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BSC4300 - BUILDING SCIENCE PROJECT
ALGONQUIN COLLEGE
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Projects

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  • Bachelor of Building Science
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• Peterborough PH Apartments
  • 12-unit MURB
  • 2-bedroom units, 800-900 SF
  • Occupied August 2016
  • Natural gas for heating and hot water

• Wolfe Island Passive House
  • Single-family dwelling
  • CLT construction
  • Occupied November 2016
  • 100% electric resistance heating and hot water

• Occupancy data-logging
  • Indoor Temperature
  • Relative Humidity

• Post-Occupancy Energy Performance
Peterborough: Temperature

- Data-logged 5 units
- 22.8°C to 26.3°C (73°F to 79°F)
- 4/12 units required heating
- First floor: no heating
- 202 heated Dec-Jan
- Third floor: quickest cooling rate

- Vacation Dec. 20-28
  - 20-25th: Settles at 14°C
  - Dec. 26, 11:00am: 9°C
  - Dec. 28<sup>th</sup> from 3pm to 11pm
    - 15°C to 22°C
    - 59°F to 72°F

![Graph showing temperature data for Peterborough apartments](image)
Peterborough: Relative Humidity

- All apartments have independent HRV
  - Tenants only control booster switch
  - Peak early September: 70%
  - Low mid January: 15%

- September: Units running AC = steady RH
- November 2016
  - Unit 101: retired couple
  - Mid-November: Outdoor temperatures cooling down
Peterborough: Energy Performance

- **Electricity**
  - **August:**
    - Building not fully occupied
    - HOT2000 includes cooling
  - **September:** temporary electric HWT
  - **Dec-March:** Actual 10-17% more than simulation

- **Natural Gas H+HW**
  - **September:** re-commissioning boiler
  - **HOT2000:**
    - Simulation heats Dec. to Feb.
    - Designed for existing and Code buildings
Peterborough: Builder/Owner POE

- Builder/Owner very satisfied with the performance
- 8000 BTU/h Portable A/C units installed due to overheating
  - Will install wall units
- Lessons learned:
  - Install A/C during construction phase
  - Alternatively: mini-split heat pumps for heating and cooling
  - External shading louvers on south side windows
  - Glycol preheat/defrost loop for ventilation system
Wolfe Island: Temperature

- Until Dec. 14\textsuperscript{th}: 1kW portable electric heater
- Dec. 14\textsuperscript{th}: installed 2kW Thermolec heating element
- Vacation Dec. 20 to 30
  - Dec. 25\textsuperscript{th}, 3:00pm: 18.4°C (65.1°F)
  - Dec. 28\textsuperscript{th}, 9:00am: 14.1°C (57.4°F)
- Solar heat gain
  - Warm-up periods from 9:00am to 3:00pm
  - Homeowner experience
- Lowest temperature Dec. 29\textsuperscript{th}: 13.0°C (55.4°F)
- Homeowners kept house at 18 to 20°C
Wolfe Island: Relative Humidity

• Zehnder ComfoAir-200 ERV

• Occupancy
  • Until November 21: moving-in
  • Dec. 4: ERV balanced
  • Dec. 20 to 30: away on vacation

• Four-month period RH
  • Average: 44%
  • Peak: 58% (2-4 hours)
  • Low: 37%

• December 2016
  • Vacation
  • No occupants
  • ERV functioning
  • Average RH 48%

• Comparison with Peterborough
  • ERV
  • CLT
Wolfe Island: Energy Performance

• HOT2000
  • Heating Dec. to Feb.

• PHPP
  • Heating Nov. to March

• Results
  • HOT2000 overestimates baseload consumption April and May
  • HOT2000 underestimates heating consumption
Wolfe Island: Homeowner POE

• Homeowner is very satisfied with the energy and passive house aspects of the house

• Constructability:
  • Importing CLT from Germany limits home design by length of shipping container
  • Cover CLT quickly during construction to protect from rain
  • Larger crew for assembly

• Future renewable energy projects
  • PV array with battery storage
  • Solar thermal hot water system
  • Homeowner blog
  • wolfeislandpassivehouse.wordpress.com
Thank You

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