Air Sealing for Savings & Moisture Control in Commercial Buildings

Energy code technical support

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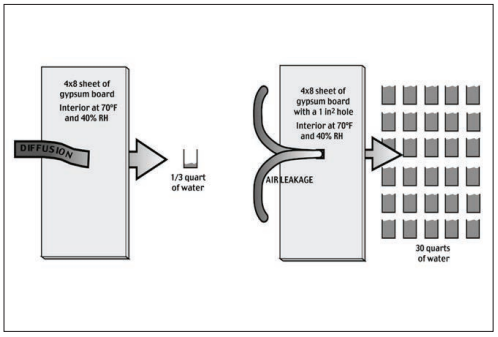
Mold and rust caused by uncontrolled moisture

Fresh air is vitally important in commercial buildings as well as in our homes. Concern is often expressed that recently introduced energy code provisions are promoting the construction of buildings that are too tight, leading to potential problems with indoor air quality and building materials degradation. It is true that recent code changes mandate tighter construction, however, the code development organizations have worked closely with building scientists to assure that mandated construction approaches promote not only energy efficiency, but also healthy, durable buildings.

In addition to air sealing, it is critically important to keep bulk water out of buildings. Rain, snow melt, and groundwater, all potential sources of bulk water, have the potential to deteriorate materials and cause microbial growth problems.



A comparison of the moisture associated with vapor diffusion and air leakage –(Source: Builder'sGuide to Cold Climates. Joseph Lstiburek)

Vapor Barriers/Retarders

Previous versions of the energy code mandated vapor barriers, (more commonly called vapor retarders), as a methodology for controlling vapor entering the insulated cavity through diffusion. However, the energy code no longer requires vapor retarders.

Several factors led to this decision:

- Based on recent information, potential moisture problems are more associated with moisture carried by uncontrolled airflow, and bulk water, than diffusion.
- Vapor retarders are required to be installed on the "warm" side of the insulation. For the Rhode Island climate, the warm side of the insulation is the heated living space in the winter. During the summer the condition is reversed as the outdoors is warm and often humid, while the building interior is cooler due to air conditioning.
- Vapor retarders are effective for preventing diffusion into insulated cavities. However, they can also have a negative effect by not allowing assemblies to dry out if they become wet from bulk water.

Sealing the air barrier connections

Controlling air movement through envelope assemblies

The energy code focus has shifted to restricting uncontrolled airflow by providing continuous air barriers with air sealing. The continuous air barrier is installed throughout the building thermal envelope, connecting all assemblies. It may be installed on the outside, inside, or within assemblies, but should be protected from physical damage and from ultraviolet light degradation.

The air barrier may, or may not, act as a vapor retarder, depending on the materials selected. The 2013 code lists 15 materials which qualify as air barriers, provided they are properly installed.

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"Peel & stick" air barrier applied to rigid insulation

The most common air barrier materials include:

- Extruded polystyrene insulation board
- Roof membrane materials
- "Peel and stick" sheet materials
- Spray-on coatings
- Foil-back rigid insulation board
- Engineered facade assemblies

The details of properly installing the air barrier are critically important. All connections and joints must be sealed with products approved by the manufacturer of the air barrier material. It can be common for two different air barriers to be used, in which case, sealing materials should be approved for both barrier materials. All penetrations of the air barrier shall be gasketed, caulked, or sealed appropriately for the building location and construction materials.

Damage from rain water entering at the roof-wall connection and draining inside the wall, to the under-floor slab

Managing Bulk Water

Bulk water often enters commercial buildings and can remain hidden from view. If not remediated, it can deteriorate insulation, promote mold growth, rust metal framing, and rot wood framing, sheathing, and paper faced products (like gypsum board). Keeping bulk water out is the first line of defense. This requires good detailing and proper installation of flashing, especially at roof/wall connections, equipment curbs, skylights and windows, and specialty areas such as loading docks.

In addition, without careful site planning, ground water and irrigation systems can be major sources of problems.

Allowing Materials to Dry

Despite the best attempts to keep moisture out of buildings, it often finds a way inside. In addition, many building materials inherently contain excess moisture, or are inadvertently installed when wet.

Managing the moisture introduced by construction materials is an important aspect of avoiding mold & indoor air quality (IAQ) problems in buildings.

- Vapor permeable air barriers – Air barrier materials may or may not be vapor retarders. Vapor permeable air barriers allow unwanted moisture to escape.
- Drain planes – Provide a space in vertical walls where moisture can drain, allowing materials to dry.
- Avoid unnecessary vapor retarders – Care should be taken to avoid installing unintended vapor retarders. (especially when using non-vapor permeable air barriers).
  o Many paints and vinyl wall coverings are examples of vapor retarders.
- Landscape – Slope landscape away from buildings and avoid excess vegetation close to buildings will help to keep materials dry.

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Introducing Fresh Air

Designing and constructing tight buildings requires that fresh air be introduced for the occupants. Depending on the size and configuration of the building, this can be done by mechanical or natural ventilation. For most commercial buildings, fresh air circulation is an integral function of the HVAC system. ANSI/ASHRAE Standard 62.1-2013 - Ventilation for Acceptable Indoor Air Quality is referenced by the commercial energy code, building code, and mechanical code as the recognized standard for ventilation system design and acceptable IAQ in commercial buildings.

Summary

With proper attention to design and construction details, code compliant buildings are not only energy efficient, but are healthy, durable, and comfortable structures.

References and Resources

Building Science Corporation:
http://www.buildingsciencepress.com/Builders-Guides-C1.aspx
http://www.buildingscience.com/documents/digests/bsd-104-understanding-air-barriers

Whole Building Design Guide:
Air movement and the purpose of air barriers
http://wbdg.org/resources/airbarriers.php

Air Barrier Association:
http://www.airbarrier.org/

ASHRAE:
https://www.ashrae.org/resources--publications/bookstore/standards-62-1--62-2