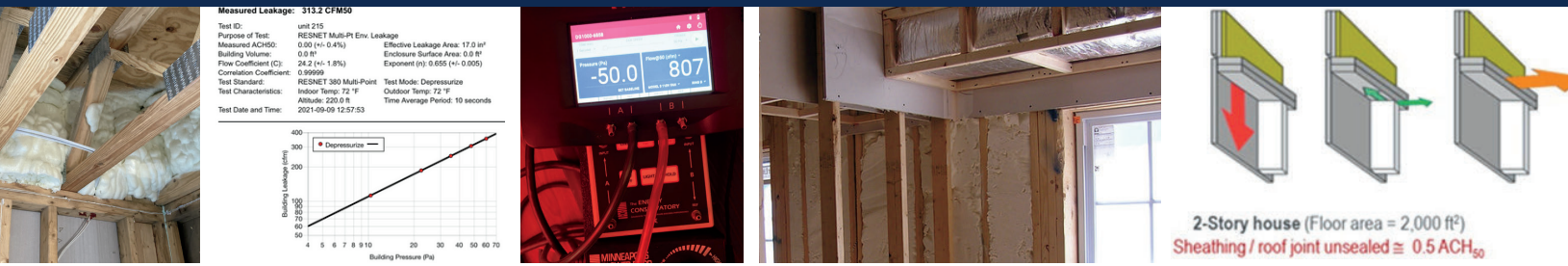


Overhead Insulation Details

2021 VRC/VECC Update Guide



Updated Details for Attic Insulation:

As in previous editions of the Virginia Residential Code, the nameplate attic insulation R-Value on the attic floor (R-60 in climate zones 4 and 5; R-49 in climate zone 3) applies only when the roof framing prevents the full height of insulation from being installed at the building perimeter – as in the image below.

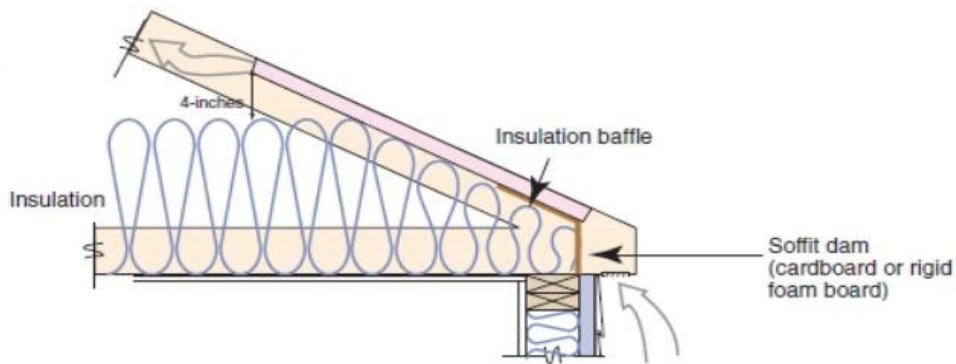
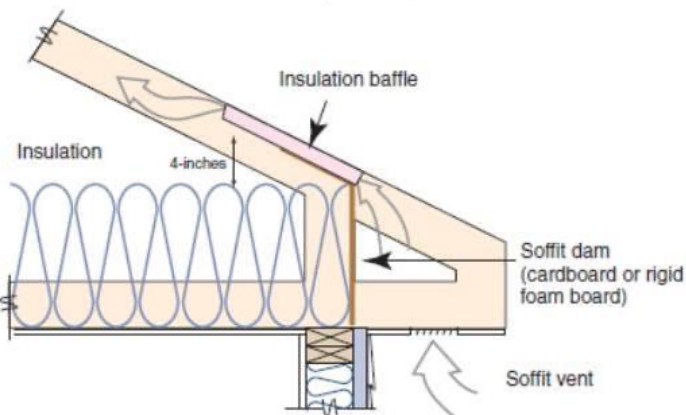


Image from <https://basc.pnnl.gov/resource-guides/attic-eave-minimum-insulation>

In climate zones 4 and 5, R-49 overhead insulation is sufficient if that amount can be obtained over the entire top plate of the exterior wall beneath. For a vented attic with insulation on the attic floor, this typically is achieved using raised heel trusses (as shown below). That reduced minimum R-Value also applies to cathedral ceilings or unvented attics. In climate zone 3, R-38 serves as this alternative minimum when those conditions hold.



Images from <https://basc.pnnl.gov/resource-guides/attic-eave-minimum-insulation>

Note also that section N1102.2.3 (R402.2.3) Eave baffle now requires soffit dam assemblies to be made airtight. Builders should caulk or otherwise seal around soffit dam material to prevent air movement through the side of the insulation layer. The only pathway to the attic from vented soffits should be via the insulation baffle installed against the bottom of the roof decking.



Image: daylight shows gaps to be caulked around cardboard baffles to eliminate air intrusion; photo: Viridiant

Wall/ceiling abutting vented attic space:

New code language specifies construction strategies to maintain full thickness of loose attic floor insulation over the entire footprint of rooms with walls that abut unconditioned attic space. This was added to the section that requires dams around attic hatches when loose fill insulation is used. As around hatches, these wood, cardboard or other dam or retainer can be used to allow the full height of the loose-fill insulation to extend over the full width of the top plate of the wall abutting the attic. It keeps insulation from falling off the insulated ceiling. If rigid sheathing is used to cover the attic side of the wall below, it can be extended up the necessary height to serve as a dam as in the image below.

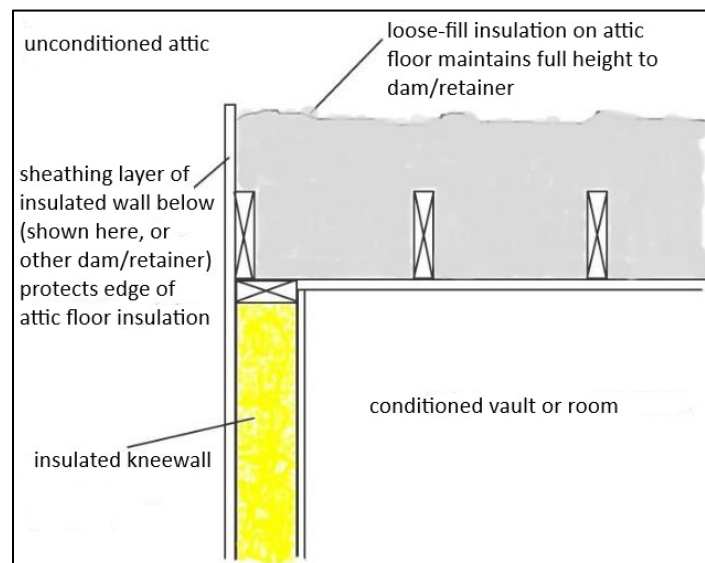


Image: Viridiant

2021 VRC/VECC Code References:

N1102.1.4 (R402.1.4) R-value computation. Cavity insulation alone shall be used to determine compliance with the cavity insulation R-value requirements in Table N1102.1.3. Where cavity insulation is installed in multiple layers, the R-values of the cavity insulation layers shall be summed to determine compliance with the cavity insulation R-value requirements. The manufacturer's settled R-value shall be used for blown-in insulation. Continuous insulation (ci) alone shall be used to determine compliance with the continuous insulation R-value requirements in Table N1102.1.3. Where continuous insulation is installed in multiple layers, the R-values of the continuous insulation layers shall be summed to determine compliance with the continuous insulation R-value requirements. Cavity insulation R-values shall not be used to determine compliance with the continuous insulation R-value requirements in Table N1102.1.3. Computed R-values shall not include an R-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table N1102.1.3, the manufacturer's labeled R-value for insulated siding shall be reduced by R-0.6.

N1102.1.5 (R402.1.5) Total UA alternative. Where the total building thermal envelope UA, the sum of U-factor times assembly area, is less than or equal to the total UA resulting from multiplying the U-factors in Table N1102.1.2 by the same assembly area as in the proposed building, the building shall be considered to be in compliance with Table N1102.1.2. The UA calculation shall be performed using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. In addition to UA compliance, the SHGC requirements of Table N1102.1.2 and the maximum fenestration U-factors of Section N1102.5 shall be met.

N1102.2.1 (R402.2.1) Ceilings with attics. Where Section N1102.1.3 requires R-49 insulation in the ceiling or attic, installing R-38 insulation over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. Where Section N1102.1.2 requires R-60 insulation in the ceiling or attic, installing R-49 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the insulation and fenestration criteria in Section N1102.1.2 and the Total UA alternative in Section N1102.1.5.

N1102.2.2 (R402.2.2) Ceilings without attics. Where Section N1102.1.3 requires insulation R-values greater than R-30 in the interstitial space above a ceiling and below the structural roof deck, and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation R-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section N1102.1.3 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the Total UA alternative in Section N1102.1.5.

N1102.2.3 (R402.2.3) Eave baffle. For air-permeable insulation in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain a net free area opening equal to or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material. The baffle shall be installed to the outer edge of the exterior wall top plate so as to provide maximum space for attic insulation coverage over the top plate. Where soffit venting is not continuous, baffles shall be installed continuously to prevent ventilation air in the eave soffit from bypassing the baffle.

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:

1. Hinged vertical doors shall have a minimum overall R-5 insulation value;
2. Hatches and scuttle hole covers shall be insulated to a level equivalent to the insulation on the surrounding surfaces; and
3. Pull down stairs shall have a minimum of 75 percent of the panel area having R-5 rigid insulation.

Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood-framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed R-value of the loose fill insulation.

N1102.2.4.1 (R402.2.4.1) Access hatch and door insulation installation and retention. Vertical or horizontal access hatches and doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be weatherstripped. Access that prevents damaging or compressing the insulation shall be provided to all equipment. Where loose-fill insulation is installed, a wood-framed or equivalent baffle, retainer, or dam shall be installed to prevent loose-fill insulation from spilling into living space from higher to lower sections of the attic, and from attics covering conditioned spaces to unconditioned spaces. The baffle or retainer shall provide a permanent means of maintaining the installed R-value of the loose-fill insulation.

Definitions:

ABOVE-GRADE WALL. A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

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.

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floors, ceiling, roofs and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

CAVITY INSULATION. Insulating material located between framing members.

CLIMATE ZONE. A geographical region based on climatic criteria as specified in this code.

CONDITIONED SPACE. An area, room or space that is enclosed within the building thermal envelope and that is directly 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.

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the building envelope.

EXTERIOR WALL. Walls including both above-grade walls and basement walls.

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 ($h \times ft^2 \times ^\circ F/Btu$) [$(m^2 \times K)/W$].

SERVICE WATER HEATING. Supply of hot water for purposes other than comfort heating.

