SCHOOL OF CONSTRUCTION AND THE ENVIRONMENT

Field Investigation on Moisture Buffering effect of materials on Indoor Environment & Energy Efficiency

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Acknowledgements

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References

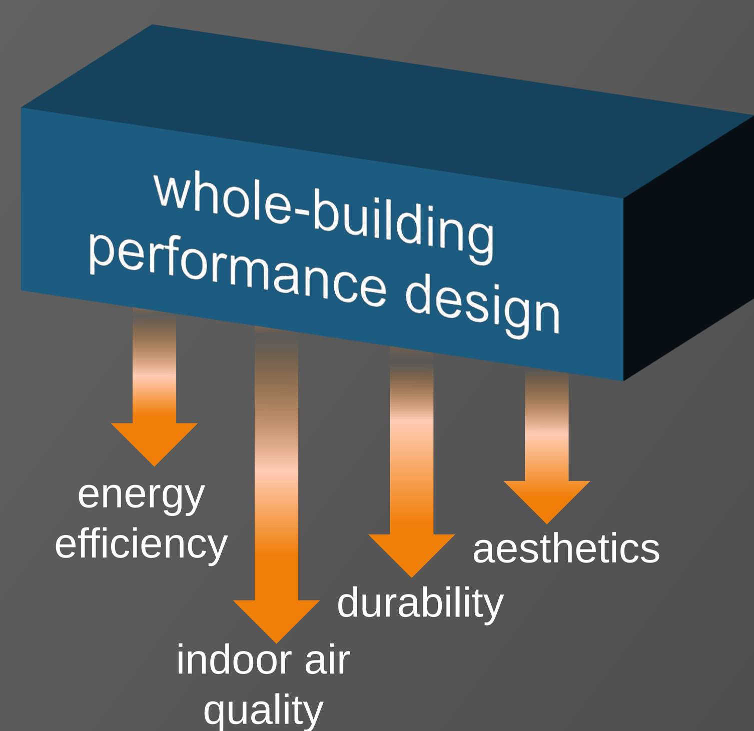
Rode, C. & Woloszyn, M. IEA Annex 41 (2007)

Svennberg, K., Lengsfeld, K., Harderup, L.E., Holm, A., (2007)

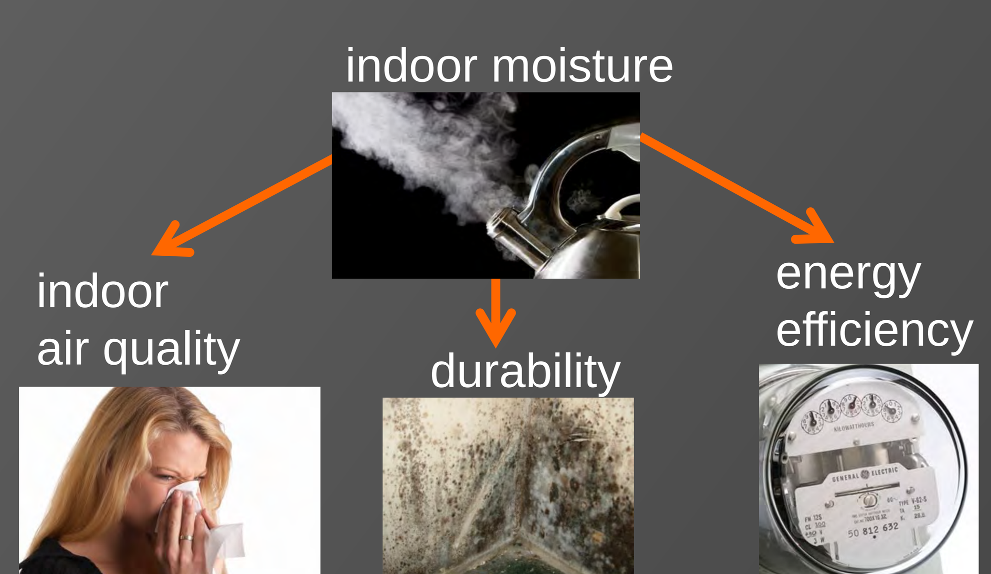
INTRODUCTION

What is whole-building performance design?

An approach developed by designers and researchers for optimizing all pillars of building design – durability, good indoor air quality, energy efficiency, and aesthetics – for obtaining healthy buildings. It involves the consideration of heat, air, and moisture (HAM) transfer and control in a building.

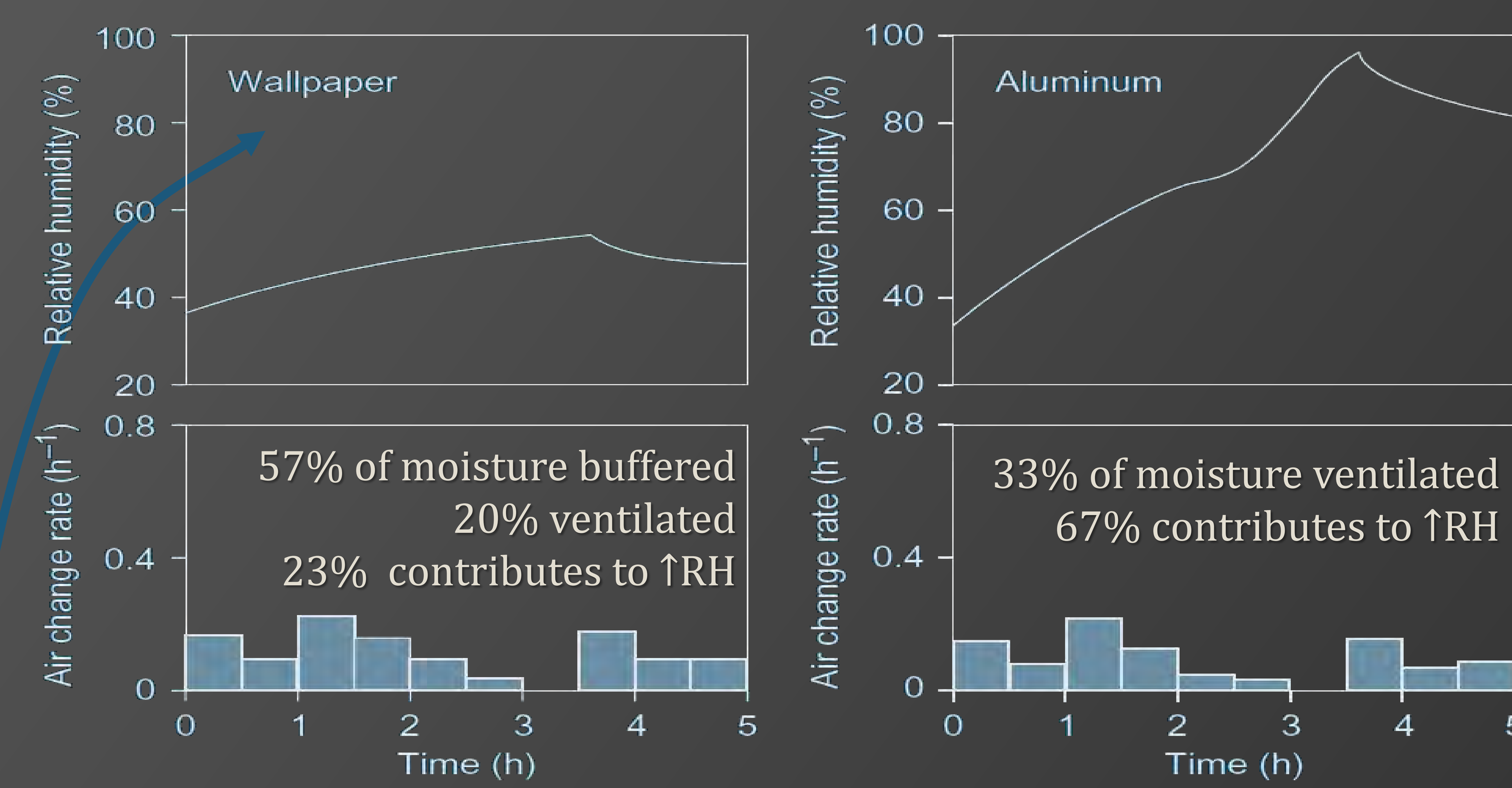


6 factors affect indoor moisture levels such as moisture sources, mechanical equipment, surface condensation, absorption by materials, and occupants. Indoor moisture then dictates IAQ, durability, and energy efficiency.



What is moisture buffering?

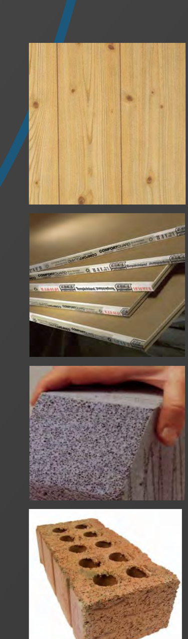
The ability of hygroscopic materials to absorb moisture when RH levels are high, and release moisture when RH levels are low. This creates a regulating effect in RH peaks.

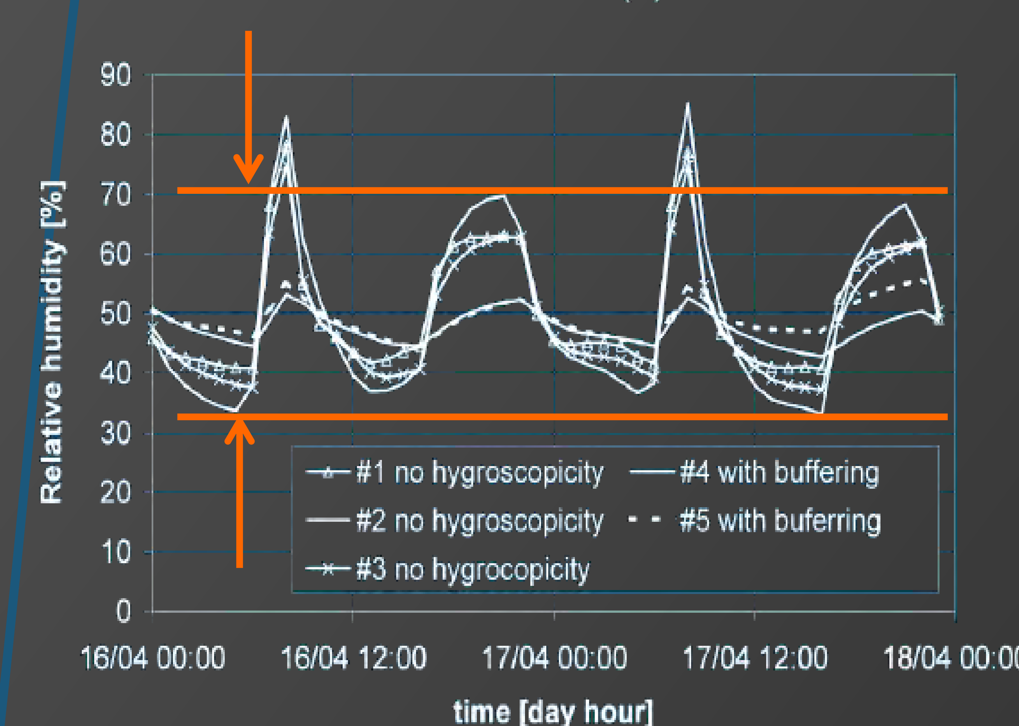


Common materials

in North American construction have moisture buffering capabilities but there are no clear performance criteria for designers.

- Gypsum wallboard
- Fiber bonded wood cement
- Wood paneling
- Cellular concrete
- Interior wall plaster
- Interior brick





Reducing indoors RH

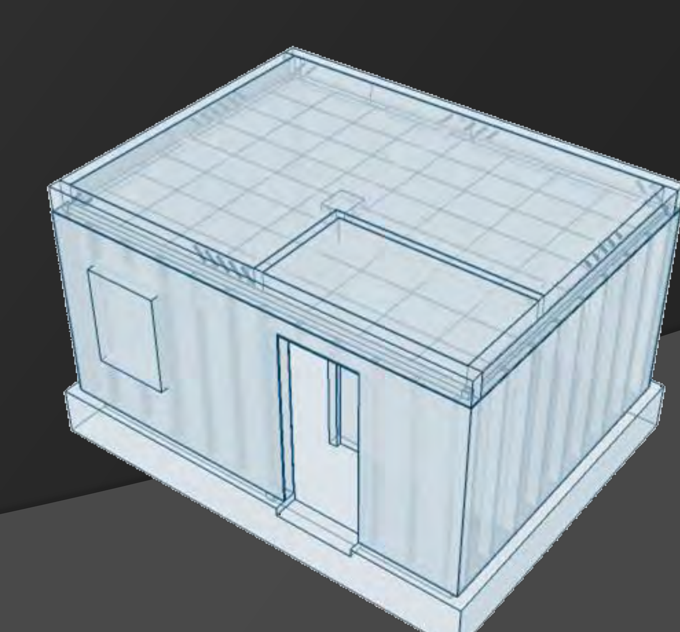
peaks can reduce percentage of time surfaces reach dew-point, decrease the chance of microbial germination and growth, improve perceived IAQ, decrease ventilation needs, and prevent over-sizing of air-conditioning equipment.

OBJECTIVE

Find viable moisture buffering materials that will maintain RH and IAQ at acceptable and stable levels in conjunction with mechanical ventilation at the most efficient rate and schedule possible while avoiding condensation and building envelope durability issues in a mild climate.

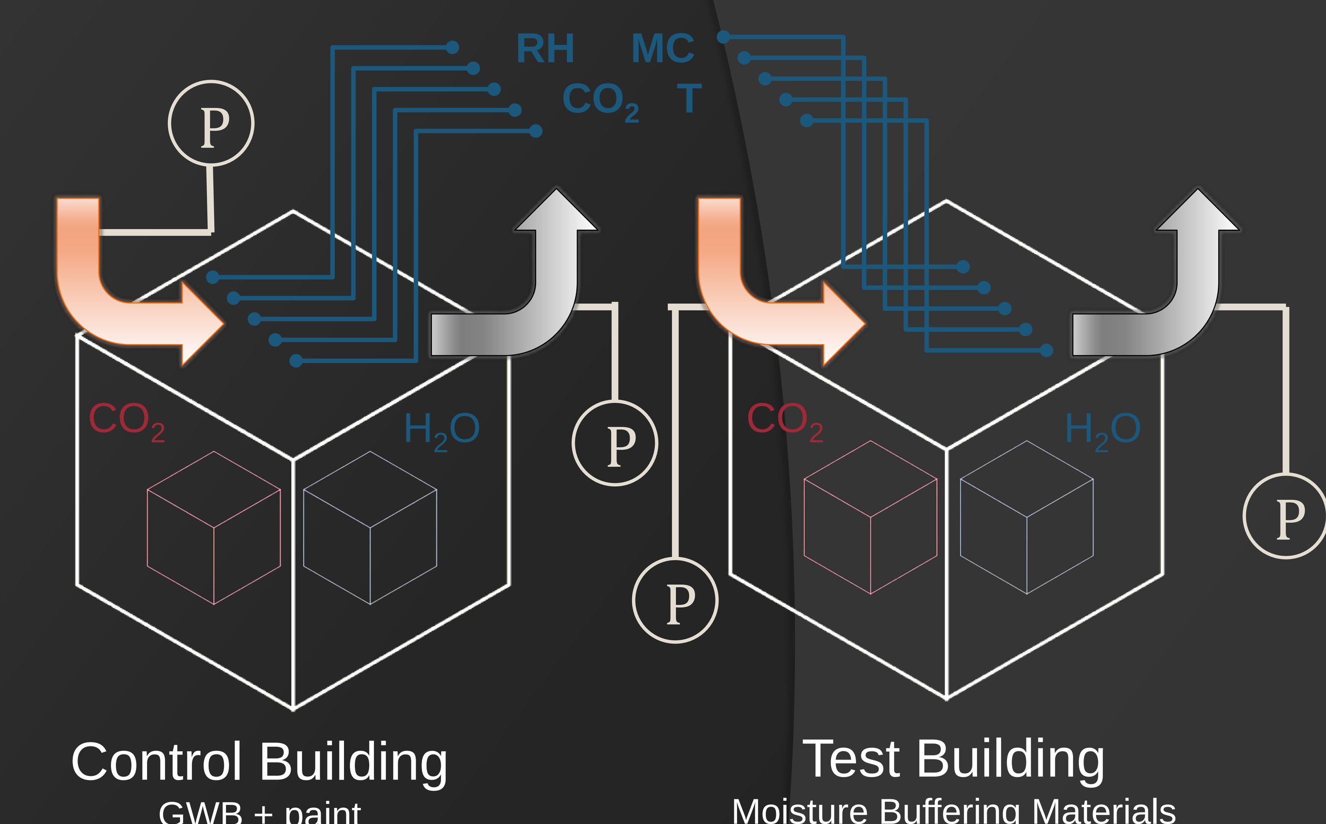
Research Program at BCIT

Two identical test buildings will be monitored to compare the effects of different moisture buffering materials on indoor humidity and energy usage required to run the ventilation system. The buildings will be located in Burnaby, BC, an area characterized by mild climate. The modular test wall assemblies for both buildings will be standard 2x6 wood frame.



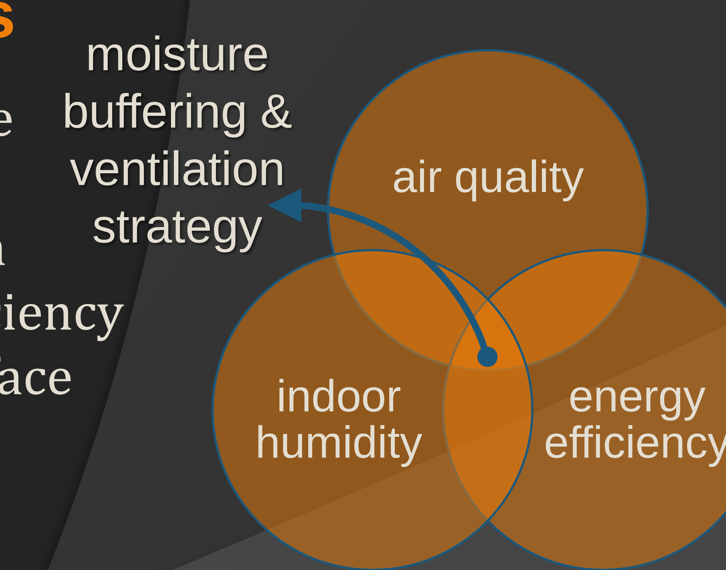
METHODOLOGY

Both test buildings will be outfitted with moisture pin, thermocouple, carbon dioxide, and RH-T sensors on the exterior, interior, inside of test wall panels and inside the test space. The ventilation and AHU systems will be connected to a power meter to collect power consumptions readings. Inside each building, a humidifier and carbon dioxide source will be placed and programmed to simulate occupants activities.



Expected Findings

Optimization of moisture management (moisture buffering and ventilation strategy) for energy efficiency without presence of surface condensation, while maintaining acceptable indoor air quality.



Contributions from this research

will be the establishment of performance criteria based on material properties, collection of field data, and determination of effect of moisture buffering performance of materials on ventilation energy efficiency and durability in a mild climate. It can also lead to the betterment of moisture prediction design tools.