Moisture and Energy Consequences of a Tight Residential Envelope

2014 FESC Workshop
May 12-13, 2014 Gainesville, FL

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• Two identical side-by-side 1536 ft², concrete block, slab-on-grade residences
  – Single pane fenestration, evenly distributed
  – No concrete block wall insulation
  – R-19 ceiling insulation
  – SEER-13 w/strip heat HVAC systems
  – Sensible gains ≈ 15.5 kWh/day
  – Latent gains ≈ 12.1 lb H₂O/day (1st winter)
Enclosure Air Leakage Set-Up

- Both home enclosures air-tightened to achieve 2.1 ach50
- Leaky home configured with 4 controllable ceiling leakage sites providing ~70% of leakage area needed to achieve ~8 ach50
- Remaining 30% of leakage area in leaky home achieved using metal shims at all windows.
Winter Average Day Heating Energy

Winter Window Condensation Results in Mold in Tight Home
Summer Data: AC energy use October 2012; Tight house unvented and then vented

No mechanical ventilation

Supply 63cfm ventilation