

What is an Air Barrier

Collaboration between Geoff Hartman, ICF; Eric Smith, 1st Rate BEC; and Brannon King, DPIS.

RESNET Standards (2006 Mortgage Industry National Home Energy Rating Systems Standards) set strict guidelines for insulation installation practices. In short, wall cavities require the “**presence of an air-impermeable barrier ... to enclose the building cavities.**”

The EPA's Thermal Bypass Checklist (TBC) further specifies that insulation shall be installed in full contact with sealed interior and exterior air barrier, except in climate zones 1 through 3, (covering most of Texas) where sealed exterior air barrier aligned with RESNET Grade 1 insulation is fully supported.

An EPA technical ruling states that “an air barrier is any solid material that blocks air flow.” The only caveat noted is that if building paper is applied directly to the framing, without sheathing, then the material would have to be taped or otherwise sealed to effectively function as the air barrier. EPA noted that, for some products, it may be “unrealistic” to achieve an air seal that will remain effective throughout the expected lifetime of the building.

Definition of an Air Barrier:

- Impermeable to airflow
- Continuous over the entire building enclosure or continuous over the enclosure of any given unit
- Able to withstand the forces that may act on them during and after construction
- Durable over the expected lifetime of the building

What material can be used as an air barrier?

The real question is: what methods of construction qualify as a properly installed air barrier? According to *Residential Energy, Fourth Edition* (John Krigger, Saturn Resources) and other building science books such as the *Builder's Guide to Hot-Humid Climates*, an air barrier is a system of materials designed to control airflow between a conditioned space and an unconditioned space. These products include, but are not limited to, rigid sheathing materials such as gypsum board, plywood, OSB, Thermo-Ply®, or rigid polystyrene sheathing.

Flexible barriers can also provide effective air barrier systems if joints and seams are sealed. These include fan fold materials, house papers and other materials. Each of these products must be sealed at the edges to create a continuous air barrier. If products are not wide enough to be installed in one continuous piece to cover from the bottom plate to the top plate of the wall system then unconventional means of installation must be employed to make these products work as an air barrier.

In practice, many flexible products do not make a good choice for an air barrier, especially on exterior walls. Significant damage can be



A well-sealed air barrier (above). Note that cracks, seams and joints are caulked and/or foamed to maintain the integrity of the air barrier throughout the entire exterior surface areas of the wall cavities.

Unacceptable results when ineffective backer is installed (below). Insulation sags, gaps occur, and insulation materials actually fall out of the framing cavity. This wall would be modeled as a separate, non-insulated (R-0) surface, according to HERS standards.





caused by siding installers and brick layers, and most tapes will not maintain long-term adherence, unless the tape is specifically designed for the air barrier product. A rigid product is almost always best, but still requires diligent attention to detail for good air sealing.

Following are examples of different materials and how they should be installed to create an effective air barrier per TBC Guidelines.

OSB, Plywood, Thermo-Ply®, DennyBoard®, etc.

These materials are to extend from the bottom plate to the top plate, and be nailed per manufacturer's specifications. Holes and any seams must be sealed. The vertical seams of the materials should meet at the point of a wall stud and be tight enough to block air from penetrating the seam. Horizontal seams between the expanse of material from bottom plate to the top plate must be properly flashed for water intrusion and air sealed by a product that will remain a sealant throughout the expected lifetime of the building.

Tyvek® or Other House Wraps

If the product is cut to extend from the bottom plate to the top plate without any seams, then the four edges (top, bottom and right and left) must be nailed and/or sealed by caulks or sealant to remove any possibility for air to enter in along any of these four sides. If the material is installed in two or more sections, the upper portion should overlap the bottom to prevent water intrusion. The horizontal seam should be sealed by a product that will remain sealed for the life of the building.

Felt Paper

Note: Use of this product will require significant added cost and effort. This product is typically installed in three to four sections to reach from the bottom plate to the top plate on a one-story wall system. The lowest portion is installed first. It can be nailed along the bottom and sides. The upper portions should overlap the bottom portions, in a shingle fashion, to prevent water intrusion. The horizontal seam should be sealed by a product that will remain sealed throughout the expected lifetime of the building. For acceptable tapes, see below. Since this product is not rigid, it is best installed behind siding by sealing the product to the bottom plate by use of the manufacturer's required starter strip for cementitious material installation. The top can be sealed best by nailing a piece of sheathing material over the top connect to seal the top behind the soffit. When done per the air barrier requirements, the edges are sealed if nailed well.

Fan Fold Material

This product is installed like felt paper but could have a much lower air permeability in the field. Material is typically installed in three to four sections to reach from the bottom plate to the top plate on a one-story wall system. The lowest portion is installed first. It can be nailed along the bottom and sides. The upper portion should overlap the bottom portion, in a shingle fashion, to prevent water intrusion. The horizontal seam should be sealed by a product that will remain sealed throughout the expected lifetime of the building. For acceptable tapes, see below. When done per the air barrier requirement, the edges are sealed if nailed well. Though often overlooked, this material can perform the task of air barrier very well. It is lightweight, easily installed, easily sealed - and inexpensive.

Acceptable Tapes

Sealing any air barrier must be done using a product that will remain sealed throughout the expected lifetime of the building. Most tapes do not fall into this category. Some tapes do and manufacturers specifications of these tapes would apply. Tapes will only work if they are applied to product free from dust and dirt. Any holes between the expanse of the house wrap material from the bottom plate to the top plate must be properly flashed and sealed for air intrusion.