

## Minnesota Radon Code

***The radon code is part of the Energy Code. The relevant parts of the Energy Code scope are on this page. The Radon Code begins on the next page.***

### **[Minnesota Energy Code]**

**N1101.1 Scope.** This chapter regulates energy efficiency for the design and construction of buildings regulated by the International Residential Code (IRC) as adopted and amended by the state of Minnesota. This chapter shall also be used to regulate energy efficiency for the design and construction of new residential buildings regulated by the International Building Code (IBC) as adopted and amended by the state of Minnesota that are not more than three stories in height and contain no conditioned common space that is shared between dwellings, and each dwelling unit contains a separate means of egress. The intent of these criteria is to provide a means for furnishing quality indoor air, assuring building durability, and permitting energy efficient operation.

***Pursuant to part 1322.2100, Appendix F of the 2006 International Residential Code (IRC) applies to all residential buildings covered by this chapter.***

### **Exceptions:**

3. Additions to existing dwellings or dwelling units may be made without making the entire dwelling or dwelling unit comply, provided that the addition complies with all the requirements of this chapter.
4. Alteration or repairs to existing dwellings or dwelling units may be made without making the entire dwelling or dwelling unit comply, provided the alteration complies with as many requirements of this chapter as feasible, as determined by the designated building official.

<u>City</u>	<u>Summer Db/Wb °F</u>	<u>Winter Db °F</u>
Litchfield	85/71	-18
Little Falls	86/71	-20
Mankato	86/72	-15
Minneapolis/St. Paul	88/72	-15
Montevideo	86/72	-17
Mora	84/70	-21
Morris	84/72	-21
New Ulm	87/73	-15
Owatonna	86/73	-16
Pequot Lakes	84/68	-23
Pipestone	85/73	-15
Redwood Falls	89/73	-17
Rochester	85/72	-17
Roseau	82/70	-29
St. Cloud	86/71	-20
Thief River Falls	82/68	-25
Tofte	75/61	-14
Warroad	83/67	-29
Wheaton	84/71	-20
Willmar	85/71	-20
Winona	88/74	-13
Worthington	84/71	-14

Db = dry bulb temperature, degrees Fahrenheit  
Wb = wet bulb temperature, degrees Fahrenheit

**1322.2100 INCORPORATION BY 1322.2101, SECTION AF101, SCOPE. REFERENCE.**

Appendix F, Radon Control Methods, of the 2006 edition of the International Residential Code (Appendix F) as promulgated by the International Code Council, Inc. (ICC), Falls Church, VA 22041, is incorporated by reference and made part of the Minnesota State Building Code except as qualified by the applicable provisions in chapter 1300, and as amended in parts 1322.2101 to 1322.2103. Appendix F is not subject to frequent change and a copy of Appendix F, with amendments for use in Minnesota, is available in the office of the commissioner of labor and industry. Portions of parts 1322.2101 to 1322.2103 reproduce text and tables from Appendix F, which is copyrighted by the ICC. All rights reserved.

Subpart 1. **General.** Appendix F, Section AF101, is amended to read as follows:

The purpose of parts 1322.2101 to 1322.2103 is to establish requirements for radon-resistant construction in new residential construction built to the requirements of Minnesota Rules, chapter 1305 or 1309.

Subp. 2. **Figure AF101.** Appendix F, Figure AF101, is deleted in its entirety.

Subp. 3. **Table AF101(1).** Appendix F, Table AF101(1), is deleted in its entirety.

**1322.2102 SECTION AF102,  
DEFINITIONS.**

Subpart 1. **General.** Appendix F, Section AF102, is amended to read as follows:

**AF102.1 General.** The definitions in this part apply to Minnesota Rules, parts 1322.2101 to 1322.2103.

**SUB-SLAB DEPRESSURIZATION SYSTEM (Passive).** A system designed to achieve lower sub-slab air pressure relative to indoor air pressure by use of a vent pipe routed 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.

**SUB-SLAB 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 of the internal perimeter of a basement or crawl space.

**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, 3-mil (0.075 mm) cross-laminated polyethylene, or other equivalent material used to retard the flow of soil gases into a building.

**SUB-MEMBRANE 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.

Subp. 2. Figure AF102.

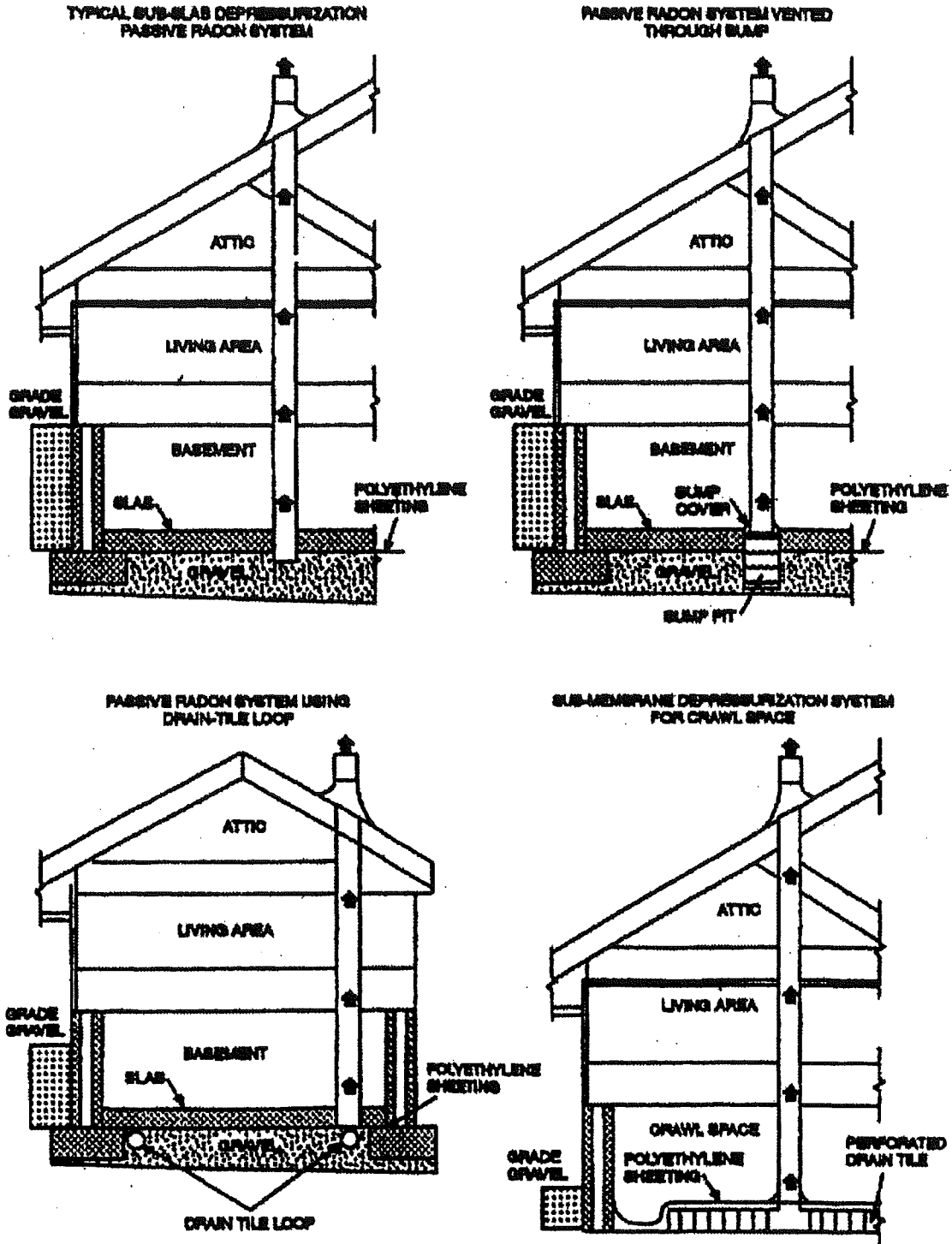


FIGURE AF102  
RADON-RESISTANT CONSTRUCTION DETAILS FOR FOUR FOUNDATION TYPES

**1322.2103 SECTION AF103,  
REQUIREMENTS.**

Appendix F, Section AF103, is amended to read as follows:

**AF103.1 General.** The following passive construction techniques are intended to resist radon entry and prepare the building for post construction active radon mitigation. (see Figure AF102).

**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 and conditioned crawl spaces of the building, to facilitate the installation of an active 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 1/4-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 geotextile 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 of 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 nonperforated pipe to daylight.

**AF103.4.4 Sumps.** Sump pits open to soil or serving as the termination point for sub-slab or interior 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 Waterproofing/dampproofing.** The exterior surfaces of portions of concrete and masonry block walls below the ground surface shall be dampproofed or waterproofed 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.

Ductwork located in crawl spaces shall have all seams and joints sealed by closure systems in accordance with Minnesota Rules, chapter 1346.

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

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

**AF103.5 Passive sub-membrane depressurization system.** In buildings with crawl space foundations, the following components of a passive sub-membrane depressurization system shall be installed during construction.

**AF103.5.1 Ventilation.** Unconditioned 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.

**AF103.5.2 Soil-gas-retarder.** The soil in crawl spaces shall be covered with a continuous layer of minimum 6-mil (0.14 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.

**AF103.5.3 Vent pipe.** A plumbing tee or other approved connection shall be inserted horizontally beneath the sheeting with one 10-foot section of a perforated pipe connected to each side of the "T" fitting and then connected to a 3- or 4-inch diameter (76 mm or 102 mm) fitting with a vertical vent pipe installed through the sheeting. The vent pipe shall be of solid piping material and shall be extended up through the building floors, terminated at least 12 inches (305 mm) above the roof in a location at least 10 feet (3,048 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 (3,048 mm) from any window or other opening in adjoining or adjacent buildings.

**AF103.6 Passive sub-slab depressurization system.** In buildings with basements, foundations, and/or conditioned crawl spaces, 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 gastight pipe shall be embedded vertically into the sub-slab aggregate or other permeable material before the slab is cast. A "T" fitting with one 10-foot section of a perforated pipe connected to each side of the "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.

**Exception:** If an active -sub-slab depressurization system is installed, the vent pipe may be routed through unconditioned space within the building or garage, provided the vent pipe is insulated to a minimum of R-4. Radon vent pipes shall terminate at least 12 inches above the roof or shall be connected to a single vent that terminates at least 12 inches above the roof. For active systems, a system monitoring device must also be installed. All other requirements of this section apply.

**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. Radon vent pipes shall connect to a single vent that terminates at least 12 inches above the roof or each individual vent pipe shall terminate separately at least 12 inches 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 provide enough space around the pipe for future installation of a fan system. The space provided for installation of a future fan shall be a minimum of 24 inches in diameter, centered on the axis of the vent stack, and shall extend for a minimum vertical distance of 3 feet.

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

**AF103.9 Vent pipe identification.** All 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.

**Exception:** A single vent pipe is allowed in a building with a combination foundation as long as soil gases can flow freely between the areas of the combination foundations and it is connected to an approved vent pipe.

**AF103.11 Building depressurization.** Joints in air ducts and plenums in unconditioned spaces shall meet the requirements of Minnesota Rules, chapter 1346. Thermal envelope air infiltration requirements shall comply with the energy conservation provisions in chapter 1322. 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.

**REPEALER.** Minnesota Rules, parts  
7670.0100; 7670.0130; 7670.0260;  
7670.0350; 7670.0400; 7670.0450;  
7670.0460; 7670.0470; 7670.0475;  
7670.0490; 7670.0495; 7670.0610;  
7670.0660; 7670.0710; 7670.0800;  
7670.1115; 7672.0100; 7672.0200;  
7672.0300; 7672.0400; 7672.0500;  
7672.0600; 7672.0700; 7672.0800;  
7672.0900; 7672.1000; 7672.1100;  
7672.1200; 7272.1300; 7674.0100;  
7674.0200; 7674.0300; 7674.0400;  
7674.0500; 7674.0600; 7674.0700;  
7674.0800; 7674.0900; 7674.1000;  
7674.1100, and 7674.1200, are repealed.

**EFFECTIVE DATE.** These amendments are effective June 1, 2009.