Field Monitoring of Wall Vapor Control Strategies in the Pacific Northwest

ACEEE Summer Study on Energy Efficiency in Buildings

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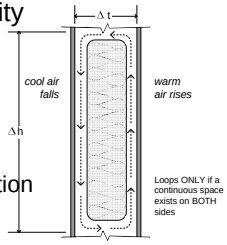
Background: Vapor Control

- IRC 2007 vapor control code changes
- Class I (<0.1 perm) or Class II (0.1 < perm ≤ 1.0 perm) required in Zone 4C (Marine)
- Class III (1.0 < perm ≤ 10 perm) allowed with permeable exterior
- High wintertime interior RH typical in Zone 4C

Background: Cavity Insulation

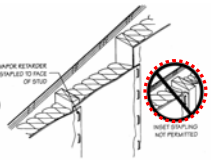
- Convection within cavity
- Function of:
  - insulation density
  - ΔT across insulation
  - air spaces/voids
  - cavity height & orientation
  - gaps at top/bottom
- Plus moisture movement



A: Air Loops Around Insulation
Straube & Burnett 2005

Background: Inset Stapling

- Common practice (drywall installation)
- Forbidden in WA state code
- Allowed by some manufacturers (tested this way)
- Energy penalty with inset stapling (~3%+) (Christian et al. 1998)



Washington State University Extension Energy Program (2004)

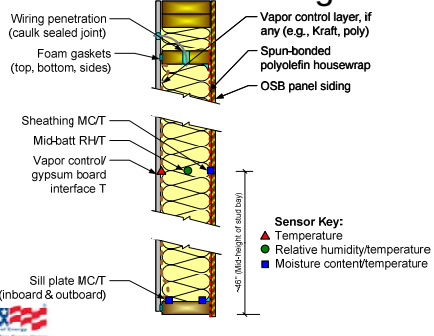
Test Site

Test Site

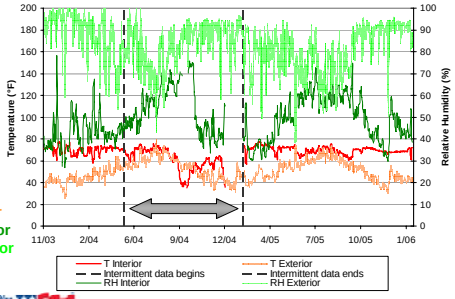
Test Site

Test Wall Materials

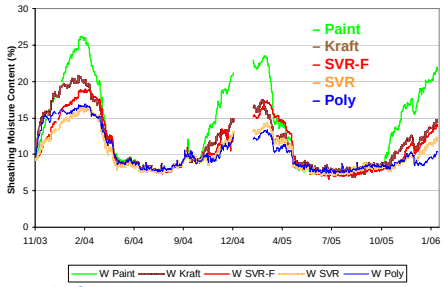
Instrumentation Package



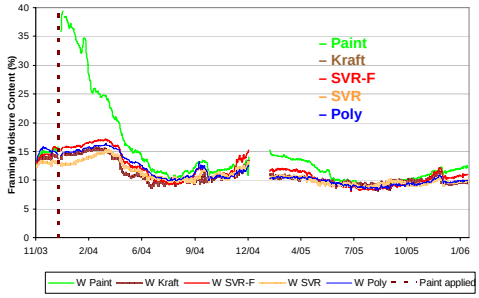
Results (Boundary Conditions)



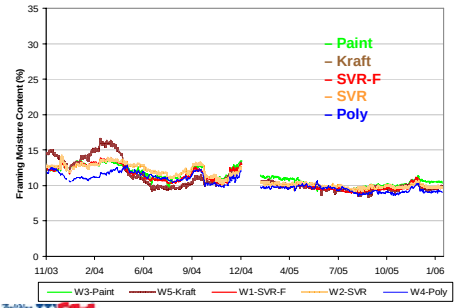
Sheathing Moisture Content (W)



Ext. Sill Plate Moisture Content



Int. Sill Plate Moisture Content



Disassembly/Decommissioning

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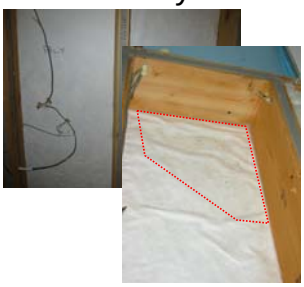
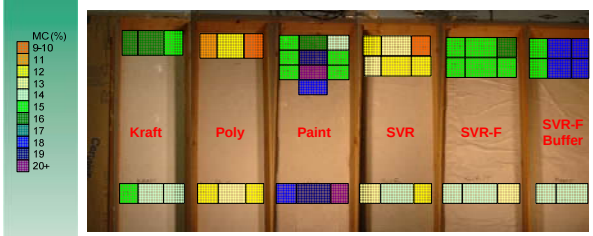


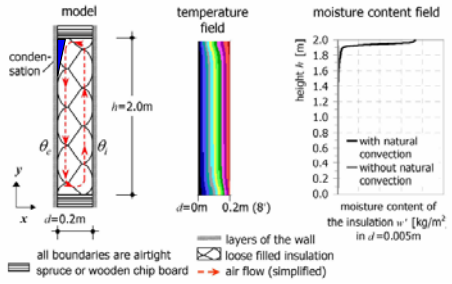
Disassembly/Decommissioning

Spatial Sheathing MCs (W)

Spatial Sheathing MCs (S)

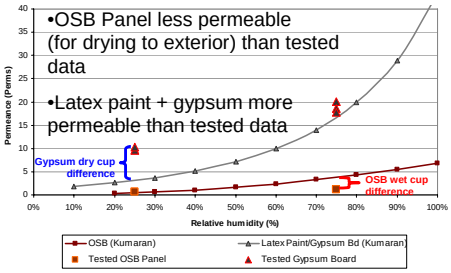


Convective Looping



Reisener et al. 2004

Vapor Permeability Testing



Analysis & Conclusions

- Latex paint (Class III) not acceptable as interior vapor control in Zone 4C
- Class II vapor retarders (Kraft/SVR) acceptable
- Class I vapor retarder (poly) acceptable
- Convective looping from inset stapling causes moisture transfer, bypassing vapor retarder
- Further reason to eliminate this practice
- No sign of convective looping <u>through</u> insulation

Acknowledgements

- U.S. Department of Energy Building America Program
- CertainTeed
- University of Waterloo Building Engineering Group

Questions & Comments

Test Facility Interior