Public Review of New Standard

RRNC
Rough-in of Radon Control Components in New Construction of 1 & 2 Family Dwellings and Townhouses

COMMENT DEADLINE: August 26th, 2019

REQUESTED PROCESS AND FORM FOR FORMAL PUBLIC REVIEW COMMENTS

Submittals *(MS Word preferred) may be attached by email to StandardsAssist@gmail.com or submitted in paper form by fax to (913) 780-2090*

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: **RRNC 06-2019 Proposed Standard**

- **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 each comment.

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Rev. 06-01-2018

RRNC 201x
Rough-in of Radon Control Components in New Construction of 1 & 2 Family Dwellings and Townhouses

Introduction for reviewers

This proposed standard prescribes specifications for building design features and components to install during construction of new homes for the purpose of reducing occupant exposure to the hazards of radon gas.

Limitations

This standard is limited to construction activities only to address immediate needs of construction professionals and code authorities.

Document relationships

This standard compliments and is harmonized with the more comprehensive scope of ANSI/AARST CCAH *Reducing Radon in New Construction of One & Two Family Dwellings and Townhouses* that includes actions to verify protection against radon hazards and fan activation if determined to be needed.

The 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 promulgating this document. This standard is intended for publication under an established continuous maintenance program for regular publication of addenda or revisions, including procedures for timely consensus action on requests for change to any part of the standard.

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RRNC 201x
Rough-in of Radon Control Components in New Construction of 1 & 2 Family Dwellings and Townhouses

SECTION 101
GENERAL

101.1 Purpose.

The purposes of this standard shall be as follows:

1) This standard is intended to regulate the design and construction of buildings to facilitate the removal of radon gas.

2) To provide minimum requirements for the *Rough-In* of *Radon Control Components* in newly constructed *dwelling* units.

3) To provide requirements for adoption by states and local jurisdictions.

101.2. Scope.

This standard shall be applicable only to new construction of one- and two-family *dwellings* and *townhouses*.

SECTION 102
LIMITATIONS

102.1 General.

The requirements of this standard shall have limitations as indicated in Sections 102.1.1 through 102.1.3.

102.1.1 Radon testing.

Testing to determine the actual radon levels in the structure is outside the scope of this standard. The application of the rough-in requirements of this standard does not guarantee that the National Action Level (*NAL)* or any other specific indoor *radon* concentration will be attained.

102.1.2 Soil-borne radon.

The requirements of this standard address only soil-borne *radon*. *Radon* from other sources such as water and building materials are not addressed.

102.1.3 Soil testing.

This standard does not require or provide guidance for soil testing or analyzing the *radon* potential of a building site prior to construction of the building.

SECTION 201
DEFINITIONS

201.1 Definitions.

Terms not defined herein shall have their ordinary meaning within the context of their use. Ordinary meaning shall be defined in "Webster's Eleventh New Collegiate Dictionary."

ACCESS (limited). Point of entry to fan location that allows service personnel to reach an *ASD fan* or intended fan location for the purpose of installing or replacing an *ASD fan*. Such access does not require walkways, service platforms, level working spaces, receptacle and lighting outlets or clear and unobstructed passageways with continuous solid flooring such as are typically required for appliances that require periodic maintenance, servicing and inspection.

ACTIVE SOIL DEPRESSURIZATION (ASD). *A Radon Control System* involving fan-powered soil depressurization, including but not limited to *sub-slab depressurization* and *sub-membrane depressurization*.

ASD FAN. A type of fan that is designed and rated by the manufacturer for continuous duty and for use in an *ASD* system.

BACKWATER VALVE. A mechanical device that will allow water to flow in one direction while preventing airflow in the opposite direction.

BECQUERELS PER CUBIC METER [Bq/m^3]. A unit of measure for the amount of radioactivity in one cubic meter of air. CONVERSION: 1 Bq/m^3 equals 0.027 *picoCuries per liter* (*pCi/L*).

CUBIC FEET PER MINUTE (CFM). A measure of the flow rate of a fluid, such as air. CONVERSION: 1 cfm = 1.699 cubic meters / hour [m^3/hr].

COMBINATION FOUNDATIONS. Buildings constructed with more than one foundation type, such as, basement and crawlspace or basement and slab-on-grade.

CRAWL SPACE. A foundation type with an open area beneath the livable space of a *dwelling* that typically has either a concrete slab or earthen floor. The crawl space can have an open height of a few inches to several feet. The crawl space may or may not be ventilated to the outdoors.

CUBIC METERS PER HOUR [m^3/hr]. A measure of the flow rate of a fluid, such as air. CONVERSION: 1 cubic meter / hour = 0.589 *cfm*.

DEPRESSURIZATION. A negative pressure induced in one area with respect to another.

DIAGNOSTIC TESTS. Procedures, including communication tests and other tests, used to identify or characterize conditions under, beside and within buildings that could contribute to *radon* entry or elevated *radon* concentrations or that could provide information regarding the performance of a *radon Radon Control System*.

DWELLING. Any building that contains one or two units that are intended to be occupied for living purposes.

GEOTEXTILE MATTING. A product suitable for soil contact, that provides a void space laterally through the material to allow air movement. The void space is created through a matrix of woven mesh, "egg crate" support of a fabric enclosure or similar means.

GRAVEL. A mixture of crushed rock or naturally occurring pebbles. Commercially, it is classified according to the size of the particles.

INCHES OF WATER COLUMN (in. WC). A measure of pressure. CONVERSION: 1 *in. WC* = 249 *Pascals*.

KARST. An area underlain by limestone in which erosion has produced fissures, sinkholes, underground streams, or caverns.

MIL. - 1mil=1/1000 of an inch = 0.0254 millimeters.

NATIONAL ACTION LEVEL (NAL). The indoor *radon* concentration at which mitigation is recommended. The *NAL* is defined as the US Environmental Protection Agency's Action Level of 4 *pCi/L* [148 Bq/m^3].

OUTDOOR AMBIENT RADON LEVELS. The amount of *radon* naturally occurring in outdoor air at a locality. The annual US national average outdoor *radon* level is 0.4 *pCi/L* [15 *Bq/m^3*] but local conditions will vary.

OUTLET. A point on the wiring system at which current is taken to supply utilization equipment.

PASCAL [Pa]. A measure of pressure. CONVERSION: 1 *Pa* = 0.004 *Inches of Water (in. WC)*.

PICOCURIES PER LITER (pCi/L). A unit of measure for the amount of radioactivity in a liter of air. CONVERSION: 1 *pCi/L* equals 37 *Becquerels per Cubic Meter*.

PIPE LOOP. A continuous length of perforated pipe extending around the inside perimeter of the foundation.

RADON. A naturally occurring, chemically inert, radioactive element (Rn-222) which exists as a gas.

RADON CONTROL SYSTEM. A system designed to reduce *radon* concentrations in the indoor air of a building.

ROUGH-IN. The installation of all parts and materials of an *ASD* system that must be completed prior to the placement of concrete, closure of building cavities and installation of finish materials. Such parts and materials are gas permeable layers, *soil gas retarders*, plenums, membranes, piping, *suction points*, discharge point and wiring.

SOIL GAS. The gas mixture present in soil that could contain *radon*, water vapor and other gases.

SOIL GAS COLLECTION PLENUM. A constructed enclosure for collecting *radon* and other *soil gases* from under a foundation.

SOIL GAS COLLECTOR. A gas permeable conduit constructed of *gravel*, perforated pipe or *geotextile matting* for collecting *radon* and other *soil gases* from within a *soil gas collection plenum* and connecting the plenum to the *ASD* pipe system.

SOIL GAS RETARDER. A continuous membrane or other comparable material laid over a *soil gas* plenum or earthen floor area that is used to retard the flow of *soil gases* into a building.

SUB-MEMBRANE DEPRESSURIZATION. A *radon* mitigation technique designed to maintain lower air pressure in the space under a *soil gas retarder* membrane than above it by use of an *ASD fan* drawing air from beneath the membrane.

SUB-SLAB DEPRESSURIZATION. A *radon* mitigation technique designed to maintain lower air pressure under a floor slab than above it by use of an *ASD fan* installed in the *radon* system piping that draws air from below the floor slab.

SUCTION POINT. Location where the *soil gas collector* is connected to the rough-in or *ASD* system piping.

TOWNHOUSE. A single family *dwelling* unit constructed in a group of three or more attached units where each unit extends from the foundation to the roof and has a yard or public way on at least two sides.

SECTION 301
RADON CONTROL ROUGH-IN COMPONENTS

301.1 Requirement.

Radon control rough-in components shall be installed in *dwellings* in accordance with Section 302.

Exceptions:

1) Buildings supported entirely on foundation systems, such as piers, that do not have enclosed areas between the earth and the building floor system.
2) Where prior to occupancy, radon testing is conducted in accordance with ANSI-AARST MAH *Protocol for Conducting Measurements of Radon and Radon Decay Products in Homes* and demonstrates results that are below the National Action Level. Where required by the code official, testing shall be provided by an approved third party.

SECTION 302
RADON CONTROL SYSTEM ROUGH-IN INSTALLATION

302.1 Radon Control System Rough-In required.

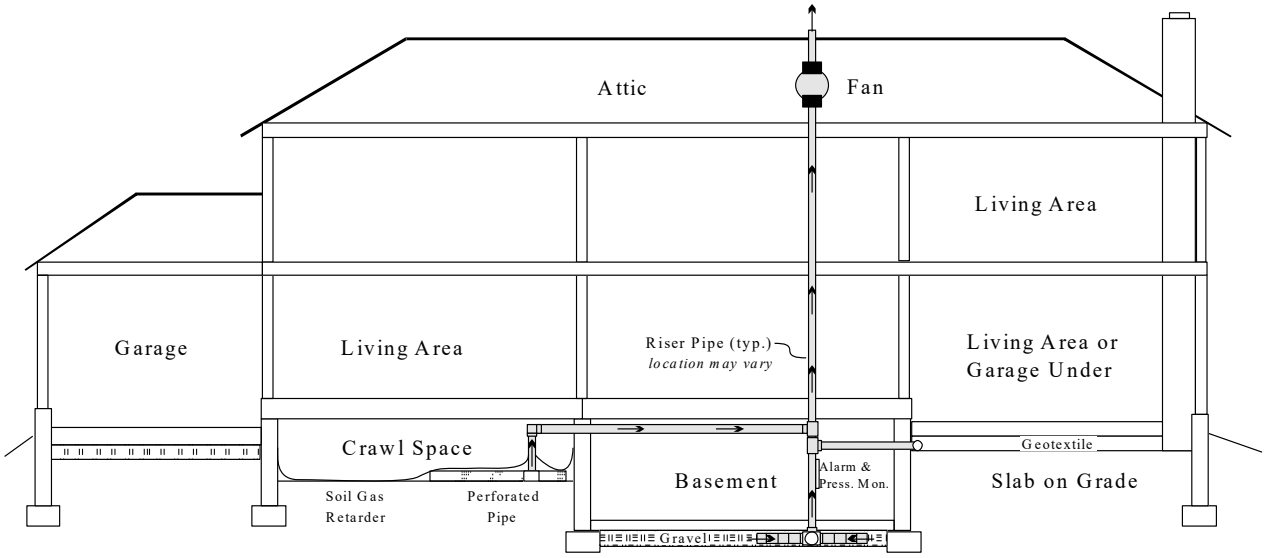
The installation of *radon control rough-in* components shall be required for all foundations and *combination foundation* types, including *crawl space*, basement and slab-on-grade. The installation shall be in accordance with Sections 302.3 through 701.5. Figure 302.1 illustrates the installations in these various foundations.

Exception:

The installation of *radon control rough-in* components is not required for:

1. garage slabs where there is no living space above the garage.
2. portions of buildings supported on foundation systems, such as piers, that do not have any enclosed areas between the earth and the building floor system.

FIGURE 302.1
ROUGH-IN INSTALLATION IN VARIOUS FOUNDATIONS.



302.2 Foundation area.

As addressed in this standard, the foundation area shall be calculated from the inside perimeter dimensions of the foundation walls.

302.3 System Coverage Area

Additional *radon control system rough-Ins,* with an independent *exhaust* pipe extending from the *soil gas collection plenum* to the roof shall be installed where the total foundation area exceeds the Maximum Coverage Area shown in Table 302.3 and each multiple thereof or as specified by a *certified radon mitigation professional.*

TABLE 302.3

Exhaust Pipe Nominal Size	Maximum Foundation Coverage Area per System
3 inch [7.6 cm]	2,500 square feet (232 m^2)
4 inch [10.2 cm]	4,500 square feet (418 m^2)

SECTION 401
SOIL GAS COLLECTION PLENUMS

401.1 Soil gas collection plenums.

Foundation areas shall be constructed so as to create sealed *soil gas collection plenums* in accordance with Sections 402.1 through 404.1.6. Any groundwater control systems inside foundation areas shall be installed at the same elevation or lower so as to drain groundwater without closing off airflow through the soil gas collection plenums.

SECTION 402
SUB-MEMBRANE
SOIL GAS COLLECTION PLENUMS

402.1 Crawl spaces without concrete floors.

For each *suction point* in crawl spaces without concrete floors, a *soil gas collector* shall be installed in accordance with Sections 402.1.1 through 402.1.7 and Section 404.1.

402.1.1 Soil gas collector.

Not less than one *soil gas collector* for each *suction point* shall be installed in accordance with Section 402.1.1.1, 402.1.1.2,402.1.1.3 or 402.1.1.4.

402.1.1.1 Pipe soil gas collector.

The *soil gas collector* shall consist of a perforated pipe of 4 inch [10 cm] nominal diameter minimum. The pipe shall be not less than 10 feet [3 m] in length. Such piping shall be placed in a trench backfilled with clean aggregate meeting the criteria of Section 403.1.1.1 such that the pipe is completely surrounded by not less than 4 inches [10 cm] of aggregate.

402.1.1.2 Geotextile soil gas collector.

The *soil gas collector* shall consist of a strip of geotextile drain matting not less than 10 feet [3 m] in length and having a cross sectional area of not less than 12 square inches [77 sq. cm]. The strip of matting shall be placed on top of the soil or in a trench.

402.1.1.3 Gravel soil gas collector.

The *soil gas collector* shall consist of a uniform layer of clean aggregate not less than 4 inches [10 cm] in depth placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or shall be in accordance with Size Number 4, 5, 56, or 6 as classified by ASTM C33.

402.1.1.4 Foundation form/drain/vent soil gas collector.

The *soil gas collector* shall consist of a loop of interconnected lineals used to cast the foundation footing and left in place to provide ground water control and provide a separate channel above the ground water channel for soil gas ventilation. Said soil gas ventilation channel shall have a cross sectional area no less than 12 square inches [77 sq. cm].

402.1.2 Suction points.

One *suction point* shall be provided for each *soil gas collector*. *Suction points* shall be installed in accordance with Section 402.1.2.1, 402.1.2.2 or 402.1.2.3 as applicable for the type of plenum installed.

402.1.2.1 Suction point for pipe soil gas collector.

The *suction point* for a pipe *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. Perforated pipe shall be inserted into both of the horizontal openings of the pipe fitting or device. One opening of the

fitting or device shall be oriented in a vertical "up" position. Alternatively, the sub-membrane area and the other foundation types shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section 403.1.1.3 and served by one or more *suction points*.

402.1.2.2 Suction point for geotextile soil gas collector.

The *suction point* for a geotextile *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. The horizontal openings shall be connected to the matting in a manner to facilitate airflow from the collector. One opening of the fitting or device shall be oriented in a vertical "up" position.

402.1.2.3 Suction point for gravel soil gas collector.

The *suction point* for a *gravel soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two openings oriented so as to create multiple horizontal intake openings. The horizontal openings shall be provided with not less than 5 feet [1.5 m] of perforated pipe extending from each opening of the fitting or device into the *gravel* layer. Said perforated pipe shall provide a minimum of 1 sq. inch [645 sq. mm] of open perforation area per lineal foot of pipe.

402.1.2.4 Suction points not permitted.

Suction points are not permitted through sump lids.

402.1.3 Fasten suction points.

Suction point fittings and devices shall be fixed in place to prevent dislocation.

402.1.4 Seal top of the soil gas collection plenum.

A *soil gas retarder* shall cover the top of the *soil gas collection plenum* and all exposed soil. The installation of the *soil gas retarder* shall be in accordance with Sections 402.1.4.1 through 402.1.4.4.

402.1.4.1 Sheeting.

The *soil gas retarder* membrane shall meet ASTM E1745 Class A, B or C.

402.1.4.2 Seams.

The seams between adjacent membrane sheets shall be overlapped not less than 6 inches [15 cm] and shall be sealed by one of the following methods:

1. A tape recommended by the membrane manufacturer.
2. Caulk complying with ASTM C920 class 25 or greater.

402.1.4.3 Repairs.

Tears or punctures in the membrane shall be sealed by one or more of the following methods:

1. A tape recommended by the membrane manufacturer.
2. An additional sheet of the membrane material that covers and overlaps the tear or puncture not less than 6 inches [15 cm] on all sides and that is sealed with a caulk complying with ASTM C920 class 25 or greater.

402.1.4.4 Penetrations.

Openings in the *soil gas retarder* membrane for piping, utilities, structural supports or similar penetrations shall be sealed.

402.1.5 Seal sides of the soil gas collection plenum.

The *soil gas retarder* membrane shall turn up onto foundation walls and shall be securely fastened and continuously sealed to the wall along the full perimeter with a caulk complying with ASTM C920 class 25 or higher.

402.1.6 Label required (membranes).

Soil gas retarder membranes shall be marked in a conspicuous place with a label to identify that the membrane is a component of a *radon* reduction system. The label lettering shall be of a height of not less than 1/4 inch [6.35 mm] and shall be of a color in contrast to the color of the background on which the lettering is applied.

SECTION 403
SUBSLAB SOIL GAS COLLECTION PLENUMS

403.1 Concrete floors.

The floors of basement, concrete crawlspace and slab-on-grade foundation systems shall be provided with a *soil gas collection plenum* installed in accordance with Sections 403.1.1 through 404.1.6.

403.1.1 Soil gas collector.

A *soil gas collector* shall be installed in accordance with Section 403.1.1.1, 403.1.1.2,403.1.1.3 or 403.1.1.4.

403.1.1.1 Gravel.

A uniform layer of clean aggregate, not less than 4 inches [10 cm] in depth, shall be placed over the soil. The aggregate shall have a void ratio of not less than 35 percent or shall be Size Number 4, 5, 56, 57, or 6 as classified by ASTM C33.

403.1.1.2 Geotextile.

A layer of geotextile drainage matting shall be placed over a uniform layer of either soil or sand. The geotextile drainage matting shall be designed to allow the lateral flow of *soil gases* to the system's *suction point* fitting. The *geotextile matting* shall have a cross-sectional area of not less than 12 square inches [77 sq. cm] and shall be placed along the entire inside perimeter of the foundation at a distance of 12 inches [30 cm] to 18 inches [46 cm] from the foundation wall to the closest edge of the drainage matting. Deviation from the 12 inch [30 cm] to 18 inch [46 cm] distance to the foundation wall shall be allowed only at the location of obstacles such as plumbing and other utilities.

403.1.1.3 Pipe loop.

A loop of 4 inch [10 cm] minimum diameter perforated pipe shall be placed along the entire inside perimeter of the foundation at a distance of 12 inches [30 cm] to 18 inches [46 cm] from the centerline of the pipe to the foundation walls. Such piping shall be placed in a trench backfilled with clean aggregate meeting the criteria of Section 403.1.1.1 and surrounding the pipe for at least 1/3 of the outside pipe circumference. The cross-sectional area of the aggregate and pipe *soil gas collector* shall be at least 50 square inches [323 sq cm]. The piping shall form a continuous loop and pipe sections shall be joined with a connector device/method recommended by the manufacturer. Deviation from the 12 inch [30 cm] to 18 inch [46 cm] distance to the foundation wall shall be allowed to avoid obstacles such as plumbing and other utilities.

403.1.1.4 Foundation form/drain/vent soil gas collector.

The *soil gas collector* shall consist of a loop of interconnected lineals used to cast the foundation footing and left in place to provide ground water control and provide a separate channel above the ground water channel for soil gas ventilation. Said soil gas ventilation channel shall have a cross sectional area no less than 12 square inches [77 sq. cm].

403.2.2 Suction points.

Not less than one *suction point* shall be provided for each foundation type and not less than one *suction point* shall be provided for each *soil gas collector*. Alternatively, each *soil gas collector* shall be interconnected by a *pipe loop soil gas collector* that is constructed in accordance with Section 403.2.3 and served by one or more

suction points. During construction, *suction point* openings above the slab shall be protected from the entry of aggregate, concrete and debris. *Suction points* shall be installed in accordance with Section 403.2.2.1, 403.2.2.2 or 403.2.2.3 as applicable for the type of *soil gas collector* installed.

403.2.2.1 Gravel layer soil gas collector.

A *suction point* for a *gravel* type *soil gas collector* shall consist of a pipe fitting or other device having not less than two openings oriented so as to create multiple horizontal intake openings within the *gravel* layer. The horizontal openings shall be provided with not less than 5 feet [1.5 m] of perforated pipe extending from each opening of the fitting or device into the *gravel* layer. Said perforated pipe shall provide a minimum of 1 sq. inch [645 sq. mm] of open perforation area per lineal foot of pipe.

403.2.2.2 Geotextile layer soil gas collector.

A *suction point* for a geotextile type *soil gas collector* shall consist of a pipe fitting or other device having not less than three openings with two oriented so as to create multiple horizontal intake openings connected to the geotextile mat in a manner to maintain airflow capacity from the plenum.

403.2.2.3 Pipe loop soil gas collector.

A *suction point* for a *pipe loop* type collector shall consist of a pipe tee fitting or pipe saddle device installed in the loop piping.

403.2.3 Multiple soil gas collection plenums.

Where interior footings divide a *soil gas collector* into two or more areas, each such area shall be provided with the required *suction points* and joined with *Radon Control System* piping in accordance with Section 501. Alternatively, each area shall be interconnected by a *soil gas collector* that is constructed in accordance with Section 403.1.1.2 or 403.1.1.3 and served by one or more *suction points*.

403.2.4 Suction points not permitted.

Suction points are not permitted through sump lids.

403.2.5 Fasten suction points.

Suction point fittings and piping shall be fastened in place to prevent dislocation during placement of the gas permeable layer, *soil gas retarder* and concrete.

403.2.6 Seal top of the soil gas plenum.

The *soil gas collector* and all exposed soil shall be covered with a *soil gas retarder* installed in accordance with Section 403.2.6.1.

403.2.6.1 Sheeting.

Polyethylene sheeting of not less than 6 *mils* [0.152 mm] in thickness or cross-laminated polyethylene sheeting of not less than 3 *mils* [0.076 mm] in thickness shall be installed on top of the *soil gas collector* and shall completely cover the area under the concrete floor and be sealed in accordance with Sections 403.2.6.1.1 through 404.1.6.

403.2.6.1.1 Seams.

Seams between adjacent polyethylene sheets shall be overlapped not less than 6 inches [15 cm] and sealed with a caulk complying with ASTM C920 class 25 or higher, or a tape installed in accordance with the manufacturer's recommendation.

403.2.6.1.2 Repairs.

Tears or punctures in the polyethylene sheeting shall be sealed or an additional sheet of polyethylene shall cover the tear or puncture with an overlap of not less than 6 inches [15 cm] on all sides. Such additional sheet shall be sealed and fixed in place with a caulk complying with ASTM C920 class 25 or

higher or a tape installed in accordance with the manufacturer's recommendation to prevent displacement during slab casting.

403.2.6.1.3 Penetrations.

Openings in the *soil gas retarder* membrane for piping, utilities, structural posts and similar penetrations shall be sealed.

403.2.7 Penetrations.

Penetrations through the concrete slab and *soil gas retarder* shall be sealed with a caulk complying with ASTM C920 class 25 or higher or a method recommended by the membrane manufacturer.

403.2.8 Block-outs.

Where openings are cast or constructed in the concrete slab under plumbing fixtures, the openings shall be filled with expanding foam or a non-shrink grout. Exposed openings shall be sealed with non-shrink grout.

403.2.9 Seal sides of the soil gas collection plenum.

The intersection of floors and foundation walls shall be sealed with a caulk complying with ASTM C920 class 25 or higher. Sealing shall be performed in accordance with Section 403.2.9.1 or 403.2.9.2 or 403.2.9.3 or 403.2.9.4 or 403.2.9.5.

403.2.9.1 Seal floor to wall.

The intersection of floors and foundation walls shall be sealed.

403.2.9.2 Seal soil gas retarder to footing or wall.

Where foundation walls are solid concrete, the *soil gas retarder* shall extend from the footing up the wall not less than 4 inches [10 cm] and be sealed to the footing or to the foundation wall.

403.2.9.3 Seal soil gas retarder to wall.

Where foundation walls are masonry block the *soil gas retarder* shall extend from the footing up the wall not less than 4 inches [10 cm] and be sealed to the foundation wall.

403.2.9.4 Soil gas retarder in a monolithic slab.

Where the floors and footings are monolithic the soil gas retarder shall extend completely under the footing.

SECTION 404
SEALING SOIL GAS COLLECTION PLENUMS

404.1 General sealing of soil gas collection plenums.

Sealing of potential *soil gas* pathways shall be in accordance with Sections 404.1.1 through 404.1.6.

404.1.1 Sumps in floors.

Sumps in interior floors shall have a rigid lid and the lid shall be sealed with a gasket or a non-permanent caulking, such as silicone caulk and mechanically fastened in a manner to facilitate removal for maintenance. Pipe and wiring penetrations through the lid shall be sealed. The intersection of the floor and sump basin shall be sealed with a caulk complying with ASTM C920 class 25 or higher.

404.1.1.1 Label sump basins.

Sump basin covers shall be identified with a durable label that reads "Component of a Radon Reduction System. Do not tamper with or disconnect." or equivalent wording. The lettering on the

label shall be not less than 1/4 inch [6.35 mm] in height and shall be of a color in contrast to the color of the background on which the lettering is applied.

404.1.2 Hollow masonry unit walls.

The top course of hollow block masonry walls shall be made of solid masonry units or the top course shall be fully grouted. The top course under the full width of door and window openings shall be made of solid masonry units or the hollow masonry units shall be fully grouted. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be made of solid masonry units or the top course shall be fully grouted**.** Other penetrations through foundation walls shall be sealed**.**

404.1.3 Floor drains.

Floor drains and condensate drains shall not allow *soil gas* entry.

404.1.4 Air ducts.

Air ducts located below concrete slabs shall be sealed to prevent *radon* entry and constructed in accordance with the International Residential Code (IRC).

404.1.5 Foundation drains.

Foundation drainage systems with openings to the atmosphere shall include a *backwater valve* or other means to isolate the *soil gas collection plenum* from any openings to atmosphere. Access shall be provided for maintenance.

404.1.6 Access openings.

Access openings in the floor provided for drain maintenance shall not allow *soil gas* entry.

SECTION 501
RADON CONTROL SYSTEM PIPING

501.1 Piping.

The *Radon Control System* piping that extends from the *soil gas* plenum to the point of discharge shall be rigid, non-perforated pipe in accordance with Sections 501.2 through 501.10.

501.2 Pipe size.

Radon Control System pipe size shall be not less than 3 inch [7.6 cm] I.D.

501.3 ABS piping.

ABS pipe shall comply with ASTM D2661, F628 or F1488. The pipe wall thickness shall be Schedule 40.

501.4 PVC piping.

PVC pipe shall comply with ASTM D2665, F891, or F1488. The pipe wall thickness shall be Schedule 40.

Exception:

Rigid, non-perforated PVC pipe meeting above ground drainage and vent pipe specified in the IRC is an alternative to the material specified herein for use vertically within enclosed wall cavities.

501.5 Slope.

Above ground piping shall have a slope of not less than 1/8 inch [3.2 mm] per foot [30 cm]. Piping shall slope downwards towards the *suction point*. Piping arrangements that could allow water to collect are prohibited.

501.6 Joints.

Plastic pipe joints shall be solvent welded in accordance with Sections 501.6.1 and 501.6.2. Where disassembly of piping is required such as for removal of a fan, the joints shall be made with flexible couplings complying with ASTM D5926 or ASTM C1173.

501.6.1 ABS plastic pipe joints.

ABS plastic pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions with solvent cement conforming to ASTM D 2235.

501.6.2 PVC plastic pipe joints.

The joint surfaces for PVC plastic pipe and fittings to be solvent welded shall be prepared with a primer conforming to ASTM F 656. PVC plastic pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions with solvent cement conforming to ASTM D 2564.

501.7 Support.

Above ground piping shall be supported by the structure of the building using hangers or strapping designed for piping support. Supports for horizontal piping shall be installed at intervals not exceeding 4 feet [1.2 m] and supports for vertical piping shall be installed at intervals not exceeding 10 feet [3 m].

501.8 Protection against physical damage.

Where pipes penetrate top or bottom plates of stud walls and the nearest edge of the hole is within 1 ½ inches [3.8 cm] of the face of the member, the pipe shall be protected by steel shield plates. Such shield plates shall have a thickness of not less than 0.0575 inches [1.463 mm] (No. 16 gage). Such plates shall cover the face of the framing member(s) where the plate is bored, shall extend not less than 2 inches above bottom plates and not less than 2 inches below top plates and shall extend not less than 2 inches beyond each side of the pipe.

501.9 Insulation required.

In interior spaces where *rough-in* piping is subject to freezing temperatures and in spaces where the external surface of the rough-in piping is subject to the formation of condensation, such piping shall be provided with insulation having an external vapor barrier and an R-value of not less than 1.8.

501.10 Labels required (piping).

Radon Control System piping shall be marked prior to the closing of wall cavities with not less than two labels at each floor level with placement so as to provide visibility on either side of the wall cavity and at intervals not greater than 10 feet [3 m] along the developed length of the piping. The label shall identify that the item is a component of a *radon* reduction system. The label lettering shall be of a height of not less than 1/4 inch [6.35 mm] and shall be of a color in contrast to the color of the background on which the lettering is applied.

501.11 Labels required (System Rough-in).

Radon Control System piping shall be marked with not less than one label in a conspicuous location. An additional label shall be placed on or within 12 inches [30 cm] of the electrical service panel. The labels shall state: **"TEST FOR RADON. The radon system has NOT been activated with a radon fan. Without testing, such system cannot be verified to reduce indoor radon to the levels recommended by the U.S. EPA."** The label lettering shall be of a height of not less than 1/4 inch [6.35 mm] and shall be of a color in contrast to the color of the background on which the lettering is applied.

SECTION 601
RADON CONTROL SYSTEM TERMINATION

601.1 Outdoors.

The discharge point of a *Radon Control System* shall be to the outdoors and shall be directed vertically upward. Where screens are installed on the terminus of radon exhaust pipes to prevent the entry of animals, such screens shall have a mesh size with a dimension of at least 0.5 inch (12.7mm)

601.2 Elevation and vertical walls.

The point of discharge of a *Radon Control System* shall comply with all of the following:

1) it shall be not less than 1 foot [30 cm] above the roof measured at the highest point of the penetration.

2) it shall be not less than 10 feet [3 m] above grade nearest the point of discharge.

3) it shall be not less than 10 feet [3 m] horizontally from a vertical wall that extends above the roof penetrated.

601.3 Windows and doors.

The discharge point of a *Radon Control System* shall be not less than 10 feet [3 m] measured in any direction from, or not less than 2 feet vertically above, air intake openings including windows, doors and other gravity air intake openings and excluding attic ventilation openings. The specified clearances apply to the structure served by the Radon Control System and any adjacent structures.

601.4 Equipment air intake.

The discharge point of a *Radon Control System* shall be not less than 3 feet [91 cm] above or 10 feet [3 m] away from mechanical air intake openings such as those for evaporative coolers, make-up air, and heat/energy recovery ventilators. The 10 foot [3 m] distance shall be measured around intervening obstacles.

SECTION 701
ACTIVE SOIL DEPRESSURIZATION
(ASD) SYSTEM FAN

701.1 Provision for ASD fan.

A cylindrical space having a vertical height of not less than 36 inches [91cm] and a diameter of not less than 21 inches [53 cm] shall be provided in the area where the *ASD fan* will be installed if required. The space provided for the *ASD fan* shall be located according to Sections 701.4 & 701.5. The *ASD* pipe shall be centered in this space.

701.2 Electrical provided.

Branch circuit conductors shall supply an outlet located within 6 feet [1.8 m] of an *ASD fan* location.

701.2.1 Label.

The over-current device for the branch circuit supplying the *ASD fan* shall be labeled to indicate that it supplies the *radon* fan.

701.2.2 Disconnect.

Where the fan is not cord and plug connected, a means of electrical disconnect shall be provided for and within sight of the *ASD fan*. The electrical disconnect shall be labeled as to its purpose.

701.3 Fan access provided.

Limited *access* shall be provided for each *ASD fan* location to allow installation of *ASD fans* and replacement of same. *Access* entry shall be located not greater than 30 feet [9 m] from the *ASD fan* location.

701.4 Fan location.

The space provided for locating *ASD fans* shall be in attics, in garages that are not beneath conditioned spaces or outdoors. *ASD 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. *ASD fans* shall not be mounted in any location where pipe positively pressured by the fan is located inside conditioned or occupiable space.

701.5 Fan location for conditioned attics.

Where an ASD fan is located in an unvented attic space, the fan shall be isolated in an enclosure that does not communicate with the rest of the attic space. The fan enclosure shall be sealed against air leakage, shall be constructed to provide access to the fan and shall be provided with one or more ventilation openings to the outdoors that have a total net free area of not less than 25 square inches (161 cm^2). The unconditioned fan enclosure shall meet the requirements of Sections 701.1 and 701.2. The construction of the enclosure shall meet the requirements of the applicable building and energy codes.

CCAH-RRNC 2018-2019 Consensus Body Committee

Sincere appreciation is both expressed and deserved for contributions of time and wisdom

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