RB361-16

IRC: , R202 (New), R327 (New), R327.1 (New), R327.2 (New), R327.3 (New), R327.4 (New), R327.4.1 (New), R327.4.2 (New), R327.4.3 (New), R327.4.4 (New), R327.4.4.1 (New), R327.4.4.2 (New), R327.4.4.3 (New), R327.5 (New), R327.5.1 (New), R327.5.2 (New), R327.5.3 (New), R327.5.4 (New), R327.5.5 (New), R327.5.6 (New), R327.5.7 (New), R327.5.8 (New), R327.6 (New), R327.7 (New), R327.8 (New), R327.8.1 (New), R327.8.2 (New), R327.8.3 (New), R327.8.4 (New), R327.8.5 (New), R327.8.6 (New), R327.8.7 (New), R327.8.8 (New), R327.8.9 (New).

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2015 International Residential Code

Add new definition as follows:

SECTION R202 ACTIVE SOIL DEPRESSURIZATION (ASD) SYSTEM.

A system using a fan-powered vent drawing air from beneath a slab or membrane designed to achieve lower air pressure under the sub-slab or sub-membrane relative to air pressure above the slab or membrane.

SECTION R202 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.

SECTION R202 RADON GAS.

A naturally-occurring, radioactive, cancer-causing 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.

SECTION R202 ROUGH-IN.

The installation of all parts amaterials of anactive soil depressurization system that must be competed prior to the placement of concrete, prior to the closure of building cavities and prior to the installation of finish materials. Such parts and materials include gas permeable layers, soil gas retarders, plenums, membranes, piping, suction inlets, discharge outlets and wiring.

SECTION R202 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.

SECTION R202 SUB-MEMBRANE DEPRESSURIZATION SYSTEM.

An active soil depressurization system designed to achieve lower sub-membrane air pressure relative to crawl space air pressure by use of a fan powred vent drawing air from beneath the soil gas retarder membrane.

SECTION R202 SUB-SLAB DEPRESSURIZATION SYSTEM.

An active soil depressurization 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 floor slab.

Add new text as follows:

SECTION R327 RADON CONTROL METHODS

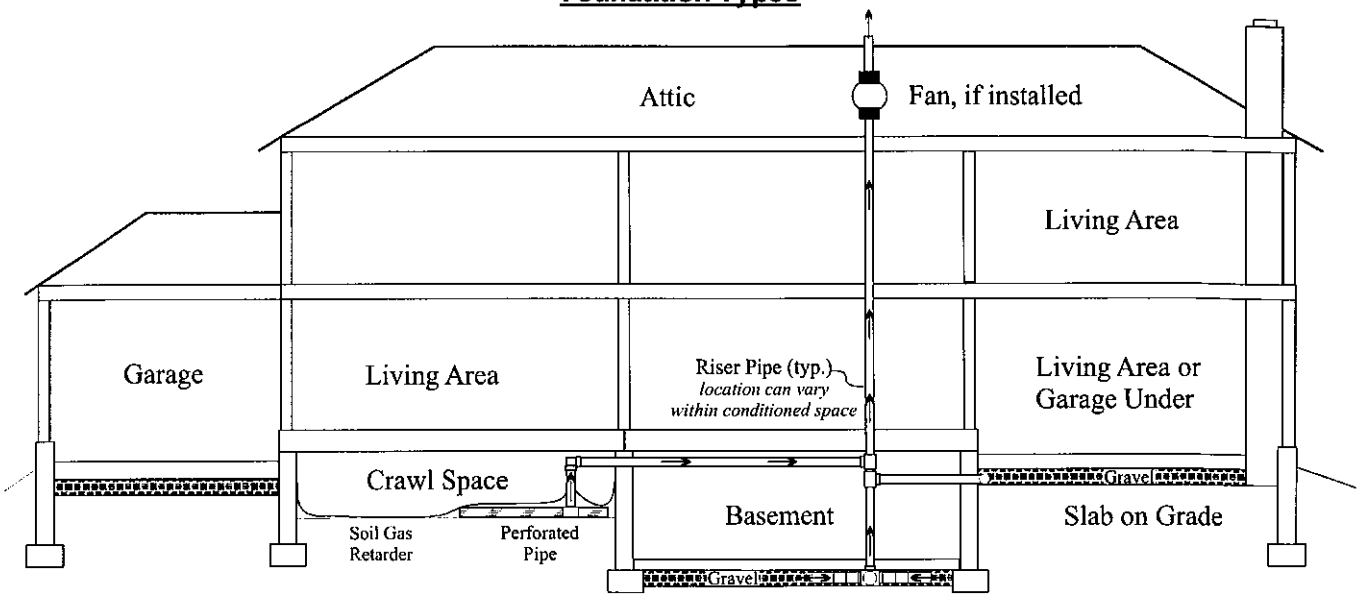
R327.1 General. Where provided, the design and installation of radon control methods for new construction shall comply with one of the following:

1. Section R327, or
2. State or local requirements, where applicable.

R327.2 Intent. Radon control mehtods are intended to reduce radon entry and prepare the building for post-construction radon mitigation.

R327.3 Active soil depressurization system rough-in. A rough-in is required for all foundations and combination foundation types, including crawlspace, basement, slab on grade, and slab on grade garage located below a living area as shown in Figure R327.3

FIGURE R327
Foundation Types



R327.4 Sub-slab depressurization system rough-in. In basement or slab-on-grade buildings, the components of a sub-slab depressurization system shall be installed during construction in accordance with Sections R327.4.1 through R327.4 and R327.5 through R327.8.9.

R327.4.1 Gas permeable layer.
To facilitate future installation of an active soil depressurization system, a gas-permeable layer shall be constructed 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. The gas-permeable layer shall be designed to allow the lateral flow of soil gases and consist of one of the following:

1. A uniform layer of clean aggregate, not less than 4 inches (102 mm) in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or a Size Number 4, 5, 56, or 6 as classified by ASTM C33.
2. A uniform layer of native or fill sand, a minimum of 4 inches (102 mm) in depth, overlain by a layer or strips of geotextile drainage matting or loop of perforated pipe. The geotextile drainage matting shall have a cross-sectional

area of at least 12 square inches (774 sq mm). The geotextile matting shall be placed not closer than 12 inches (305 mm) to the foundation wall around the interior of the foundation perimeter.

3. A loop of 4 inch (102 mm) nominal or larger size perforated pipe placed in a trench along the perimeter of the foundation, with the trench backfilled with clean aggregate having a void ratio of not less than 35 percent or a size number 4, 5, 56, or 6 as classified by ASTM C33 such that the pipe is surrounded by a not less than 4 inches (102mm) of aggregate on all sides. The pipe shall be placed not closer than 12 inches (305 mm) to the foundation wall around the interior of the foundation perimeter.
4. Other materials, systems or floor designs with demonstrated capability for depressurization across the entire sub-floor area.

R327.4.2 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. The sheeting shall cover the entire floor area with separate sections of sheeting lapped not less than 12 inches (305 mm). Openings in the sheeting caused by pipe, wire and other penetrations shall be sealed. Punctures or tears in the material shall be sealed or covered with additional sheeting. Where under slab insulation is installed, it shall be placed on top of the sheeting.

R327.4.3 Vent pipe connector.

A 3 inch nominal (76 mm) or larger size ABS, PVC or equivalent gas-tight pipe shall be embedded vertically into the gas permeable layer before the slab is cast. A tee fitting or equivalent method shall be used to secure the pipe opening within the gas permeable layer. Not less than 5 feet (1524 mm) of perforated pipe shall be connected to the two horizontal openings of the tee fitting or the two horizontal openings shall be connected to the interior drain tile system.

Alternatively, the 3 inch nominal (76 mm) size pipe shall connect through a sealed sump cover where the sump communicates directly with the sub-slab aggregate or with it through a drainage system. A flexible rubber coupling connector shall be provided at the sump cover connection to facilitate servicing the sump.

R327.4.4 Sub-membrane depressurization system rough-in.

In buildings with crawl space foundations, the components of a sub-membrane depressurization system shall be installed during construction in accordance with Sections R327.4.4.1 through R327.4.4.3.

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

R327.4.4.1 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.

Exception: Outdoor ventilation is not required for conditioned crawl spaces.

R327.4.4.2 Soil gas-membrane.
The soil in crawl spaces shall be covered with a continuous layer of soil gas-membrane complying with ASTM E1745 Class A, B or C. The membrane shall be lapped not less than 12 inches (305 mm) at joints and shall extend upwards 12 inches (305 mm) and be sealed to all foundation walls enclosing the crawl space area.

R327.4.4.3 Vent pipe connector.
A tee fitting shall be installed beneath the soil gas membrane with not less than 10 feet of perforated pipe connected to the two horizontal openings of such fitting or the two horizontal openings of the tee fitting shall connect to the interior drain tile system. The branch opening of the tee fitting shall be connected to the vent pipe in accordance with Section R327.5.

R327.5 Vent pipe.
A 3 inch (76 mm) nominal size or larger ABS, PVC or equivalent gas-tight pipe shall be extended from the tee fitting up through the building floors and in accordance with Sections R327.5.1 through R327.5.8.

R327.5.1 Vent pipe termination.
The vent pipe shall terminate vertically upward not less than 12 inches (305 mm) above the roof in a location not less than 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. The vent pipe shall terminate not less than 10 feet (3048 mm) from windows or other opening in adjoining or adjacent buildings.

R327.5.2 Vent pipe drainage.
Components of the radon vent pipe system shall be installed to provide condensation drainage to the ground beneath the slab or soil gas retarder.

R327.5.3 Vent pipe installation.
Components of the radon vent pipe system shall be installed in accordance with Section 512 of the International Mechanical Code.

R327.5.4 Vent pipe identification.
Exposed and visible interior radon vent pipes shall be identified with not less than one label on each floor level and in crawlspaces and accessible attics. The label shall read: "Radon Vent."

R327.5.5 Combination foundations.
Combination basement and crawl space and combination slab-on grade and crawl space foundations shall have separate radon vent pipes installed in each type of foundation area. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

R327.5.6 Multiple vent pipes.
In buildings where interior footings or other barriers separate areas of sub-slab aggregate or other gas-permeable material, each area shall be fitted with an individual

vent pipe or a pipe loop shall connect such areas below the slab. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

R327.5.7 Vent pipe accessibility.
Radon vent pipes shall be provided with access in an attic or other area outside the habitable space for the purpose of installing an active soil depressurization system fan.

> **Exception:** Where an approved electrical supply is installed on the roof for future use.

R327.5.8 Provisions for fan.
A cylindrical space having a vertical height of not less than 48 inches (122 cm) and a diameter of not less than 21 inches (53 cm) shall be provided in the location where an active soil depressurization fan would be installed. The active soil depressurization pipe shall be centered in this space. The space provided for the active soil depressurization system fan shall be located in accordance with Section R327.6.

R327.6 Active soil depressurization system fan locations. Active soil depressurization system fans shall be installed outdoors, in attics or in garages that are not beneath conditioned spaces. Active soil depressurization system fans shall not be installed below ground, in conditioned spaces, in occupiable spaces of a building or in any basement, crawlspace or other interior location that is directly beneath a conditioned or occupiable space of a building. Active soil depressurization system fans shall not be installed in any location where pipe positively pressured by the fan would be located inside conditioned or occupiable space.

R327.7 Power source.
To provide for future installation of an active soil depressurization system fan, an electrical circuit that terminates in an approved junction box shall be installed in the attic or other anticipated location of active soil depressurization system fans.

R327.8 Entry routes.
Potential radon entry routes shall be closed in accordance with Sections R327.8.1 through R327.8.9.

R327.8.1 Floor openings.
Openings around bathtubs, showers, water closets, pipes, wires and other objects that penetrate concrete slabs or floor assemblies shall be sealed in a permanent manner.

R327.8.2 Concrete joints.
Control joints, isolation joints, construction joints and other joints in concrete slabs and 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 complying with ASTM C920 class 25 or higher or equivalent method applied in accordance with the manufacturer's instructions.

R327.8.3 Foundation and condensation drains.
Foundation and HVAC condensate drains routed below the soil gas retarder area shall be isolated through a plumbing trap or routed through non-perforated pipe to outdoors.

R327.8.4 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.

R327.8.5 Foundation walls.
Hollow block masonry foundation walls shall be constructed with 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 and other openings around penetrations of both exterior and interior surfaces of masonry block and wood foundation walls below the ground surface shall be filled with polyurethane caulk complying with ASTM C920 class 25 or higher, or equivalent method applied in accordance with the manufacturer's recommendations. Penetrations of concrete walls shall be sealed.

R327.8.6 Damp proofing.
The exterior surfaces of portions of concrete and masonry block walls below the ground surface shall be damp proofed in accordance with Section R406.

R327.8.7 Air handling units.
Air-handling units in crawl spaces shall be sealed to prevent air from being drawn into the unit.

R327.8.8 Crawlspace floors.
Openings around penetrations through floors above crawl spaces shall be caulked or otherwise filled to prevent air leakage.

> **Exception:** Air sealing is not required for floors above conditioned crawl spaces complying with Section R408.3.2.2.

R327.8.9 Crawlspace 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.

> **Exception:** Air sealing is not required for conditioned crawl spaces conforming to Section R408.3.2.2.

Reason: The inclusion of this section into the IRC reflects the intent of the International Residentail Code of providing minimum requirements to ensure the public health and safety. This proposed change does not require Radon Control Methods, rather it creates a uniform method of design, installation and inspection when Radon Conrrol Methods are used during new construction.
Currently RRNC is being provided in new construction in most jurisdictions without a means for the building inspector to evaluate the work performed. Four states do have statewide RRNC Codes, but local jurisdictions must adopt them. Nineteen states do not have statewide RRNC codes, but do have some local jurisdictions that have RRNC codes. Seven states do have statewide RRNC Codes that apply to designated jurisdictions. Twenty States and three Districts/Territories do not have any statewide or local jurisdictions that have RRNC Codes.

The Federal government has recently published the Federal Radon Action Plan (FRAP), a collaborative effort led by

the Environmental Protection Agency, Department of Health and Human Services, Department of Agriculture, Department of Defense, Department of Energy, Department of Housing and Urban Development (HUD), Department of Interior, Department of Veterans Affairs and the General Services Administration. One of the goals of the FRAP is to increase to 100% the number of new single family homes constructed with RRNC by 2020. As part of HUD's commitment to healthy housing, they now require RRNC in 100% of multi-family communities constructed or renovated in Zone 1 counties that have HUD backed mortgages and currently support changes in radon requirements for all Federal Housing Finance Agency (FHFA) single family mortgages (this is 90% of all mortgages)

According to the NAHB, 1.5 million homes were constructed with RRNC between 1990 and 2006. This number is likely twice that today, yet only a small percentage of them have been inspected to ensure they are properly constructed.

According to the NAHB, more than half of the NAHB members incorporate green practices into development, design and construction of new homes.

There is precedent in the IRC for the inclusion of the requirements of the proposal. Many chapters in the Code pertain to elements of construction that are not required in all homes, but are present in order to provide a means of design, installation and inspection (Chapter 10 Chimneys and Fireplaces, Chapter 18 Chimneys and Vents, Chapter 19 Special Fuel-burning Equipment, Chapter 21 Hydronic Piping, Chapter 22 Special Piping and Storage Systems, Chapter 23 Solar Systems, Chapter 24 Fuel Gas).

Bibliography: List of state and local RRNC Codes: http://www.epa.gov/radon/building-codes-radon-resistant-new-construction-rrnc
Federal Radon Action Plan: http://www.epa.gov/sites/production/files/2014-08/documents/Federal_Radon_Action_Plan.pdf

HUD Multi-family radon policy: http://portal.hud.gov/hudportal/documents/huddoc?id=13-03hsgn.pdf

References to NAHB RRNC statistics: http://www.epa.gov/radon/radon-resistant-new-construction-home-buyers

Law suit against builder for incorrectly installed RRNC: (http://www.journal-news.net/page/content.detail/id/511633.html) and (http://www.lehighvalleylive.com/warren-county/index.ssf?/base/news-3/1287115540270780.xml&coll=3)

Cost Impact: Will not increase the cost of construction
This proposal does not require Radon Control Systems to be installed, however it will apply a minimum standard to those that are being installed. If systems are currently being installed correctly, the only impact of the proposal is the local code official will now have a means of inspecting the installed system. If systems are currently being installed incorrectly, the proposal may actually reduce cost to a builder from potential corrective action or legal financial liability created by systems being incorrectly installed.

A review of the standard(s) proposed for inclusion in the code, ASTM E1745-11, Standard Specification for Plastic Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs, with regard to the ICC criteria for referenced standards (Section 3.6 of CP#28) will be posted on the ICC website on or before April 1, 2015.

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