



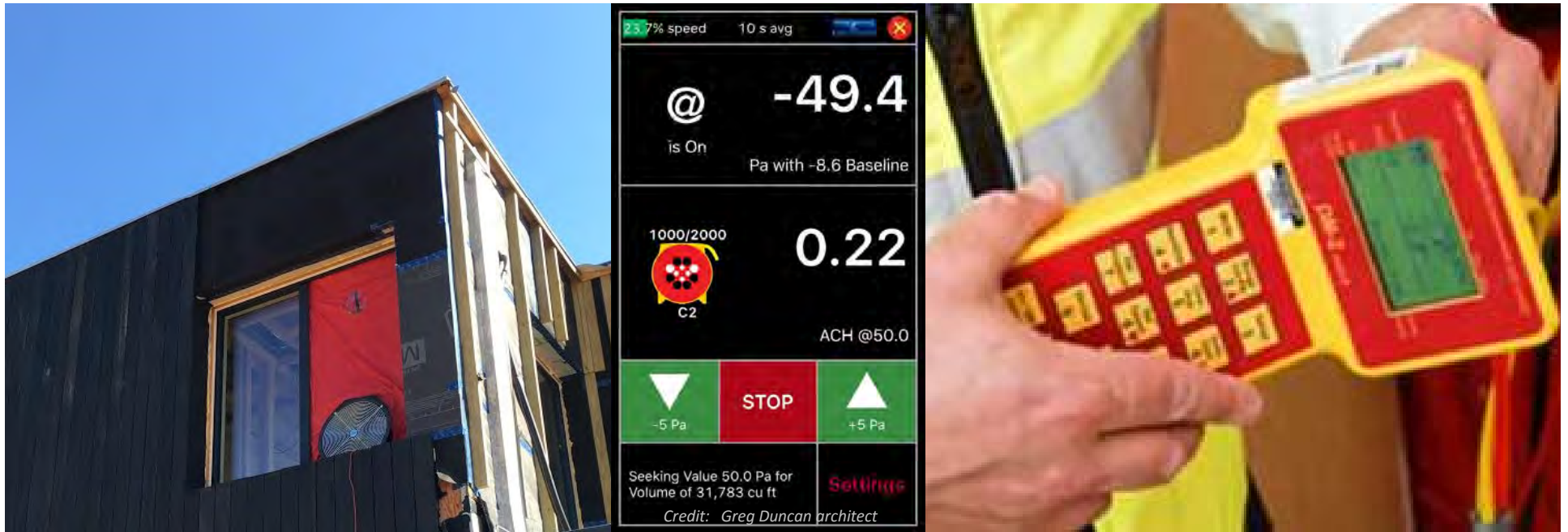
HIGH PERFORMANCE BUILDING SUPPLY foursevenfive.com



Solutions. Simplified.

Where the blowerdoor is King

(and required by code since 10-3-16)



Residential: 3ACH50 (NYC and NYS)

Commercial: 0.04CFM/sf@75 envelope leakage (NYC for 25-50k SF bldgs)

Well designed Envelopes

Properly separating inside from outside

- Airtight
- Thermal Bridge Free Construction
- Continuous Insulation
- Great windows, properly installed
- etc





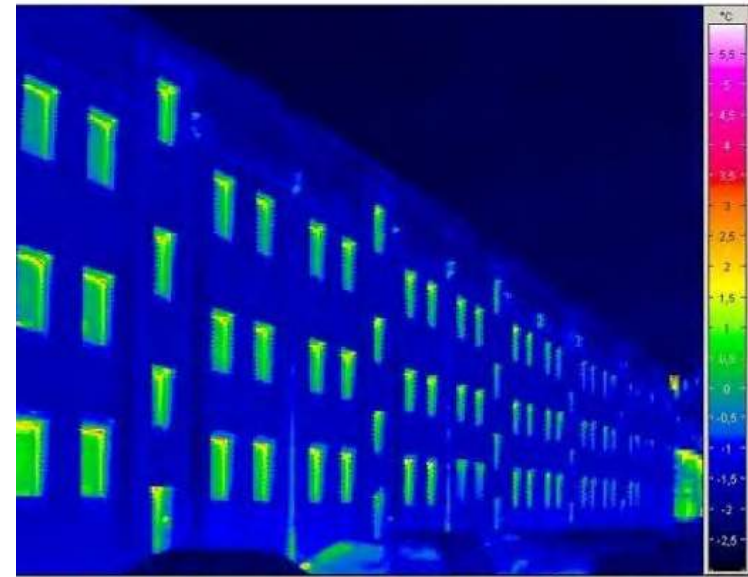
We can optimize and do better

More **robust**.
More **resilient**.
More **sustainable**.
Higher **performance**.

Higher R – better airseal – **more risk?**



Poorly insulated walls are often heated dry.



Well built assemblies dry through vapor diffusion.
(or they don't dry)



We Have Choices:

Structure: steel, concrete, wood, brick, etc

Insulations: cellulose, mineral wool, wood fiberboard
fiberglass, sheepswool, hemp, etc,

Air & vapor control layers: sheathings, membranes
vapor open, closed or variable

Connections: tapes, adhesives, gaskets



An evolution in high performance

1. **Water control**
 2. Ever greater **air control**
 3. More resilient **vapor control**
 4. More robust **thermal control**
- More **predictable** and durable
 - More **sustainable** and “green”

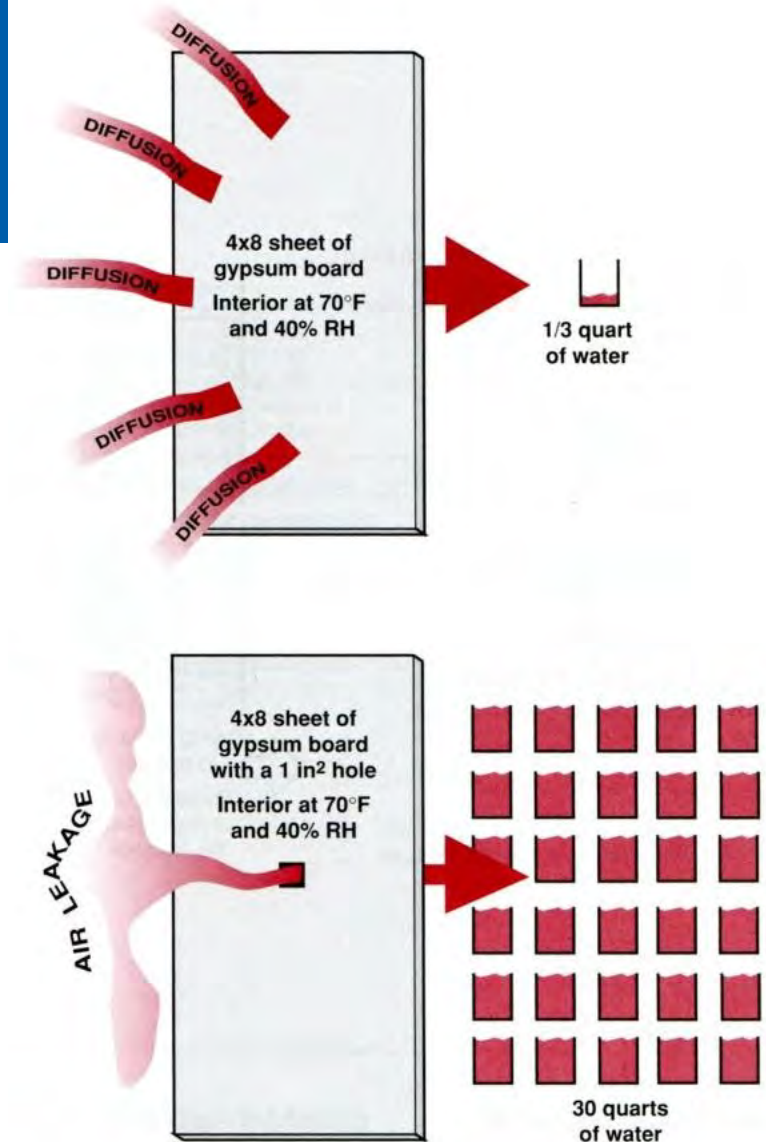


Air Control



Air Control

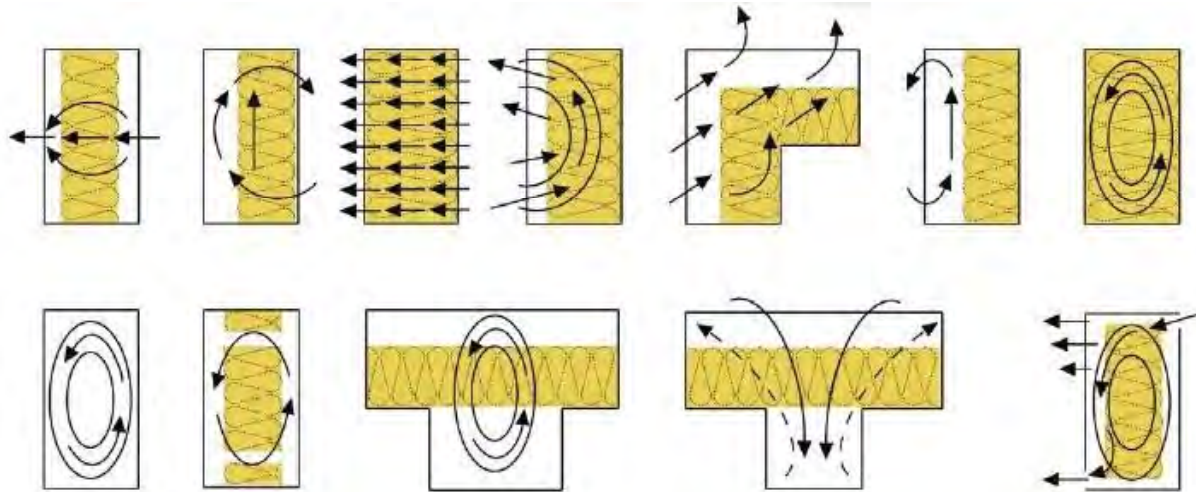
- Second only to water control.
- **Disproportionately effects:**
 - **Indoor air quality:** control the air to control the quality
 - **Comfort:** drafts are uncomfortable
 - **Air transported wetting:** a bigger liability than diffusion wetting
 - **Heat loss/thermal bypass**



Credit: Building Science Corporation

Thermal Bypass Diagrams

Thermal bypass describes heat loss that gets around intended thermal insulation, including:
windwashing, air infiltration, and convective loops.



Credit: Mark Siddall, Building Green Magazine

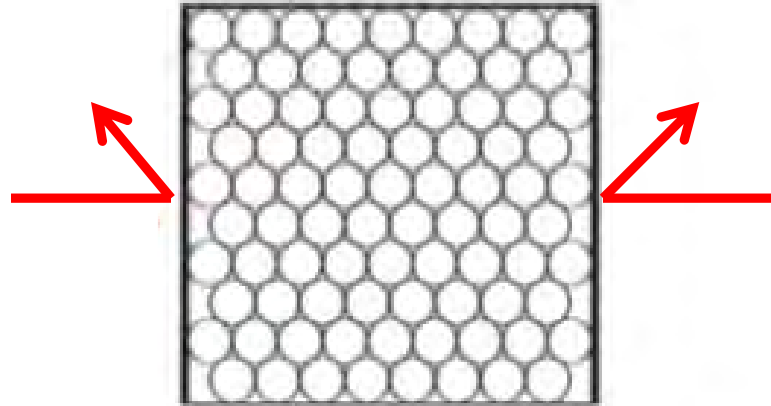
Thermal Performance of **Leaky** vs. **Airtight** enclosures:
Factor of 4.8 or a **79% reduction in performance**

Fraunhofer Institute, Stuttgart Germany

Airtight Inside and Outside

Surround the insulation in airtightness.

All 6 sides



Now the insulation is protected for
optimum performance



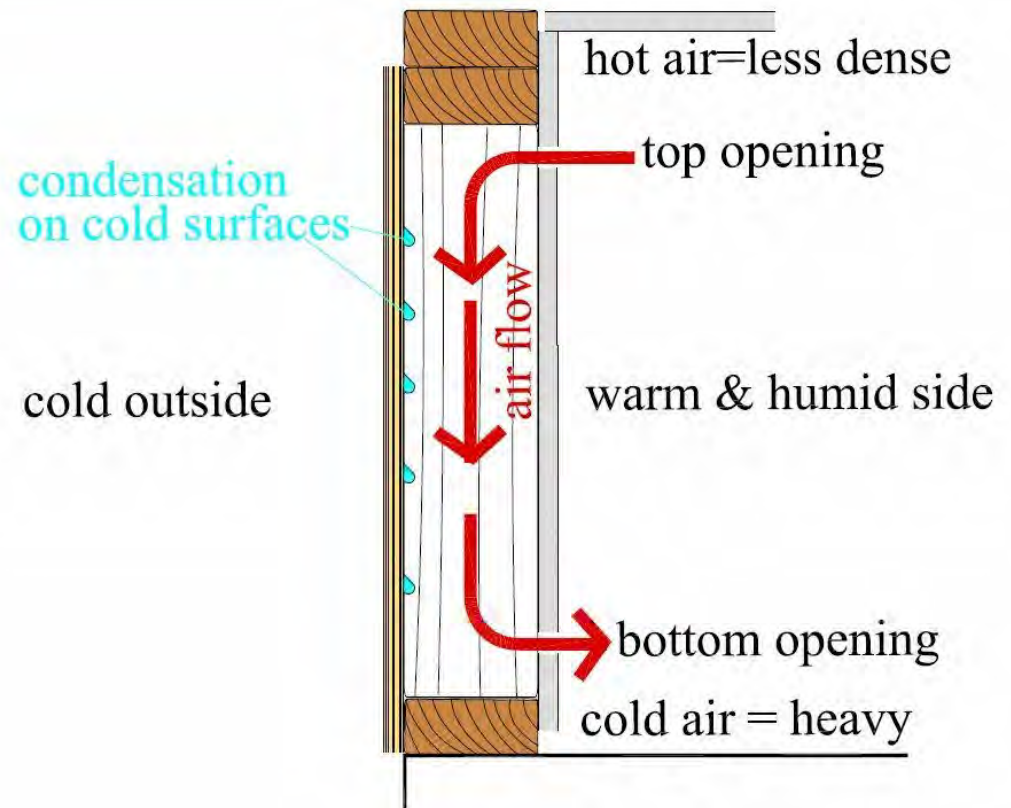
Joe Lstiburek:

“Air-sealing both sides of the wall is more important than the fluffing of the insulation in the cavity.”

Building Science Camp 2012

Why Inboard is Better

1. Keeps conditioned air within the conditioned space.
2. Better protection against condensation risk.
3. Places the components of this most important control layer in a climate controlled location.
4. Leaks can often be more readily found and easier to repair.
5. **The air control layer can/should double as a vapor control layer.**





Stuff happens.
So, help the drying.

Vapor retarding on warm side

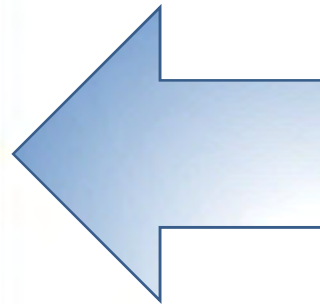
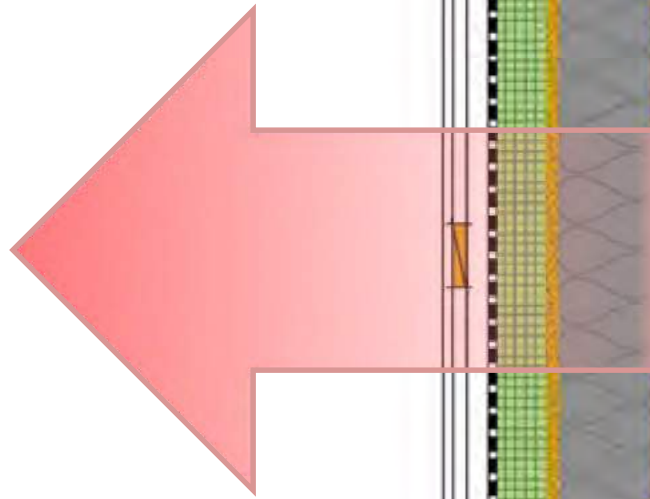
Outside

Winter

Inside

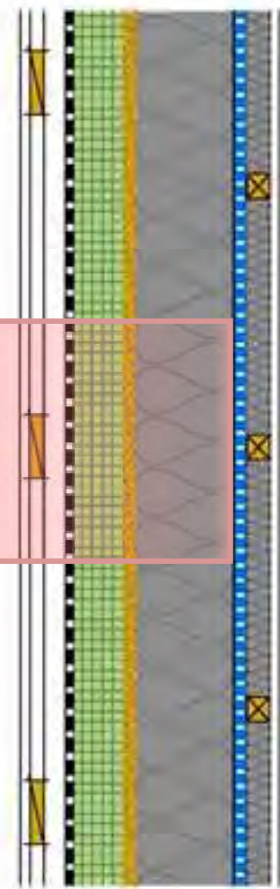
#1 Vapor open

**#2 Vapor Closed
(retarding/variable)
How variable?**

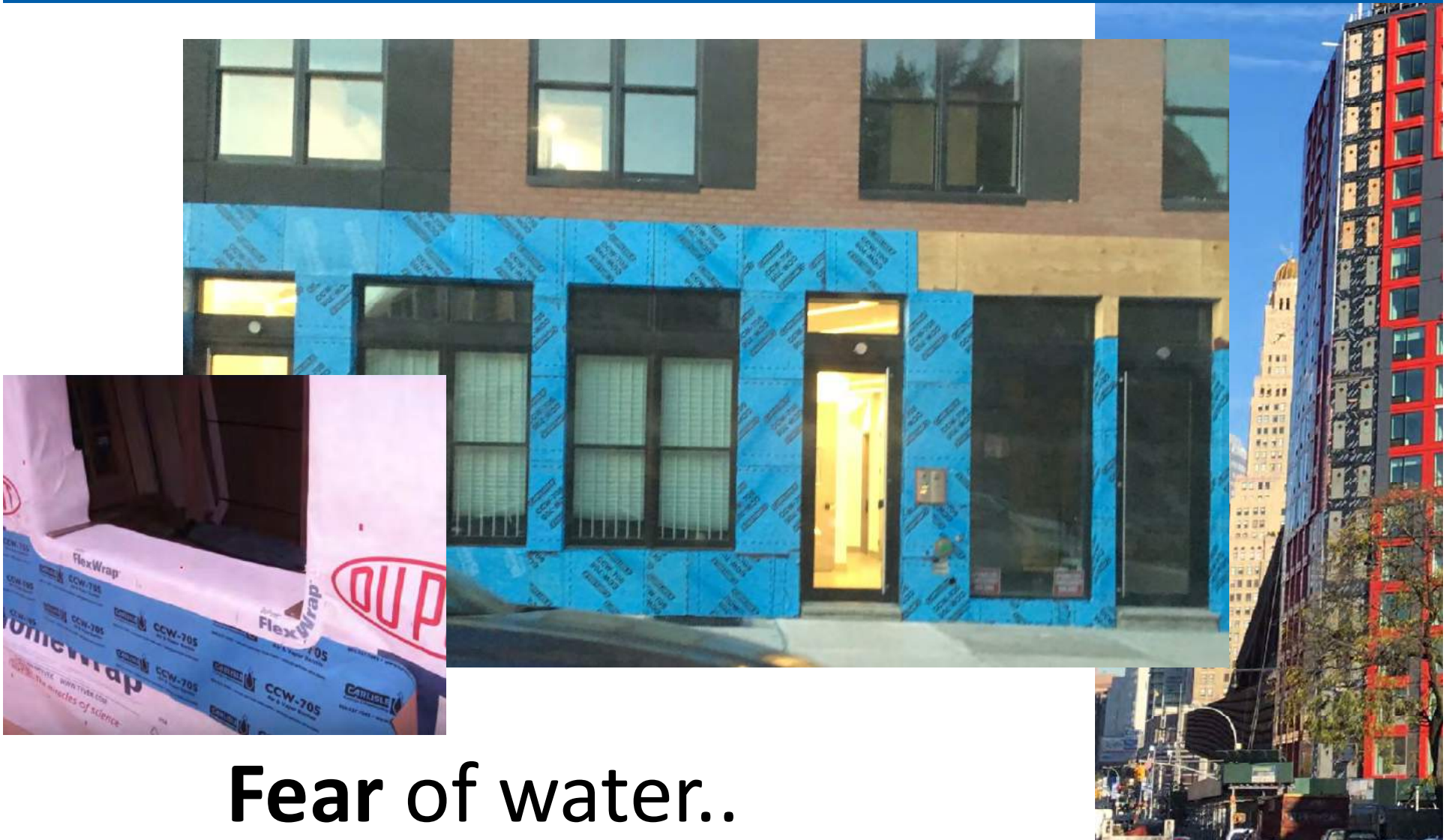


Drying Out

**Minimize potential
Wetting from
Inside**



Why are we installing vapor dams?



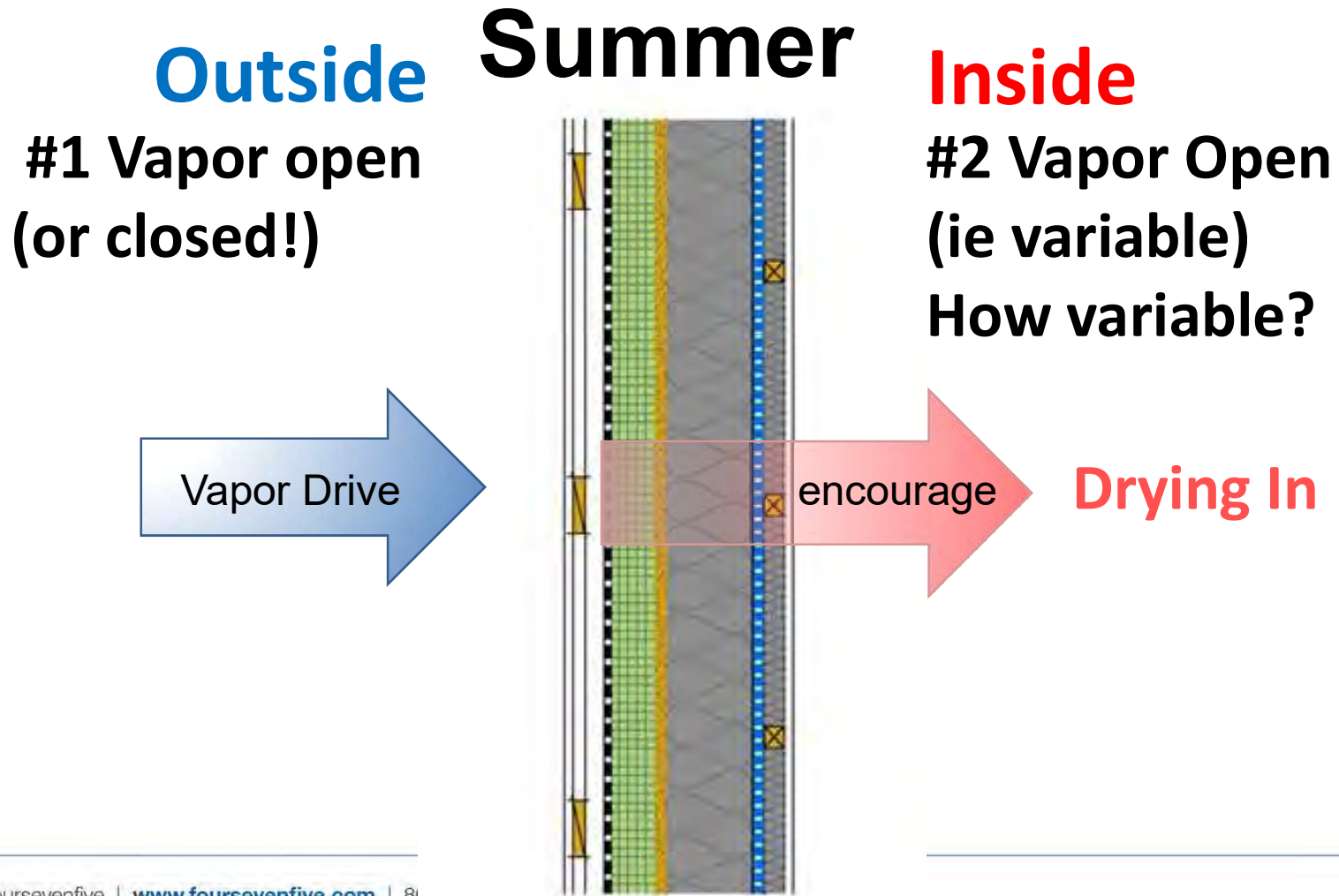
Fear of water..



Reduce the intolerance.

Increase the resilience.

Cold/Mixed Climate



Interior Vapor Control / IBC

1405.3 Vapor retarders.

Class I or II vapor retarders shall be provided on the interior side of frame walls in Zones 5, 6, 7, 8 and Marine 4. The appropriate zone shall be selected in accordance with Chapter 3 of the *International Energy Conservation Code*.

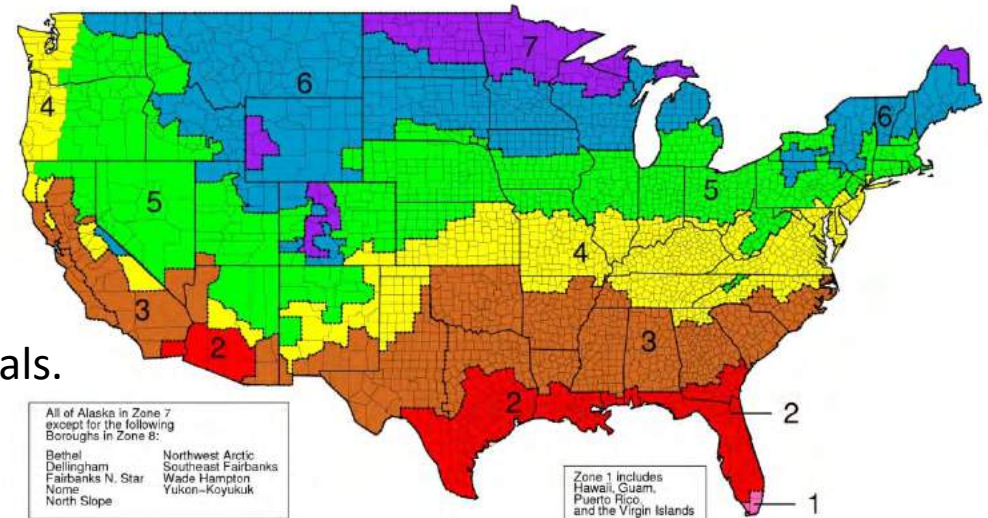
Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.

R702.7.1 Class III vapor retarders.

Class III vapor retarders shall be permitted where any one of the conditions in Table R702.7.1 is met.

- Vented cladding
- Insulated outboard sheathing (per climate zone requirements)

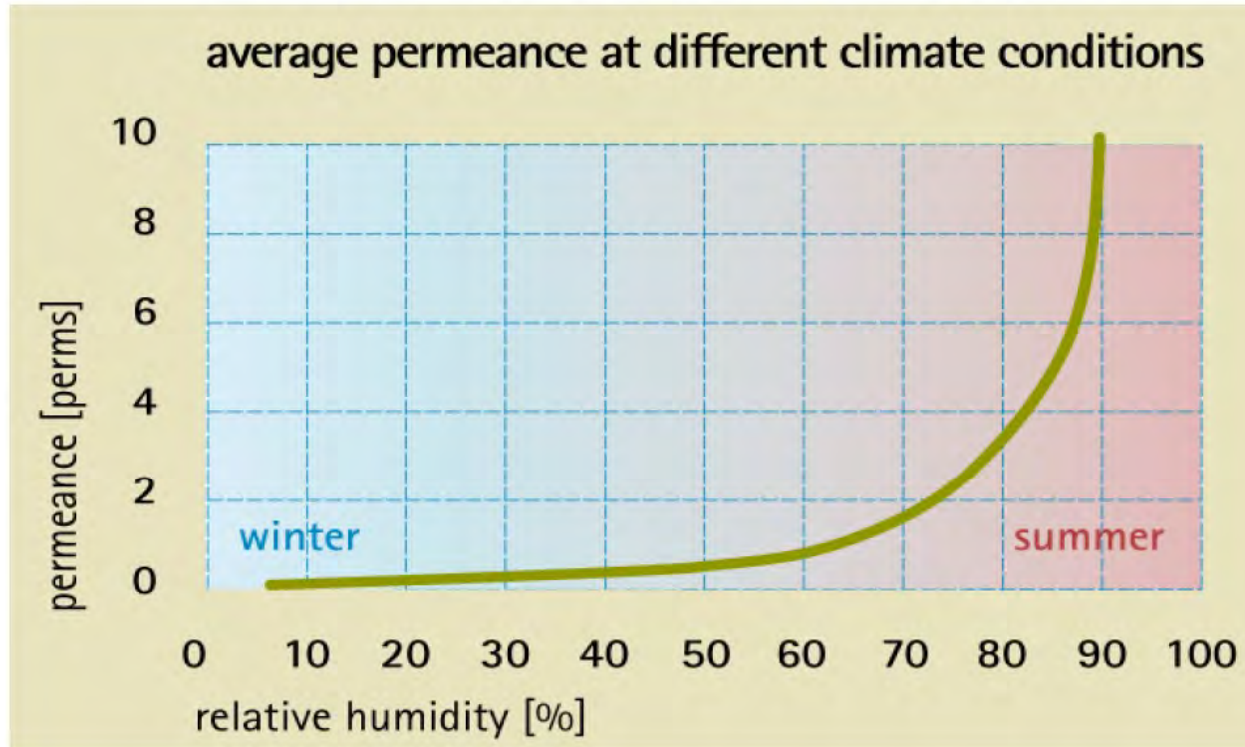


Credit: International Code Council, 2012

Air & Vapor Control Membranes



Vapor Intelligent Membrane

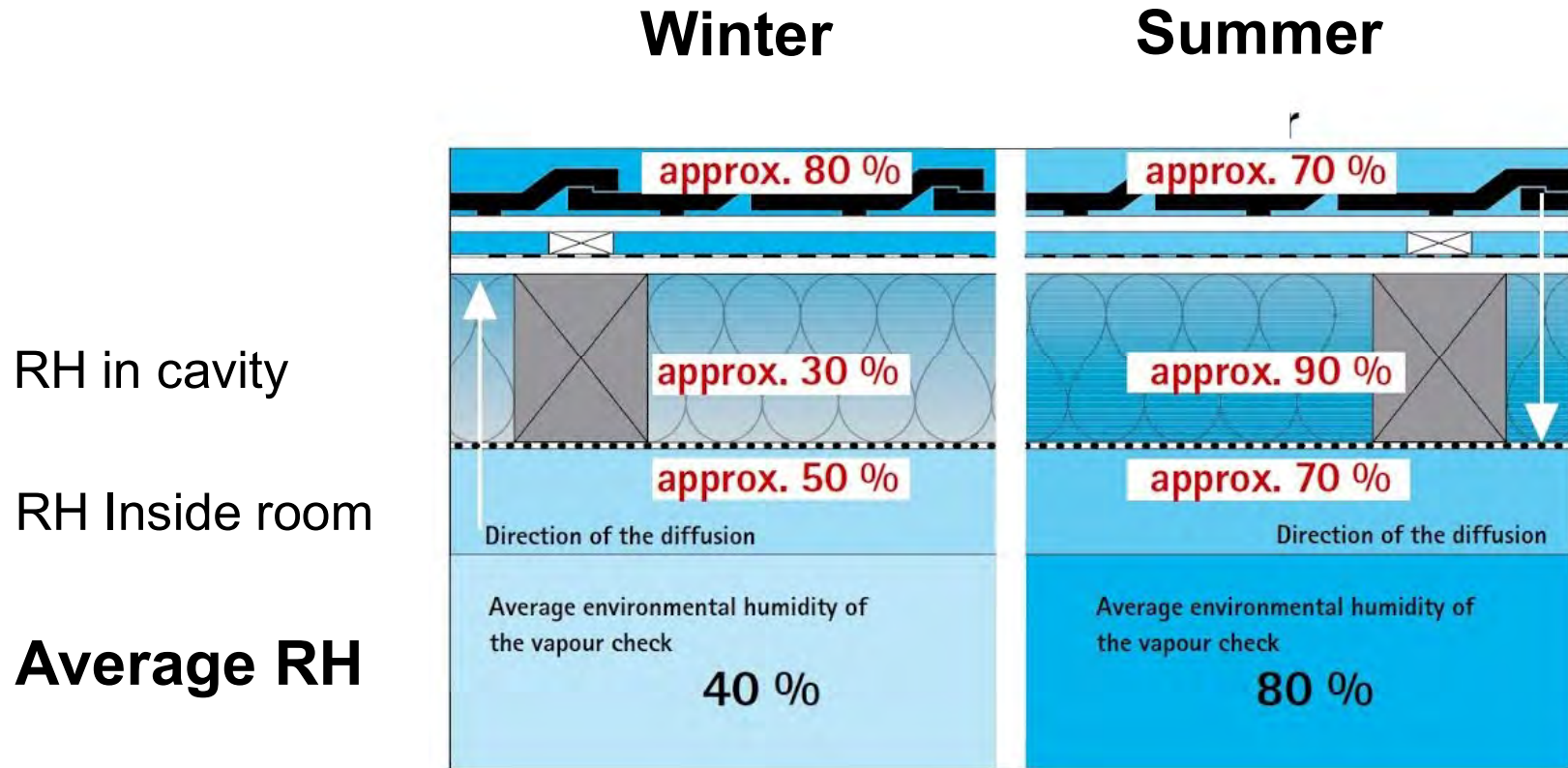


From vapor closed in winter (0.13)
to vapor open when vapor drive is reversed (summer)>13

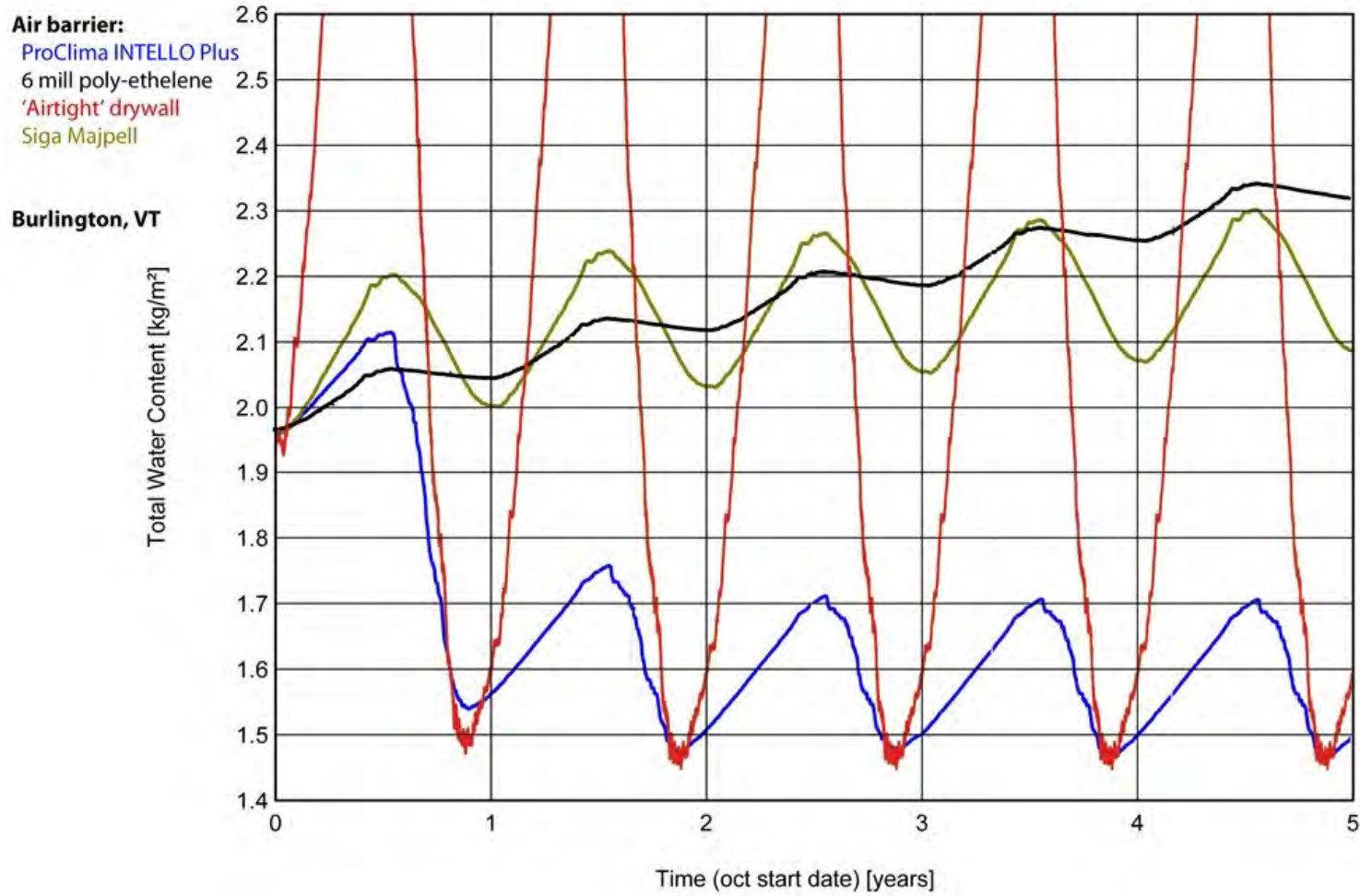
Factor 100x

vapor Intelligent Membrane

Responds to the *average adjacent* humidity exposure



Unvented VB envelopes w/ Fiberglass



See blog post: [Yes, Unvented Roof Assemblies Can Be Insulated With Fiberglass – A WUFI Post](#)

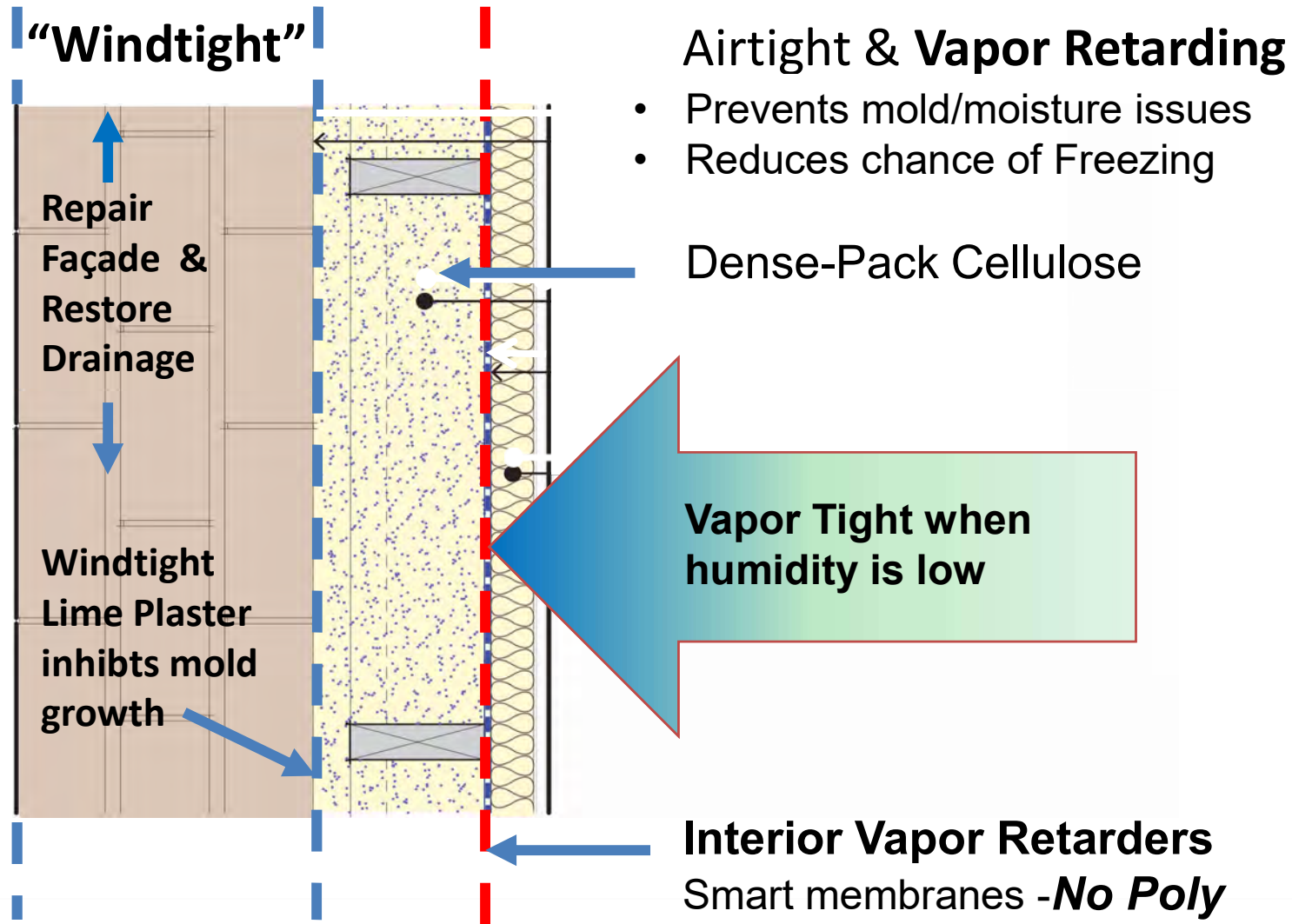


Intelligent vapor variable Membrane

Ideally suited for:

1. Meeting Code for Class II vapor retarders.
2. Assemblies with significant vapor retarding or vapor closed outboard layers.
3. Historic Masonry Retrofits
4. Fibrous Insulation
5. Highly insulated assemblies
6. Where increased drying reserves are desired

Historic Masonry retrofit





Airseals Dependent on **Control Layer Continuity and durability**



Durable connections are essential

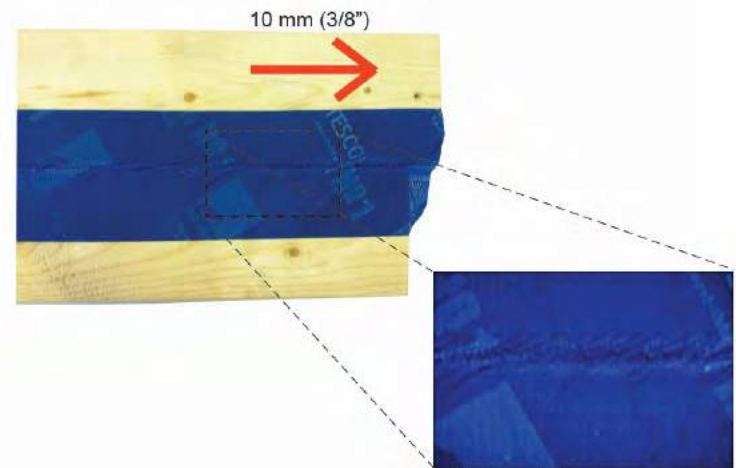
Traditional

- Many sealants dry, embrittle and fail over time



Modern approach

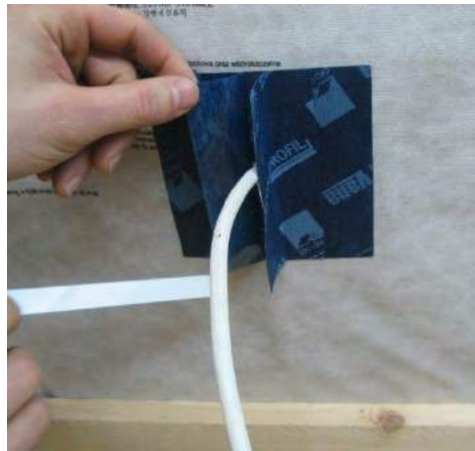
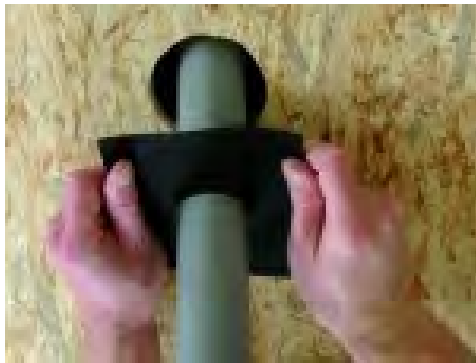
- PSA tape connection adhesives can move with materials
- 100 year performance



...it doesn't tear
air tightness not compromised

Wire and pipe penetration sealing

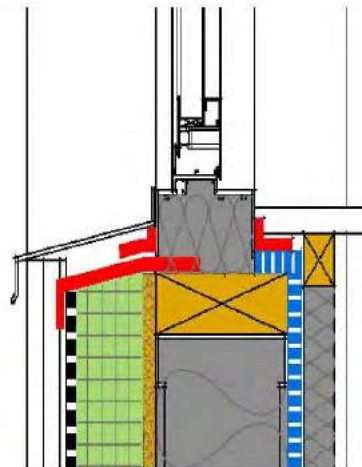
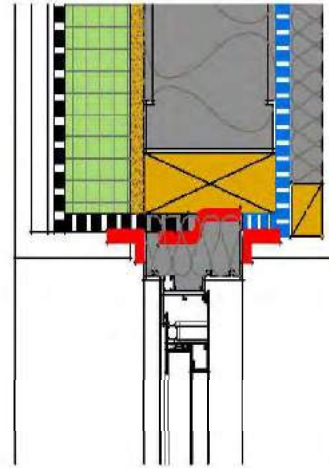
Allow for **room** to gasket properly



Credit: Ed May, BldgTYp

Window penetration sealing

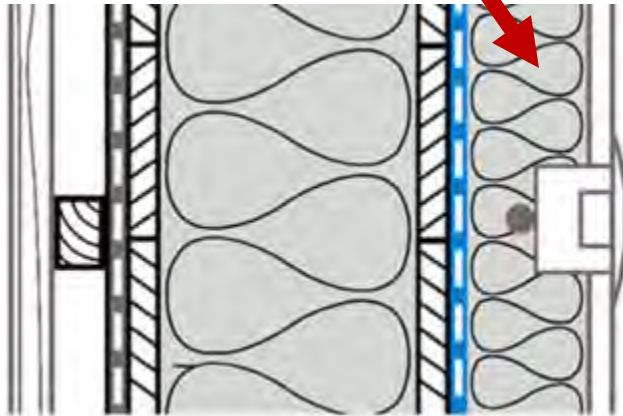
seal both sides (for condensation and best installed PSI values)
Exterior taped seal should be vapor open





.....and a *Service Cavity*

Service cavity
protects airtight
layer



Plan View



Verify air tightness



Before finishes go up (so you can fix leaks) & before project hand over (code compliance)



Thank you.
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Questions?

