# Understanding Air Barriers and Vapor Retarders

***Building Operating Management***
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The use of air barriers in combination with vapor barriers is not a new practice. A properly designed and installed air/vapor barrier system offers many benefits: greater comfort, fewer maintenance requirements and reduced energy bills.

Nevertheless, concern about energy conservation and increasing mold-related issues have driven facility executives and design professionals to look at vapor retarders more closely. In particular, a distinction has been made between air barriers and vapor retarders. Several states, including Massachusetts, Illinois, New York and California, have recently updated building codes to include sections dedicated specifically to air barriers in the building envelope. Other states focusing on energy efficiency, such as Florida and Connecticut, are anticipated to update codes that require air barriers in conjunction with vapor retarders in the building envelope.

On its own, a vapor retarder restricts movement of water vapor through the building envelope by diffusion. Typically, water vapor travels between difference zones of air vapor pressure, such as the interior and exterior of a building. The vapor retarder prevents moisture from entering cold portions of the envelope, thereby reducing the potential for condensation, which can cause building deterioration and mold growth.

The air barrier is a continuous system to stop mass airflow into and out of the exterior wall or roof assembly. Airflow through buildings brings excessive amounts of water vapor into the envelope, much more than by diffusion alone. A leaky air barrier can increase water penetration, decrease energy efficiency and damage building components.

Although some materials act as both air barrier and vapor retarder, the materials should be considered as individual components.

Selection and placement are critical. No one material will function as an air/vapor barrier for the entire building. Selection of materials and correct placement of the air/vapor barrier is critical. Joints between materials, as well as envelope assembly components, such as windows, doors and corners, must also be sealed, as this is where the majority of air leakage occurs.

Air/vapor barrier materials are distinguished by their permeability. Materials can be vapor- or air-impermeable by code definition.

Examples of combined air/vapor barrier materials include modified asphalt membranes with polyethylene facing, liquid-applied air barriers, sheet metal, and polyethylene. Although a material like polyethylene is both air- and vapor-impermeable, it is generally used only as a vapor retarder. Examples of commonly used air barriers that are vapor-permeable include gypsum sheathing (base standard), vapor-permeable liquid-applied air barrier membranes, and insulation (polystyrene, spray urethane, polyisocyanurate).

Joint transition materials often function as both air and vapor barriers by providing a connection between main components. The joints are often dynamic and the seal must be flexible. Examples of both flexible and rigid transition materials are: urethane or silicone caulking, modified asphalt membrane strips, backer rod, joint fillers combined with spray urethane foam insulation and sheet metal.

Although air/vapor barriers are intended to improve envelope performance, improper design and installation can result in water or air infiltration, condensation problems, mold growth, building deterioration and poor indoor air quality. Careful selection and placement of the air/vapor barrier materials creates an efficient system.

Architects, engineers, owners and construction managers, if applicable, must work cohesively in the early stages of design to fully develop the air/vapor barrier concept and transition detailing. Prior to and during construction, owners, architects, inspectors, and construction personnel can increase the probability of a proper installation by holding preconstruction conferences, setting up inspection standards and procedures, performing frequent quality control checks, and enforcing a stringent material submittal and mock-up process. The project team's focus during these stages will help achieve an air/vapor barrier that will be continuous, durable and within locally set air and vapor permeability standards.