

Moisture:
How to Prevent Problems and
Find Solutions

**Affordable Comfort Track At
RESNET National Conference
2006**

Moisture Problems

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 - Administered CABO/IECC Model Energy Code for eight years
 - Several Indoor Air Quality Certifications
 - Former contractor
 - Consulting, diagnosing performance problems in homes and commercial buildings, training

The House Is A System

- High Performance Homes Are...
 - *Healthy*
 - *Safe*
 - *Efficient*
 - *Durable with Low Maintenance*
 - *Comfortable*

Let's Agree On Some Basics.

- **Problems With Mold, Rain, Condensation and Comfort Have Increased.**
- **Builders (and Insurers) Are Shouldering Huge Liability and Financial Costs.**

Where Do We Go From Here?

- What Do These Failures/Problems Have in Common?
- How Do We Go About Eliminating Them ?



Avoiding Moisture Problems - *The House Is A System*

- Mold Basics

Mold Basics:

- Water Only Moves 4 Ways:
 - *A – Air Transported*
 - *B – Bulk (Liquid)*
 - *C – Capillary Suction*
 - *D – Diffusion*

Mold Basics:

- **A, B, C, D, it's that easy!**
- **You must take control of moisture to control mold.**
- **It can only grow in wet or humid environments.**
- **Most are not particularly harmful, but some can do real, permanent damage to the lungs, kidneys, liver and brain.**

Houses Are Wetter Today Because...

- They Are Tighter, but
- They Are Better Insulated too
- The A/C's Dehumidify Less Effectively.
- The Exhaust Fan Flows Are Up.
- Many Materials Today Are Less Forgiving

Mold Basics:

- **Mold is an Indicator of Poor Moisture Management.**
- **The NAHB tells us that over 80% of all builder warranty/callback dollars are spent to repair moisture related problems.**

Second Law of Thermodynamics:

- Why Southern Homes Dry *IN*
When Yankee Homes Dry *Out*?
 - Texas Air, Yankee Air and What You've Always Heard About Water Vapor Control
 - Climate Correct Best Building Practices

Second Law of Thermodynamics States That:

- Heat Moves From Warm to Cold.
- Moisture Moves From Warm to Cold and From Wet toward Dry.
- Air Moves From High to Low Pressure.

Controlling Moisture – Vapor Barriers

- **Not Required in most of US by 2006 building/energy codes. (IRC/IECC)**
- **They Should Either Be Eliminated or If You Really Feel Better With One, Put it On the Outside of the Wall!!**
- **Rigid Board Insulation, #15 Building Paper, OSB or Plywood are great low perm vapor retarders.**
- **House Wraps are NOT vapor retarders!!**

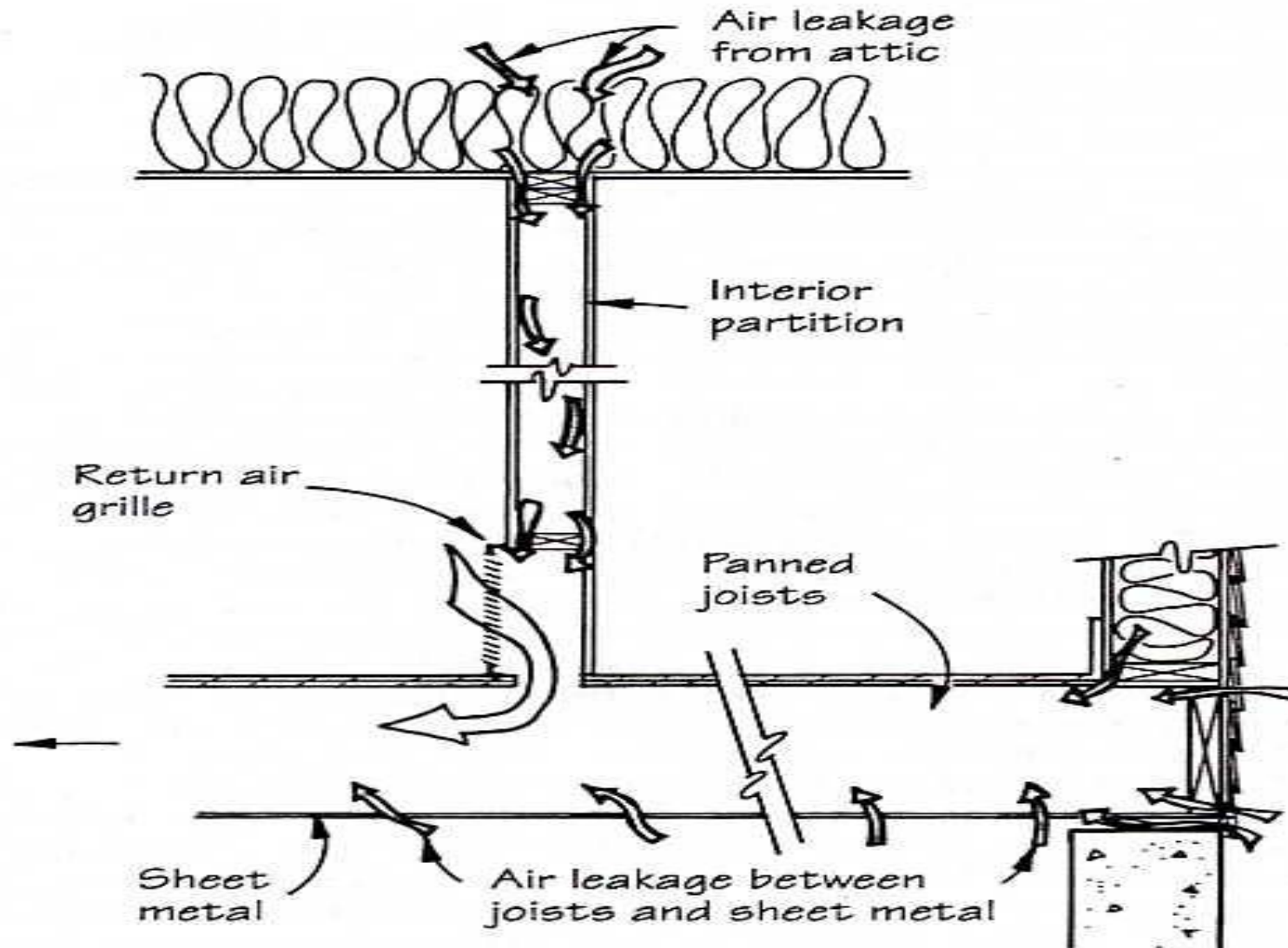
Avoiding Mold Problems - *The House Is A System*

- *HVAC System:*

How Much Do Ducts Leak?

- Studies by Texas utilities, cities and universities found leakage averaging 30% of rated airflow!
- U.S. Dept. of Energy research found the same leakage across the nation.
- This costs us all a fortune, as in Billions of dollars each year!
- They cause very high indoor humidity levels, too!

Using Building Cavities as Ducts



Basic Envelope Construction

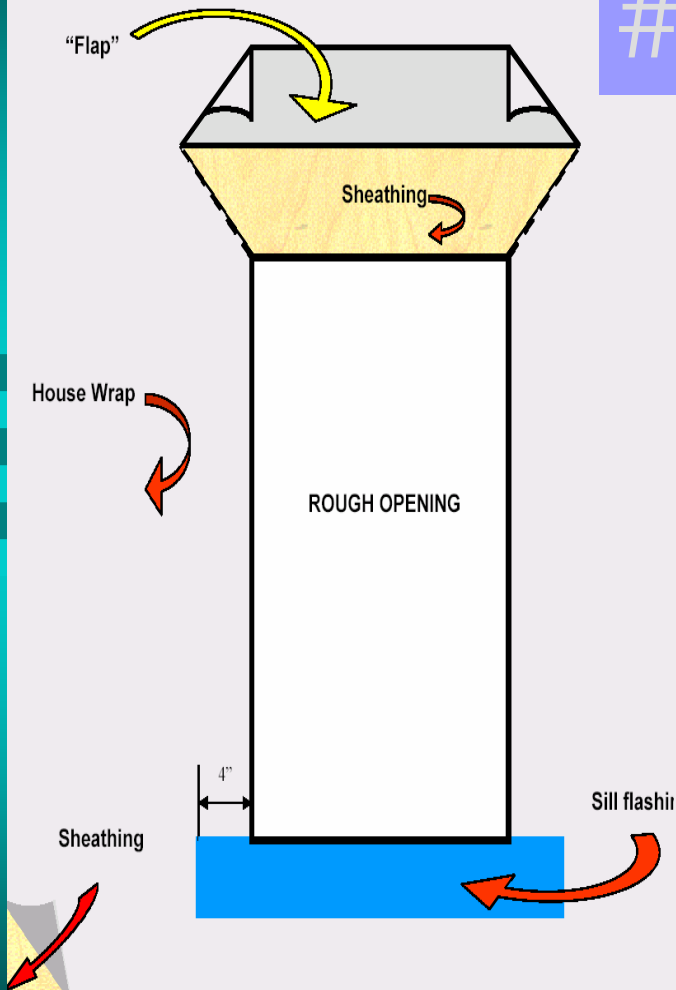
- *Moisture Control Strategies:*
- **Good Thermal, Air, Vapor Barrier:**
 - Never depend on caulk to control water entry, *flash and install a drainage plane!*
 - Correct flashing, window wrapping details direct water out of walls on top of DP
 - Exterior vapor retarder slows vapor penetration from outside air, aids A/C

Basic Envelope Construction

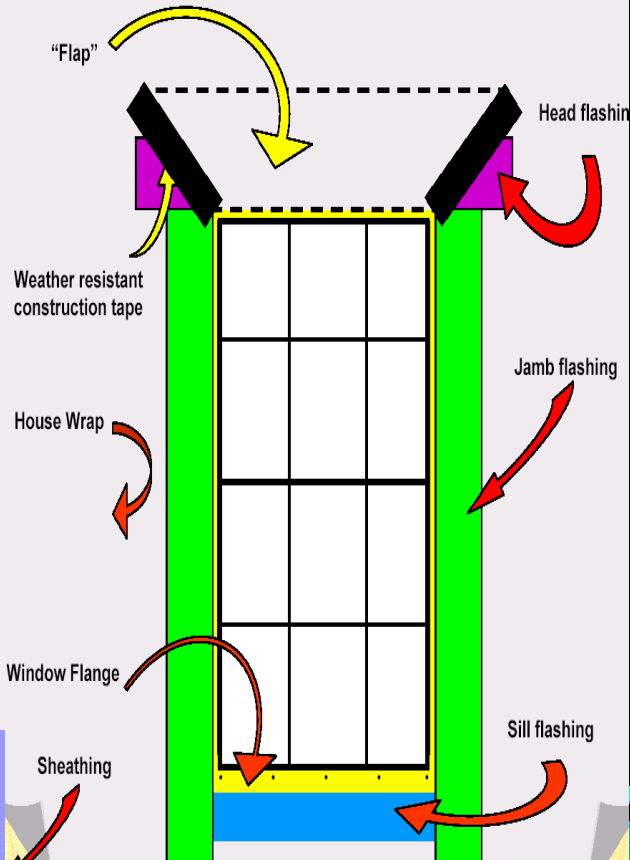
- **Wrapping A Window:**
 - **Install Drainage Plane to Rough Opening**
 - **Install Drainage Pan with ends turned up**
 - **Caulk Between Flanges and Drainage Plane Except the Bottom**
 - **Install Window**
 - **Install Lower Window Membrane**
 - **Install Side Window Membrane**
 - **Install Upper Window Membrane**

Window Flashing – After the Drainage Plane

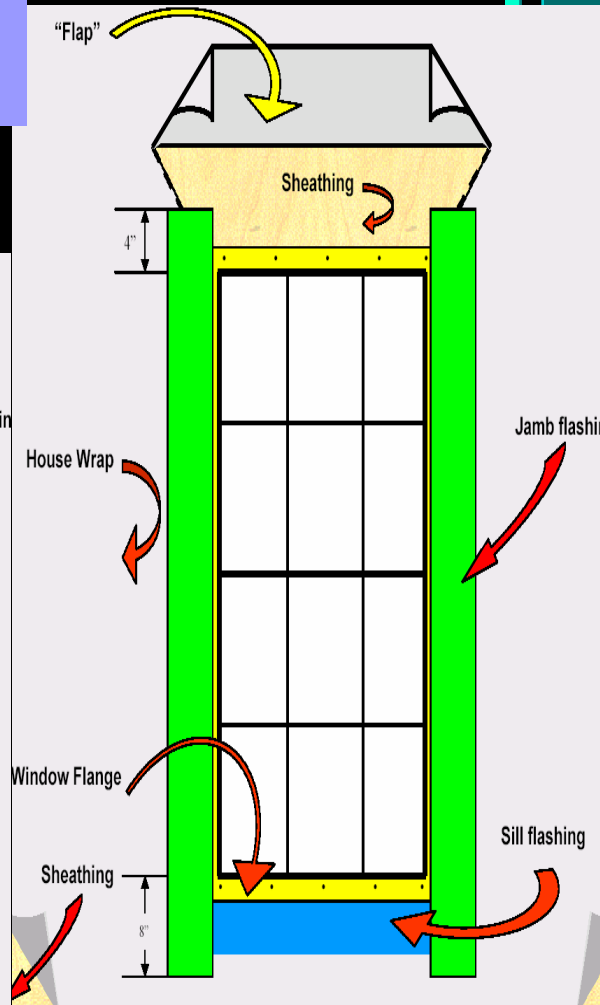
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Avoiding Moisture Problems

- Moisture travels in limited ways.
- If we think about the 4 ways moisture moves we can by elimination determine how and why a component is wet.
- Don't limit your thinking to leaks.

Avoiding Moisture Problems

- **Remember that fans, ducts, poorly installed insulation, air leaks, oversized A/C's, bad vapor barriers and more can be the root cause of the moisture you find.**
- **Moisture related problems are very commonly due to more than a single factor gone bad.**

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