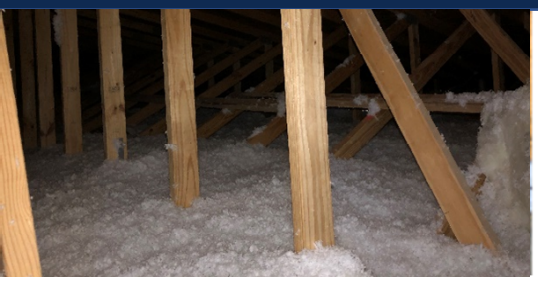
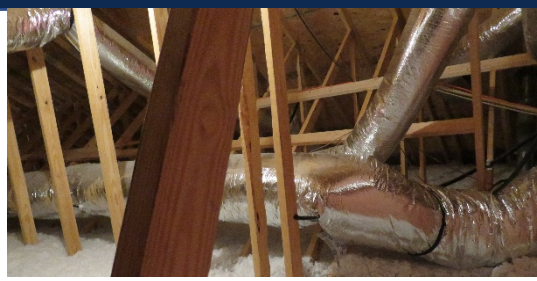
Ducts Buried Within Insulation

2018 VRC/VECC Inspection Guide





Ducts Buried Within Insulation:

Summary: The residential portion of the Virginia Energy Conservation Code (VECC) now provides the option to bury ducts in insulation when they are in an attic. This provides better thermal insulation for the ducts and minimizes heat losses and gains while also ensuring that sufficient attic insulation is provided. This guide will cover the key installation details that must be followed in order to properly utilize this installation method.

Why: HVAC ductwork that is run outside of the building thermal envelope in a vented attic is only required to have R-8 insulation protecting it from extreme summer and winter temperatures in that space. While best practice dictates installing ductwork in conditioned space, many contractors prefer to locate this equipment in attics. In order to better protect ductwork from attic temperatures, the 2018 VECC allows for ducts to be buried within the attic insulation.

Items of Note:

* *The code is silent as to whether batts are allowed to be used for this installation method. However, only sprayed or blown insulation could be installed to avoid air gaps or compression without unusual effort by installers – particularly with round ducts. The batts would have to be carefully cut to fit against the sides of the duct to avoid an air gap. Any compression of the batts (e.g., from the duct resting on a batt) would have to be compensated for with additional insulation in order to achieve a fully code-compliant installation.*
* *Best practices for buried ducts include placing the ducts very close to or in contact with the ceiling drywall and encapsulating these ducts in closed cell foam. As always, duct systems should be well sealed and installed in as compact a layout as possible.*
* *The potential for condensation during the summer exists when burying ducts. Duct leakage and a lack of continuity of the vapor barrier on the duct insulation (e.g., rips in the duct jacket) are the two largest contributing factors to this risk. This is because it becomes more likely that the attic air will come in contact with a condensing plane that is at or below the attic air's dew point. It is recommended to encapsulate ducts in closed cell spray foam to minimize the potential for*

condensation. In the absence of encapsulating the duct in closed cell foam, extra attention should be paid to ensure the continuity of the vapor barrier on the duct insulation jacket.[1]

* *Well-sealed ducts properly buried in attic insulation have been shown to deliver 7 degrees cooler air in the summer – as compared to exposed ducts. This provides increased comfort for the occupants as well as energy savings.*[1]

Visual Reference:

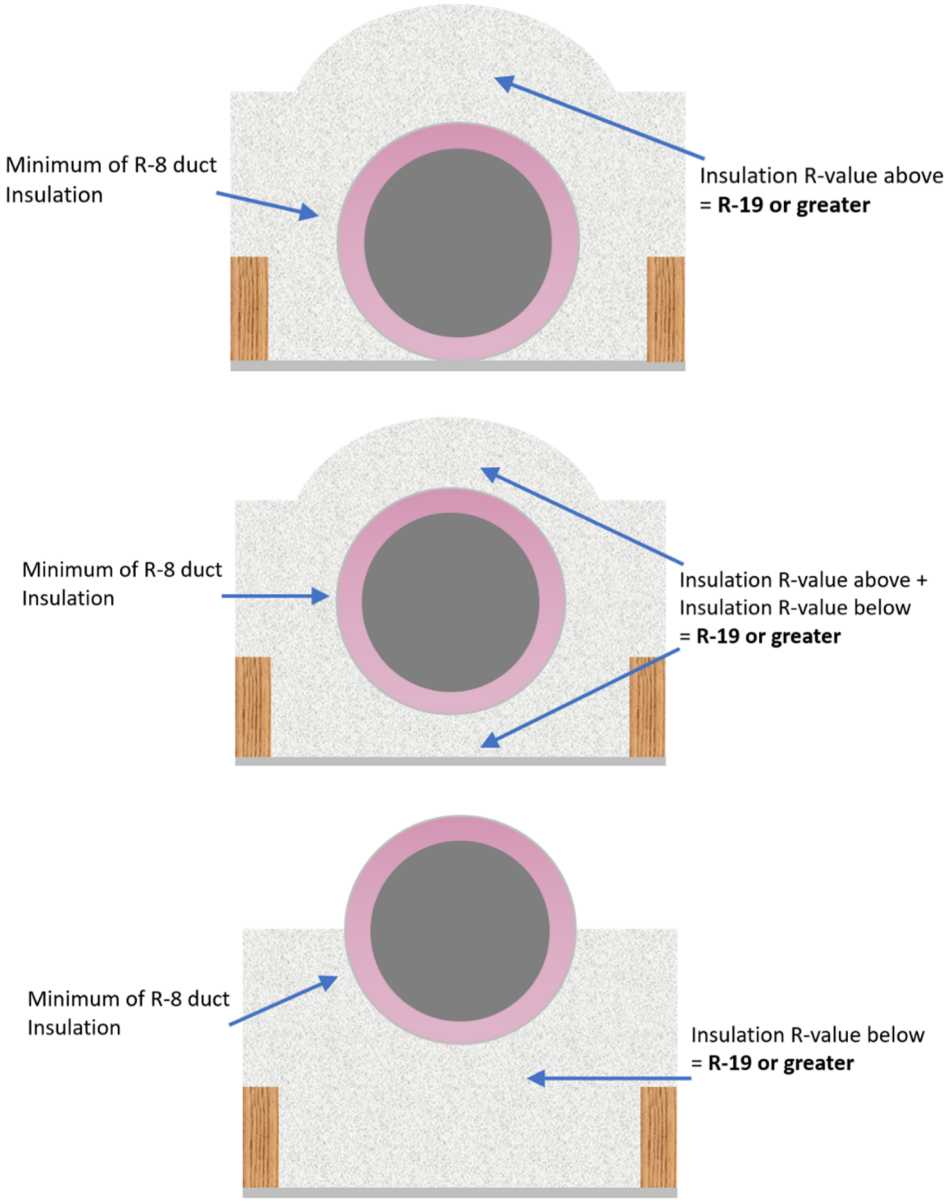


Figure 1: Different configuration options for burying ducts

[1] https://www1.eere.energy.gov/buildings/publications/pdfs/building_america/compact-buried-ducts-hot-humid.pdf

2018 IECC/IRC Code Reference:

N1103.3.6 (R403.3.6)

Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. 1.The supply and return duct shall have an insulation *R*-value not less than R-8.
2. 2.At all points along each duct, the sum of the ceiling insulation *R*-values against and above the top of the duct, and against and below the bottom of the duct shall be not less than R-19, excluding the *R*-value of the duct insulation.
3. 3.In *Climate Zones* 1A, 2A and 3A, the supply ducts shall be completely buried within ceiling insulation, insulated to an *R*-value of not less than R-13 and in compliance with the vapor retarder requirements of Section M1601.4.6.

   Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

N1102.4.1.1 (R402.4.1.1) Installation (Mandatory)

The components of the building thermal envelope as listed in Table N1102.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table N1102.4.1.1, as applicable to the method of construction.

Table N1102.4.1.1 (R402.4.1.1) Air Barrier and Insulation Installation

Component	Air Barrier Criteria	Insulation Installation Criteria
General Requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/Attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.

Definitions:

Air Barrier: One or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Attic: The unfinished space between the ceiling assembly and the roof assembly.

Building Thermal Envelope: The basement walls, exterior walls, floors, ceilings, roofs and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

Conditioned Space: An area, room or space that is enclosed within the building thermal envelope and that is directly heated or cooled or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling.

R-Value: Thermal resistance. The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area (h * ft2 * °F/Btu) [(m2 * K)/W]. **Note: In more general terms, resistance to heat flow of a single material, expressed as a whole number. Higher numbers denote higher resistance to heat flow*

Vapor Barrier: *(Definition not from code)* A material or product that prevents the migration of moisture via vapor diffusion; a Class I vapor retarder with a perm rating of less than or equal to 0.1.

Vapor Retarder Class: A measure of the ability of a material or assembly to limit the amount of moisture that passes through that material or assembly. Vapor retarder class shall be defined using the desiccant method with Procedure A of ASTM E96 as follows:

- Class I: ≤0.1 perm rating
- Class II: > 0.1 to ≤ 1.0 perm rating
- Class III: > 1.0 to ≤ 10 perm rating