-pipe must be provided through the attic or other non-habitable space. If an approved rooftop electrical supply is provided, the access from the building's interior is not necessary.

(Section AF103.9) Radon venting systems must be adequately identified to reduce the potential for improper use or modification. The identification is required for every floor level and in all accessible attics where the radon vents are exposed and visible. At a minimum, the identification label must state: **"Radon Reduction System."**

(Section AF103.10) When dealing with a structure that combines a basement with a crawl space, or a slab-on grade with a crawl space, separate radon mitigation shall be provided for each individual type of foundation system. Again if vent piping is used, it must extend above the roof, either as an individual vent or as a single vent termination connected to multiple vents.

(Section AF103.11) When other provisions of the code are applicable to the installation of a radon reduction system, they are only applicable to the extent prescribed by the code. Specific references are made in this appendix to Section M1601 for joints in air ducts and plenums in unconditioned spaces, Section R602.8 for fire stopping in concealed spaces and Chapter 11 for whole house ventilation systems.

(Section AF103.12) Although this appendix only requires a venting system to be a "Passive depressurization system", it is possible a conversion to an active system may occur some time in the future. In anticipation of such an occurrence this appendix requires an electrical circuit be provided to an approved electrical box. The box should be located in the attic or other location that will provide access to the vent pipe. An active system will also require a "system failure" alarm, so in anticipation of this alarm an additional electrical supply must be provided at the anticipated future "system failure" alarm location. Examples of system failure warning devices are: *a liquid gauge, a sound alarm, a light indicator*, and *a dial (needle display) gauge*. The warning device *must* be placed where it can be seen or heard easily. The location and type of "system failure" alarm should be determined by the contractor (and/or home owner) and should be identified on house plans at the time of submittal for plan review.

Additional questions?
Contact Micheal D Ewert at
503-373-7529 or
mike.d.ewert@state.or.us

Examples of System Failure Warning Devices

Dynameter

Checkpoint Audible Radon System Alarm

An audible alarm is desirable when the U-tube manometer is installed in a hard to view location. The Checkpoint alarm will sound when the pressure drops in the vent pipe due to an obstruction or fan failure.

Example of a Home Radon Testing Device

Features

- HS71512 110V - 60 Hz
- Numeric LED display range of .1 to 999.9 shows the level of radon gas in pCi/L.
- Short-term reading displays the average radon gas levels over the past 48 hours.
- Long-term reading displays the average radon gas levels since powered-up or last reset with a maximum reading time of 5 years.
- Upon initial power-up, short-term and long-term readings will display after the first 48 hours.
- Audible alarm sounds if the long-term average reaches 4 pCi/L or greater or the short-term average stays above 4 pCi/L for 30 consecutive days.
- Samples air continuously with the display updated every hour.
- Conducts a failsafe self-test every 24 hours with an error code displayed if there is a failure.
- Menu button controls 4 functions.
- Switch between the short-term and long-term display, indicated by a green LED illuminated next to the S or L .
- Conduct a manual test of the detector.
- Mute or reactivate the audible alarm if the detector is in an alarm state.
- Clear and reset the memory of the detector to begin new readings.
- 10-foot power cord allows user to locate detector away from walls, windows and doors.
- Evaluated by the US EPA and meets performance criteria to accurately and precisely measure radon.
- One year warranty.