



APPENDIX C CODE CHANGE PROPOSAL NORTH CAROLINA BUILDING CODE COUNCIL

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Petition for Rule Making

Item Number _____

Granted by BCC _____
Denied by BCC _____

Adopted by BCC _____
Disapproved by BCC _____

Approved by RRC _____
Objection by RRC _____

PROPONENT: Wanda D. Edwards, PE _____ PHONE: (919)812-0856
REPRESENTING: Wanda Edwards Consulting, Inc., representing Rheia _____
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North Carolina State Building Code, Volume Residential- Section(s) R202, N1103.3.1, N1106.2

CHECK ONE: [x] Revise section to read as follows: [] Delete section and substitute the following:
[] Add new section to read as follows: [x] Delete section without substitution:

~~LINE THROUGH MATERIAL TO BE DELETED~~

UNDERLINE MATERIAL TO BE ADDED

Please type. Continue proposal or reason on plain paper attached to this form. See reverse side for instructions.

See attached.

Will this proposal change the cost of construction? Decrease [x] Increase [] No []
Will this proposal increase to the cost of a dwelling by \$80 or more? Yes [] No [x]
Will this proposal affect the Local or State funds? Local [] State [] No [x]
Will this proposal cause a substantial economic impact (≥\$1,000,000)? Yes [] No [x]

- Non-Substantial – Provide an economic analysis including benefit/cost estimates.
- Substantial – The economic analysis must also include 2-alternatives, time value of money and risk analysis.
- Pursuant to §143-138(a1)(2) a cost-benefit analysis is required for all proposed amendments to the NC Energy Conservation Code. The Building Code Council shall also require same for the NC Residential Code, Chapter 11.

REASON: See attached.

Signature: _____

Date: _____

BCC CODE CHANGES
FORM 11/26/19

Revise Section N1103.3.1 and Section N1106.2 as follows:

N1103.3.1 (R403.3.1) Insulation (Mandatory). Supply and return ducts in unconditioned space and outdoors shall be insulated to a minimum R-8. ~~Supply ducts inside semi-conditioned space shall be insulated to a minimum R-4; return ducts inside conditioned and semi-conditioned space are not required to be insulated. Ducts located inside conditioned space are not required to be insulated other than as may be necessary for preventing the formation of condensation on the exterior of cooling ducts.~~

Exception:

Ducts or portions thereof located completely inside the building thermal envelope.

N1106.2 (R406.2) Mandatory requirements. Compliance with this section requires that the provisions identified in Sections N1101.14 through N1104 labeled as “mandatory” be met. The building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.1 or Table 402.1.3 of the 2012 *North Carolina Energy Conservation Code*. Minimum standards associated with compliance shall be the ANSI/RESNET/ICC 301—2014 *Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using an Energy Rating Index*. A North Carolina registered design professional or certified *HERS rater* is required to perform the analysis if required by North Carolina licensure laws.

Exception: Supply and return ducts in unconditioned space and outdoors shall be insulated to a minimum R-8. ~~Supply ducts inside a semi-conditioned space shall be insulated to a minimum R-4; Return ducts inside conditioned and semiconditioned spaces are not required to be insulated. Ducts located inside a conditioned space are not required to be insulated other than as may be necessary for preventing the formation of condensation on the exterior of cooling ducts.~~

Delete the definition of semi-conditioned space in its entirety as follows:

~~**SEMI-CONDITIONED SPACE.** A space within the building thermal envelope that is not directly heated and/or cooled.~~

Reason statement:

The requirement to provide that “supply ducts inside semi-conditioned space be insulated to a minimum R-4” is a North Carolina amendment to the International Residential Code, Chapter 11, Energy Efficiency. In Section N1101 there is a note that states “Section N1101.2 through N1105 is extracted from the 2018 edition of the North Carolina Energy Conservation Code—Residential Provisions and has been editorially revised to conform to the scope and application of this code. The section numbers appearing in parenthesis after each section number are the section numbers of the corresponding text in the North Carolina Energy Conservation Code—Residential Provisions.” R403.3.1 appears in parentheses in the title to Section N1103.3.1.

Section R403.3.1 of the International Energy Conservation Code reads as follows:

R403.3 Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.7.

R403.3.1 Insulation (Prescriptive). Supply and return ducts in attics shall be insulated to an *R*-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the *building* shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*.

The International Energy Conservation Code (IECC) allows an exception to the duct insulation requirements if the duct or portions thereof are completely inside the building thermal envelope. Additionally, the term semi-conditioned space does not appear in the IECC or the International Residential Code (IRC).

The North Carolina Residential Code defines conditioned space as:

[RE] CONDITIONED SPACE. A space within a building that is provided with heating or cooling equipment or systems capable of maintaining, through design or heat loss/gain, 50°F (10°C) during the heating season or 85°F (29°C) during the cooling season, or communicates directly with a conditioned space. Spaces within the building thermal envelope are considered conditioned space.

Note the last sentence states spaces within the building thermal envelope are considered conditioned space, with no mention of an exception for semi-conditioned space. At minimum, stating conditioned space is inside the building thermal envelope and then define semi-conditioned differently is confusing to code officials and users of the code.

The commentary for Section R403.3.1 of the IECC states:

HVAC ductwork located outside of the conditioned space must have insulation with minimum *R*-values of R-8 or R-6, depending on the size of the duct. This includes both supply and return ducts. For areas other than attics, the values are R-6 and R-4.2. Energy losses are less in smaller ducts; therefore, the *R*-value of the insulation is lower for ducts less than 3 inches (76 mm) in diameter. The exception addresses the fact that ductwork in the thermal envelope is already protected from energy loss by virtue of being in the conditioned space surrounded by the building thermal envelope.

This proposal deletes the sentence “~~Ducts located inside conditioned space are not required to be insulated other than as may be necessary for preventing the formation of condensation on the exterior of cooling ducts~~” from Section N1103.3.1. The format of the International Codes is to state a requirement and then provide an exception if there are some instances where the requirement is not mandated. The proposal also deletes the sentence as the language is vague and non-enforceable. The Residential code is designed to be a prescriptive path for code compliance. To say “other than may be necessary for preventing the formation of condensation on the exterior of cooling ducts”, does not provide any specific requirement, doesn’t provide guidance of how to determine if condensation may form, and doesn’t say who makes the decision.

The NC Residential Code currently requires either a visual inspection of the building thermal envelope or testing. Either of these requirements minimizes air leakage from the building envelope and, along with the code requirement to perform blower door testing it ensures the envelope is sufficiently sealed from unconditioned air infiltration.

The current code requirement to insulate duct in semi-conditioned space is not needed and is inconsistent with the provisions of the International Codes.

Cost analysis:

Locating ductwork inside the building thermal envelope was proposed by DOE as a path to zero energy. The cost analysis was performed by DOE and determined to be cost effective. A copy of the document can be found at the following link:

[DOE Zero Energy Ready Home National Program Requirements Rev05 - Final 0.pdf](#)

In addition, a savings of approximately 8% when using uninsulated duct in the building thermal envelope rather than ductwork in an unconditioned attic. Below is a link to tech sheet from pathnet.org which details the savings.

[file:///C:/Users/we/Downloads/article- ducts in conditioned space%20\(1\)%20\(1\).pdf](#)

Also demonstrating cost effectiveness is a white paper found at the following link:

[file:///C:/Users/we/Downloads/Ducts%20in%20the%20Attic %20What%20Were%20They%20Thinking_.pdf.pdf](#)