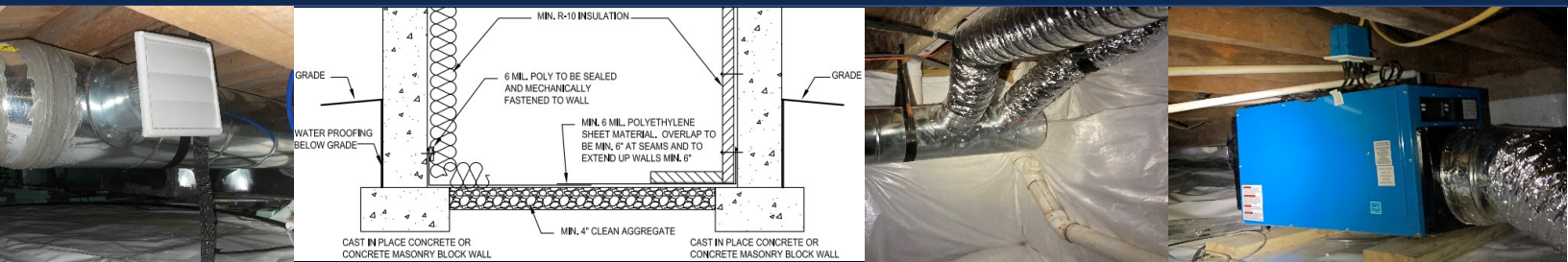


Unvented Crawl Spaces

2018 VRC/VECC Review Guide



Unvented Crawl Spaces:

Summary: The 2018 Virginia Residential Code provides several options for ensuring that unvented crawl spaces maintain acceptable humidity levels. Chapter 4, Foundations (R408.3) and Chapter 11, Energy Efficiency (N1102.2.11 or VECC Table R402.1.2) provide requirements for vapor barriers, perimeter insulation, and humidity control strategies when the home's air barrier and insulation layer is constructed to include the crawl space.

Why: Unvented crawl space details have been included in Chapter 4 of the IRC going back at least to the 2000 edition. Extensive research by NC State University, Oak Ridge National Lab, and others has shown that venting permits the crawl space to track exterior moisture levels. This can create elevated *relative humidity* during portions of the year which can cause condensation, mold, and rot in crawl spaces. It's a particular risk in summer months when traditional practice has dictated that operable vents should be opened.

Key Components of an Unvented Crawl Space:

The Vapor Barrier. As with vented crawl spaces, the first and most important element is an effective vapor barrier covering the earth. Joints in the vapor barrier material must overlap and be sealed or taped. Edges of the vapor barrier must extend at least 6 inches up stem walls and be attached and sealed to the stem wall or to insulation on that wall. Best practice advises that the vapor barrier extend at least 6 inches above the level of the exterior grade.

Perimeter Insulation. The walls separating unvented crawl spaces from the exterior must be insulated to a minimum of either R-10 continuous (interior or exterior) or R-13 cavity (interior only). The insulation must be permanently fastened to the wall and extend downward from the floor to the finished grade elevation and then vertically or horizontally (as applicable) for at least another 2 feet.

In locations where termites are a risk, the vertical face of the sill plate plus the first 1 to 2 inches of the foundation wall below the sill plate must be uncovered by insulation. These areas may be covered if the insulation is easily removable or if another approved means of inspection is provided. Access doors from the exterior into an unvented crawl space must have a minimum of R-5 insulation and effective weatherstripping.

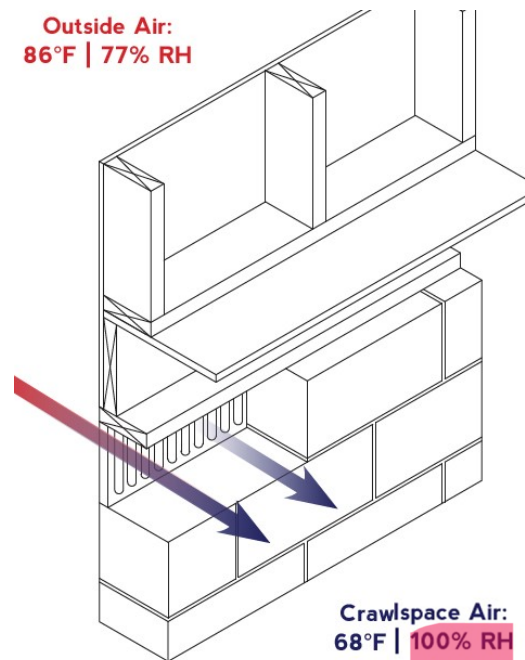


Image: Pennsylvania Housing Research Center

Humidity Management Strategy. The home must utilize one of the options listed below.

1. A continuously operating exhaust fan pulling conditioned air (1 CFM per 50 SF of crawl space floor area) from the home via a transfer grille or duct, through the crawl, and exiting the perimeter wall
2. Provision of conditioned air (1 CFM per 50 SF of crawl space floor area) to the crawl space with a permanent open pathway to a return grille of the HVAC system
3. Dedicated dehumidification of the crawl space (with moisture removal capacity of not less than 70 pints/day per 1000 SF of crawl floor area). While not stated in the code, for effective moisture removal, the equipment should not require manual emptying of condensate. Many systems drain into the same reservoir and pump that manages condensate from the AC coil.
4. (*Prohibited in new structures; allowable only as a modification or repair to an existing under-floor plenum*) Receives conditioned air because the crawl space is a return plenum.

Radon:

Crawl spaces utilizing a passive submembrane depressurization strategy to manage radon may not be unvented unless “an *approved* mechanical crawl space ventilation system or other equivalent system is installed.”

2018 VRC/VECC Code References:

R408.3 Unvented crawl space. For unvented under-floor spaces, the following items shall be provided:

1. Exposed earth shall be covered with a continuous Class I vapor retarder. Joints of the vapor retarder shall overlap by 6 inches (152 mm) and shall be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation.
2. One of the following shall be provided for the under-floor space:
 - 2.1. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of crawl space floor area, including an air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.2. Conditioned air supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code.
 - 2.3. Plenum in existing structures complying with Section M1601.5 if under-floor space is used as a plenum.
 - 2.4. Dehumidification sized to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet (93 m²) of crawl space floor area.

R408.3.1 Termite inspection. Where an unvented crawl space is installed and meets the criteria in Section R408, the vertical face of the sill plate shall be clear and unobstructed and an inspection gap shall be provided below the sill plate along the top of any interior foundation wall covering. The gap shall be a minimum of 1 inch (25.4 mm) and a maximum of 2 inches (50.8 mm) in width and shall extend throughout all parts of any foundation that is enclosed. Joints between the sill plate and the top of any interior wall covering may be sealed. **Exception:** In areas not subject to damage by termites as indicated

by Table R301.2(1). **Exception:** Where other approved means are provided to inspect for potential damage.

Where pier and curtain foundations are installed as depicted in Figure R404.1.5(1) [double rim joists], the inside face of the rim joist and sill plate shall be clear and unobstructed except for construction joints, which may be sealed. **Exception:** Fiberglass or similar insulation may be installed if easily removable.

TABLE N1102.1.2 (R402.1.2)

CLIMATE ZONE	3	4 EXCEPT MARINE	5 AND MARINE 4
CRAWL SPACE WALL R-VALUE	5/13	10/13	10/13

“10/13” means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall.

N1102.2.11 (R402.2.11) Crawl space walls.

As an alternative to insulating floors over crawl spaces, crawl space walls shall be insulated provided that the crawl space is not vented to the outdoors. Crawl space wall insulation shall be permanently fastened to the wall and shall extend downward from the floor to the finished grade elevation and then vertically or horizontally for not less than an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with this code. Joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (153 mm) up the stem walls and shall be attached to the stem walls.

M1601.5 Under-floor plenums.

Under-floor plenums shall be prohibited in new structures. Modification or repairs to under-floor plenums in existing structures shall conform to the requirements of this section. The space shall be cleaned of loose combustible materials and scrap and shall be tightly enclosed. The ground surface of the space shall be covered with a moisture barrier having a thickness of not less than 4 mils (0.1 mm). Plumbing waste cleanouts shall not be located within the space. **Exception:** Plumbing waste cleanouts shall be permitted to be located in unvented crawl spaces that receive conditioned air in accordance with Section R408.3.

N1102.2.4 (R402.2.4) Access hatches and doors. Access doors from *conditioned spaces* to *unconditioned spaces* (e.g., attics and crawl spaces) shall be weather-stripped and insulated in accordance with the following values: Hinged vertical doors shall have a minimum overall R-5 insulation value.

AF103.5 Passive submembrane depressurization system. In buildings with crawl space foundations, the following components of a passive submembrane depressurization system 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 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.