2024 IECC Residential Energy Code Air Leakage Requirements

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In 2024, Rhode Island passed a law requiring the prompt adoption of the 2024 International Energy Conservation Code (IECC), which includes more stringent requirements for residential buildings. The maximum air leakage rate for new construction dwellings is set at **3.0 ACH50.** *Reference: 2024 IRC Chapter 11 - N1102.5.1.3 (R402.5.1.3)*

How is Air Leakage Measured?

Air leakage is verified by performing a blower door test. Test results must be recorded as air changes per hour at 50 Pascals of pressure (ACH_{50}) and reported to the building official. The building or residential unit is prepared for testing following ANSI 380 Section 4.2 guidelines and a large fan is placed in a door or window (see image). This fan depressurizes the building or dwelling unit. A pressure gauge records the pressure and cubic feet per minute (CFM) flow rate of the fan to achieve a pressure difference of 50 Pascals (0.2-inch water gauge). The CFM is then converted to ACH_{50} using the volume of the house with the following calculation: ACH_{50} = (CFM_{50} x 60)/ Volume (Cubic Feet).



A Minneapolis Blower Door

Who Performs Blower Door Testing?

The code states "Where required by the code official, testing shall be conducted by an approved third party". Widely accepted third party credentials include BPI (www.bpi.org) and HERS (www.resnet.us/raters/hers-raters). Before the test is conducted, the testing professional's qualifications should be reviewed by the code official. Builders are not allowed to perform the test for code compliance on their own building.

Reference: 2024 IRC Chapter 11 - N1102.5.1.2 (R402.5.1.2)

How Do I Meet 3.0 ACH50?

For builders that haven't built homes to these levels of airtightness, it can be a challenge. But once you've done it, you will realize that it is quite simple and does not require a cost prohibitive amount of spray foam. In fact, it doesn't require spray foam at all.

Here are some recommendations for achieving a successful and cost-effective air barrier:

1. Use materials that are already included in the construction

Table N1102.5.1.1 (R402.5.1.1) lists requirements for air barrier, air sealing and insulation installation. The very first item in the table states "A continuous air barrier shall be installed in the building thermal envelope. Breaks or joints in the air barrier shall be sealed". The code doesn't specifically tell you what materials to use and where to seal, but it sets the stage. Let's break it down.

Con·tin·u·ous: forming an unbroken whole; without interruption.

The air barrier is not one "thing". It is a system of materials and components that are installed around your building. In many cases, materials that can be used as an effective air barrier are ***already included*** in the construction; taped exterior sheathing, sub-slab vapor barrier, etc. All that is needed to unlock the air barrier potential of these materials is good design, some tape or caulk and extra care connecting them together.

Let's take for instance a wall assembly with Zip sheathing. Taped sheathing, when installed properly, serves as an excellent air barrier material. In conjunction with the windows and doors (and the caulk and tape we use to install them) this constitutes a continuous air barrier for this section of the building.

If we can avoid adding materials such as spray foam, self-adhering membranes, fluid applied air sealing products, etc. we can be successful in our endeavor to construct a cost-effective building.

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2. Choose materials that are easy to understand and install

Although there are an abundance of materials that can be used as part of an effective air barrier system, some are more challenging to install than others. Let's create a system that is easy to understand, execute and repeat. Let's take, for instance, a mechanically fastened house wrap (WRB) such as Tyvek or Typar. You may be tempted to use this as part of your air barrier system. It is already included in the construction and is a cost-effective material.

While it is possible to use these materials as an effective air barrier, a tremendous amount of care and detail are typically required to successfully seal every seam, perimeter edge, puncture and tear that is necessary to establish a continuous layer. Why not, instead, tape the exterior sheathing which requires less time and energy?

Sheet rock is another material which can introduce unnecessary complications and headaches when used as part of the air barrier system. Extra steps are required such as sealing the electrical receptacles, recessed lighting, caulking top plates, etc. In addition, sheet rock is one material in our buildings that is not only *intended* to have penetrations in it, but also frequently altered by occupants. Why would we use it as part of the air barrier?



VS



Air barrier material selection example: mechanically fastened house wraps vs. taped sheathing. Avoid materials that require complicated, labor-intensive installation.

3. Install the air barrier on the exterior side of the thermal envelope

A common source of confusion is whether the air barrier system should be installed on the interior or exterior of the building. While the code requires that "a continuous air barrier shall be installed in the building thermal envelope", it does not specify which side of the envelope it must be installed. As long as an assembly incorporates a continuous air barrier, the pressure differential that would otherwise drive air infiltration or exfiltration is effectively neutralized.

When considering air barrier design ask yourself this question: *Is it easier to seal a box from the inside or outside?* In most cases, installing the air barrier on the exterior of the building simplifies design and installation. It also prevents potential "wind-washing" of fibrous insulation materials like fiberglass and cellulose.

In some cases, the air barrier may move from the exterior to the interior (think of a ceiling below an unconditioned attic). In these situations, we need to implement creative and critical thought processes into our design processes.

A "smart" vapor retarder installed below the trusses and above the strapping. The membrane extends over the top plate and is sealed to the sheathing creating a continuous air barrier system. The space created by the strapping can be used as a service cavity for wires, lights, etc. The sheet rock installed to the bottom of the strapping is not part of the air barrier. Therefore, penetrations are inconsequential.

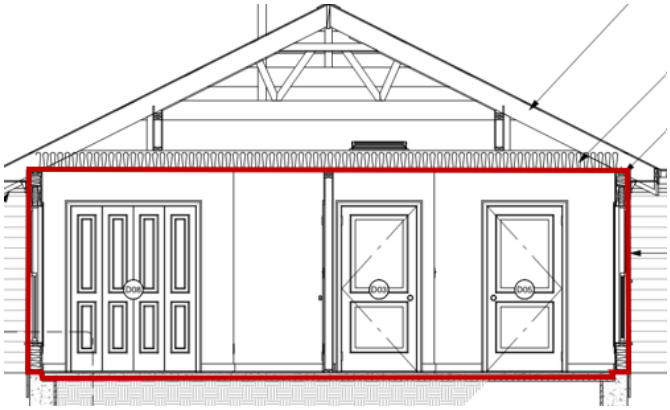


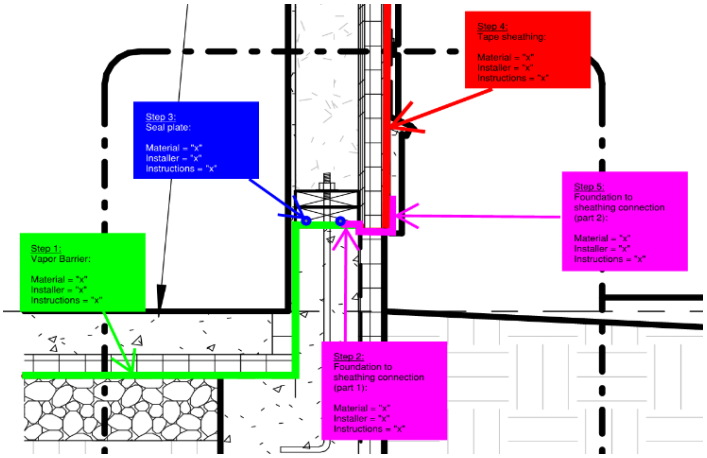
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4. Thorough details and thoughtful design are critical in successful implementation

First, define the air barrier. On your plan set, take a pen and draw a line around the entire building's conditioned space without taking the pen off the paper. This is where your air barrier system will be installed.





Next, analyze each assembly and transition to determine which materials and components you will use as your air barrier and how to align and connect them so that they are continuous.

There is no one way to do it. But once you've found a system that works for you and is easily repeated, you'll find that building a house that tests below 3.0 ACH_{50} can be simple and cost-effective.

It is an exercise in critical thinking, but that is what we, as the builders, do best.

If a home fails to meet 3.0 ACH_{50} at final testing it can be difficult and costly to resolve. Partnering with an energy consultant such as a HERS Rater early in the design and construction process can be helpful in avoiding potential problems, especially if they can perform inspections and testing during the rough stage of construction.

For free information and assistance with meeting the energy code, including free on-site contractor training, call Rhode Island Energy's Energy Code Technical Support at 855-343-0105.