

**NC Department of Insurance
Office of the State Fire Marshal - Engineering Division
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Areas subject to freezing

Code: 2018 Residential Code

Date: 09/08/2020

Section: P2603.5ⁱ

Code: 2018 Plumbing Code

Section: 305.4

Question:

Is a ventilated crawl spaceⁱⁱ (or unconditioned basementⁱⁱⁱ) an area “...subjected to freezing temperatures...” as described by P2603.5, thereby requiring plumbing piping located therein to be minimally insulated to R-6.5?

Answer:

Generally, not, but not always.

Although the wording in the code has changed slightly since the 2012 code, there was not an intent to require wholesale reclassification of ventilated crawl spaces. Areas of the state that routinely did not require freeze-protection insulation under the 2012 code would not be expected to require it under the 2018 code.

The NCDOT Web Interpretations had, for 2006, 2009, and 2012 code cycles, an interpretation that a ventilated crawl space would not be considered an *unconditioned* space for purposes of freeze protection even though it met the definition of an *unconditioned* space for purposes of the thermal envelope. This was based on the concept that ground temperatures would provide sufficient residual heat to prevent pipes from freezing under many conditions in NC. Starting in 2012, the NC Residential Code introduced the term “*semi-conditioned*” to describe areas inside the thermal envelope, but not directly heated or cooled. Although a ventilated crawl space does not fit the definition of a conditioned space or a semi-conditioned space, it is still less likely to freeze than attics or unconditioned utility rooms specifically called out in Section P2603.5.

However, the code or this interpretation does not provide a blanket exemption from insulating plumbing piping for the purpose of freeze protection in all ventilated crawl spaces. The [permit holder](#) is responsible for knowing the local climatic conditions and the construction of the building^{iv} to determine if the space will experience freezing temperatures. Code officials are not trained to predict which designs will or will not freeze in any given ventilated crawl space.

Follow up Question #1:

Does this interpretation extend to manufactured homes with skirting, or any homes built up on pilings with lightweight skirting or screenings?

Answer:

No.

This interpretation is limited to 1-and-2 family dwellings governed by the NC Residential Code, and having crawl space walls constructed of CMU, brick, stud walls and sheathing of OSB and siding, or a combination of these.

Follow up Question #2:

Does the code require crawl space vents be closed in winter?

Answer:

No.

There is no code expectation or requirement that crawl space vents be closed in the winter. It may be prudent during predicted cold snaps, but there is not a blanket requirement. The underlying research cited in ASHRAE, indicated an expectation of leaving^v crawl space vents open in the winter, unless the floor above the crawl is uninsulated. Cool dry air does provide the opportunity to provide seasonal drying out of crawl spaces.

The NC Residential code has minimum vent sizing, rodent protection and location requirements, but there is not a requirement for operable louvers. The exception to R408.1.1^{vi} clarifies that the installation of operable louvers shall not be prohibited, but they are also not required.

Follow-up question #3

Does the code require a minimum temperature in the building during heating season?

Answer:

No.

The minimum code provides a minimum temperature that the heating system must be able to provide (68F) on a design day but does not mandate it be maintained at all times. However, many homeowner's insurance policies may require a minimum interior temperature be maintained at or above 55F to minimize the chance of pipes freezing.

Key Words:

None

^vP2603.5 Freezing. Water pipes installed in a wall exposed to the exterior shall be located on the heated side of the wall insulation. In other cases, water, soil, and waste pipes shall not be installed outside of a building, in unconditioned attics, unconditioned utility rooms or in any other place subjected to freezing temperatures unless adequate provision is made to protect such pipes from freezing by a minimum of R-6.5 insulation determined at 75F in accordance with ASTM C177 or heat or both.

Exterior water supply system piping shall be installed not less than 6 inches below the frost line and not less than 12 inches below grade.

Note: These provisions are minimum requirements, which have been found suitable for normal weather conditions. Abnormally low temperatures for extended periods may require additional provisions to prevent freezing.

ⁱⁱ As discussed in R408 of the NC Residential code. These are not closed crawl spaces that may be mechanically ventilated.

ⁱⁱⁱ Unconditioned basements have similar if not better capabilities of retaining residual ground heat, therefore minimizing the likelihood of freezing conditions in the space.

^{iv} In 1979, the R-value of floors was R-11 statewide. In 2002 and 2006, it was R-19 statewide. In 2009 and 2012, the requirements for Zone 3 & 4 are still R-19, but in Zone 5 the requirement is R-30, or as thick as the floor framing, but not less than R-19. Also, starting in 2012, there was more prescriptive language in the code meant to reduce leakage in the thermal envelope and the ductwork located outside the thermal envelope. Therefore, there may be less leaked heat to a crawl space built under the 2018 code than there was in prior codes. Similarly, water lines to refrigerators are much more common now than they were in the pre-2000's, and smaller lines freeze quicker.

^v ASHRAE Handbook of Fundamentals-1989, Section 21.3, Floor Systems, 21.12 Crawl Spaces, 25.4 Calculating heat losses from crawl spaces.

^{vi} R408.1.1 Foundation vent sizing. The minimum net area of ventilation opening shall not be less than 1 square foot for each 150 square feet of crawl space ground area.

Exception: The total area of ventilation openings may be reduced to 1/1,500 of the under-floor area where the ground surface is treated with an approved vapor retarder material in accordance with Section R408.2 and the required openings are placed to provide cross-ventilation of the crawl space. **The installation of operable louvers shall not be prohibited.**