Passive House at YorkU

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What is Passive House?

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What is Passive House?

Cornell Tech Residence, NYC

- → Passive design as a general concept is ancient
- → "Passive House" is a system with defined requirements for extremely energy efficient buildings; "EnerPHit" is slightly altered program for tricky existing building retrofits
- → Primary focus on building enclosure
  - → Emphasis on comfort and IAQ
- → Applies to any building type
- → Achievable in any climate
- → Est. 60,000+ buildings

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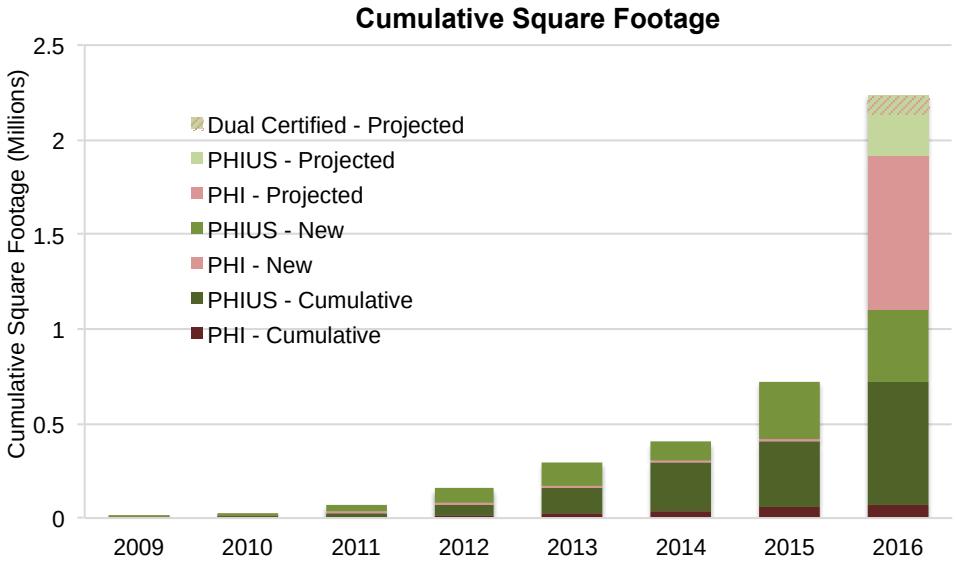
What is Passive House?

→ We care about sustainability in buildings

→ As consultants, generally take a neutral stance on different green building approaches (LEED, Net Zero, etc.)

→ But worth noting that we are seeing Passive House projects dramatically outperform other green buildings in terms of energy performance

→ And we're not alone in this observation…



CITY OF VANCOUVER

TORONTO

Why Passive House?

→ Addresses heating demand and overall energy use

→ Requirements for occupant comfort

→ Built-in quality control during construction

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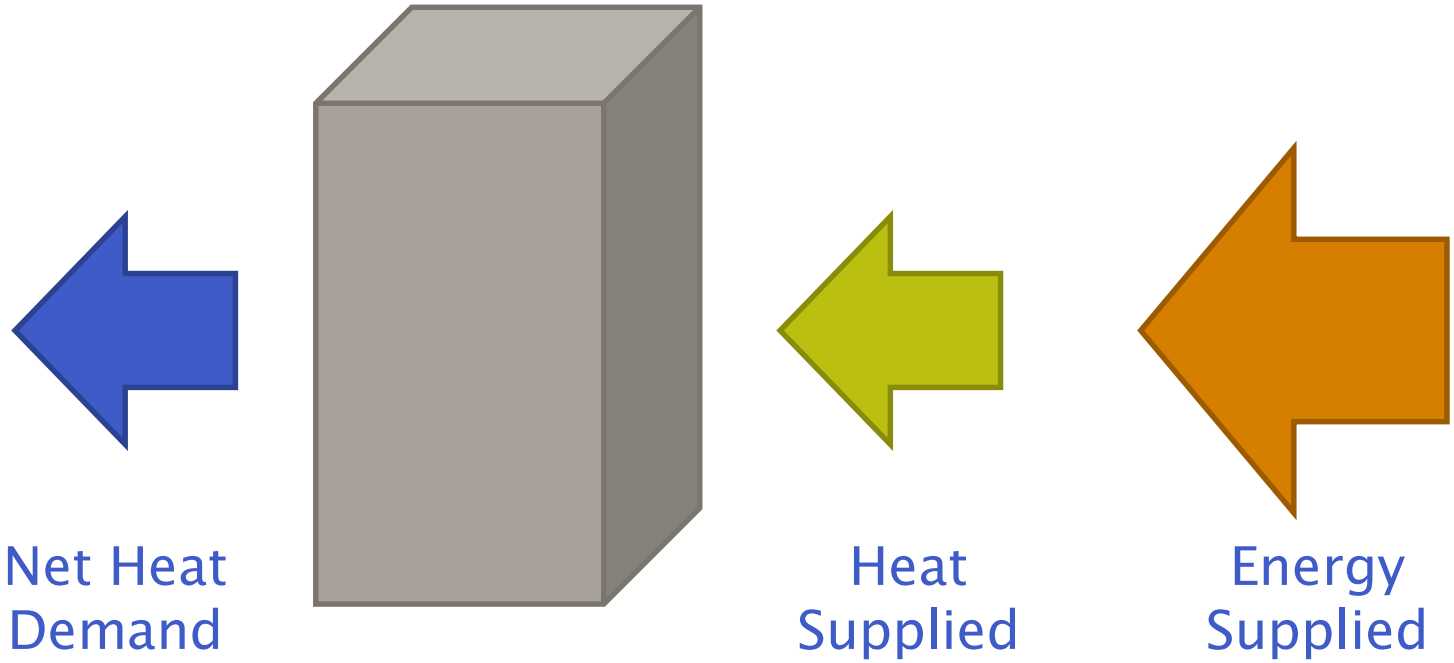
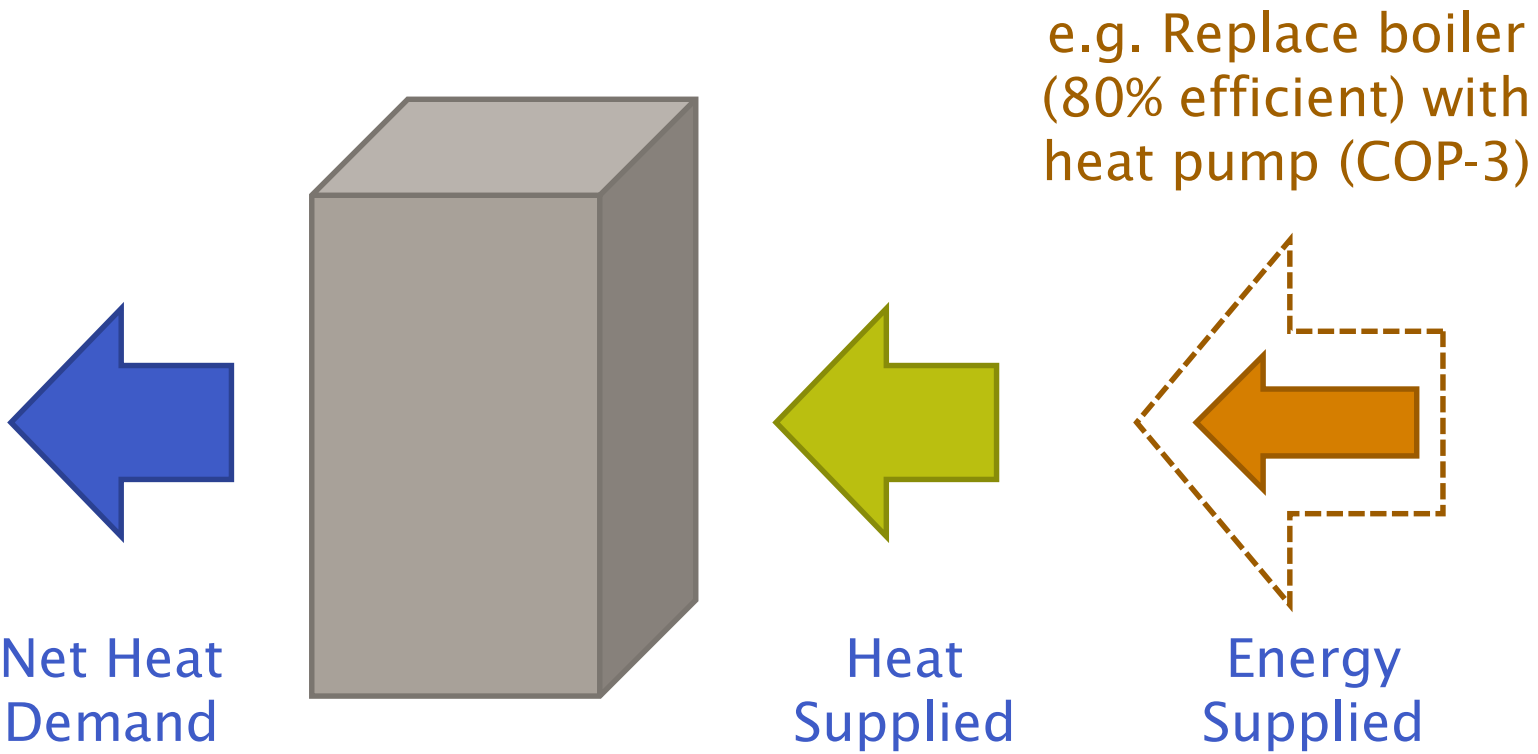
Addressing Heating Demand

→ Heating energy consumption



Addressing Heating Demand

→ Heating energy savings from *equipment efficiency*



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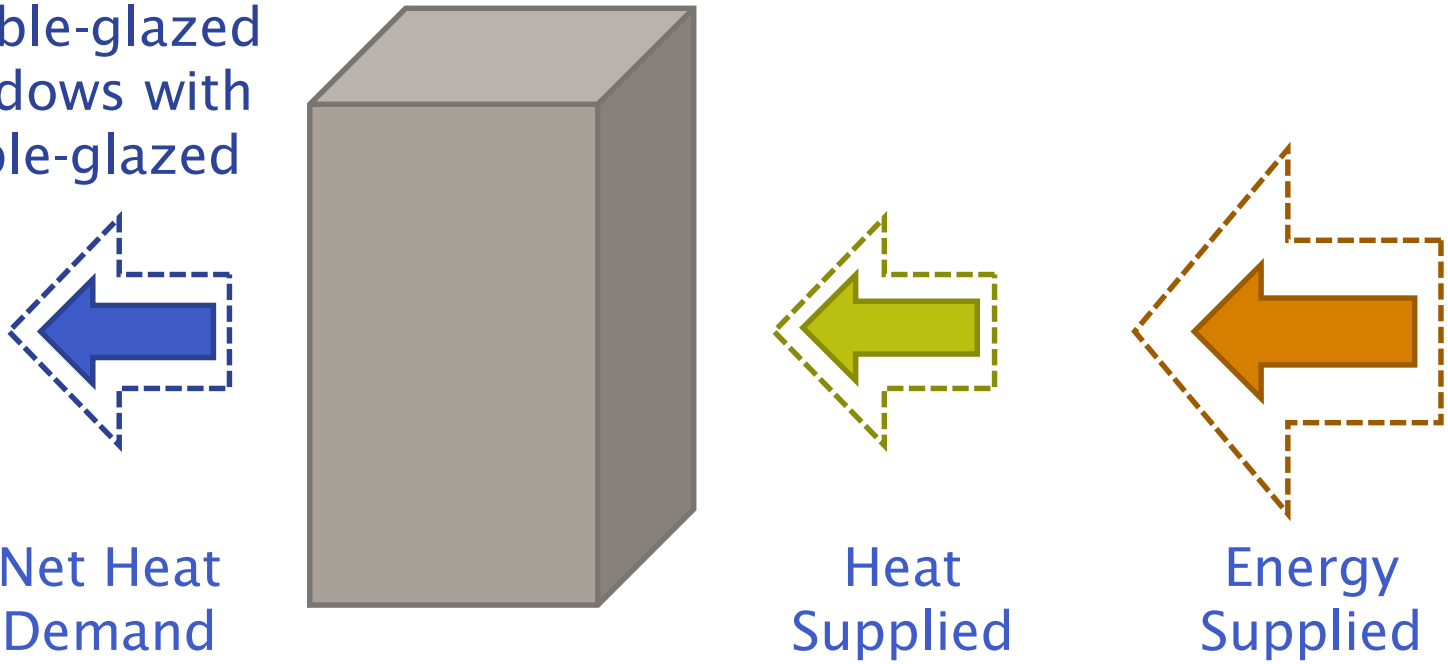
Addressing Heating Demand

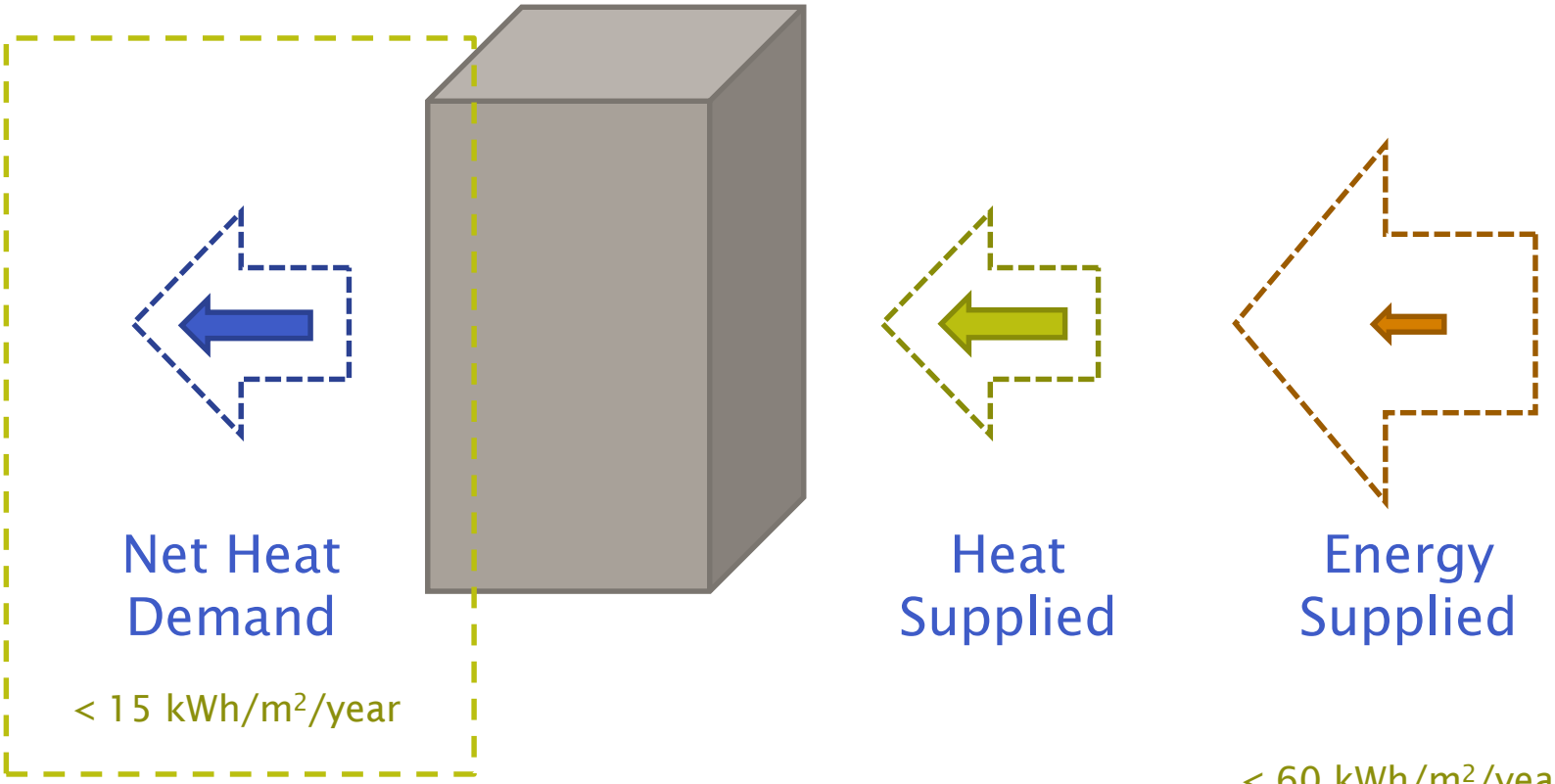
→ Heating energy savings from *reduced heating load*

e.g. Replace double-glazed windows with triple-glazed



Addressing Heating Demand

→ Passive House is the only approach that has explicit requirements to reduce the heating demand first ("*passive strategies*"), as well as considering equipment efficiencies.



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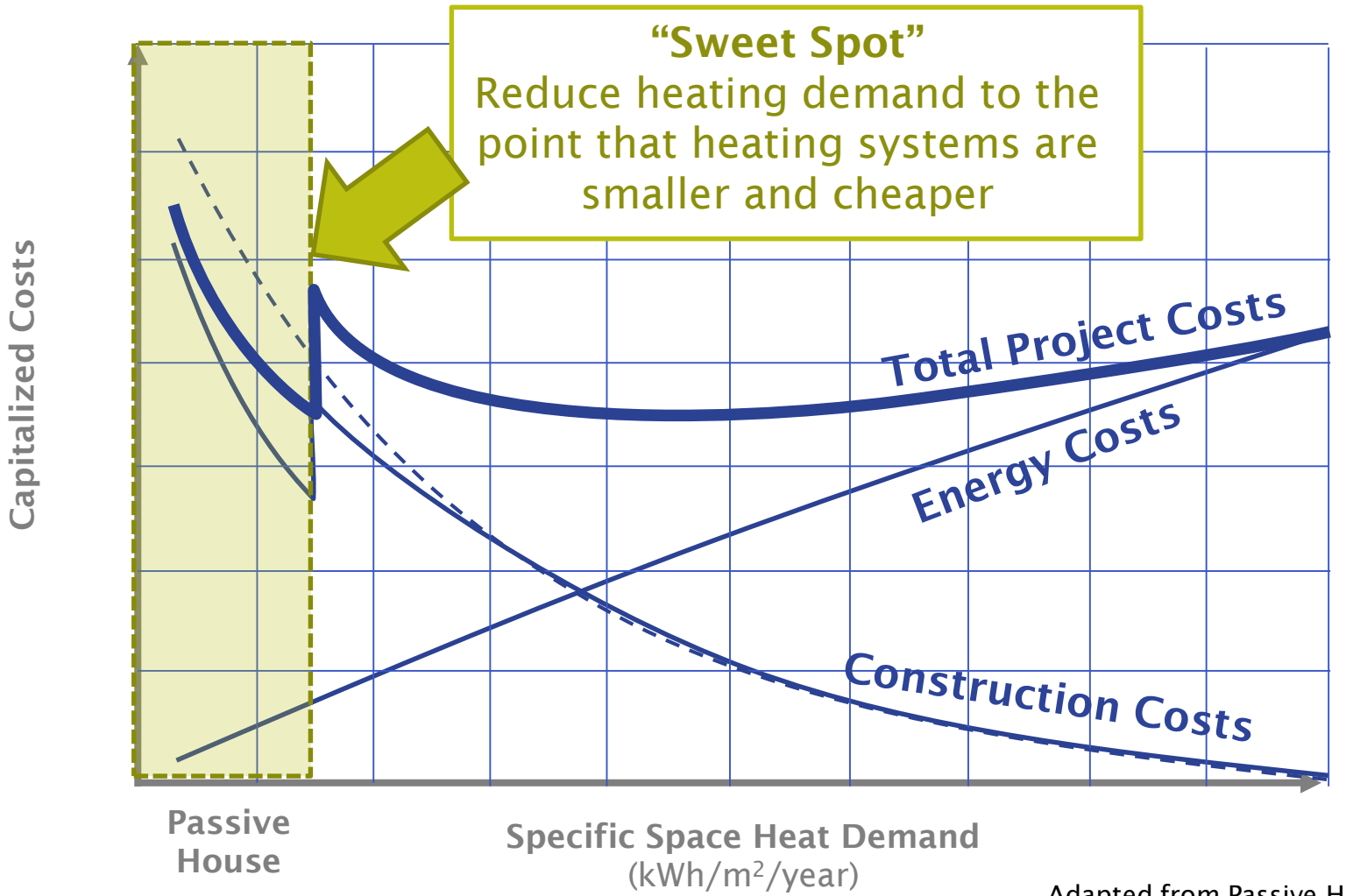
Addressing Heating Demand

→ Passive House heating demand target: < 15 kWh/m²/year is the "sweet spot" of energy performance and capital cost



Adapted from Passive House Institute

Addressing Heating Demand

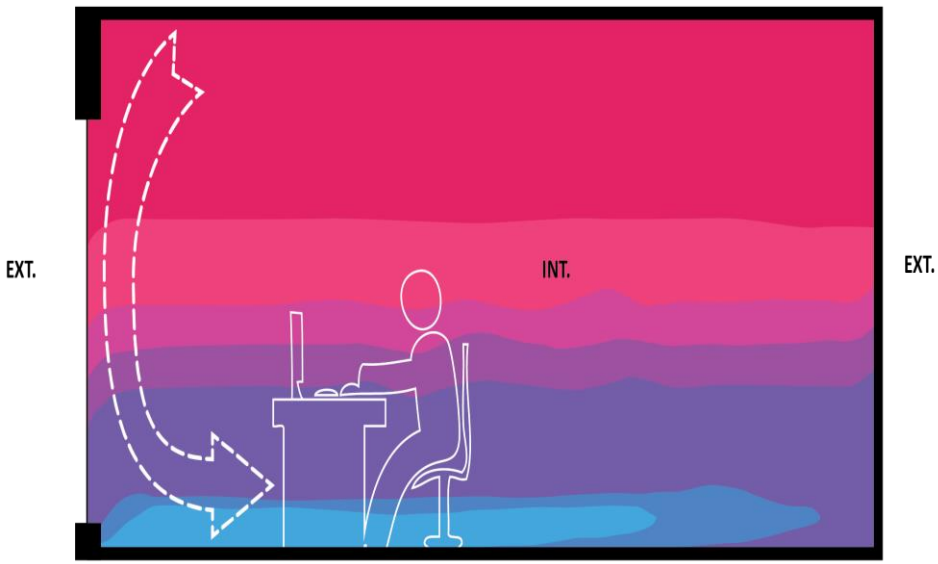
- → Upfront capital cost premium likely to pay back within building lifetime for institutional owners/operators
- → Reduced heating demand also has other important ramifications for day-to-day operations at post-secondary institutions:
  - → Futureproofing (this is where codes are going…)
  - → Manage existing central heating plant capacity
  - → Resiliency and passive survivability (outages, natural disasters, etc.)
  - → Reliable energy savings (more or less as projected…)
  - → Reduced occupant complaints

Occupant Comfort

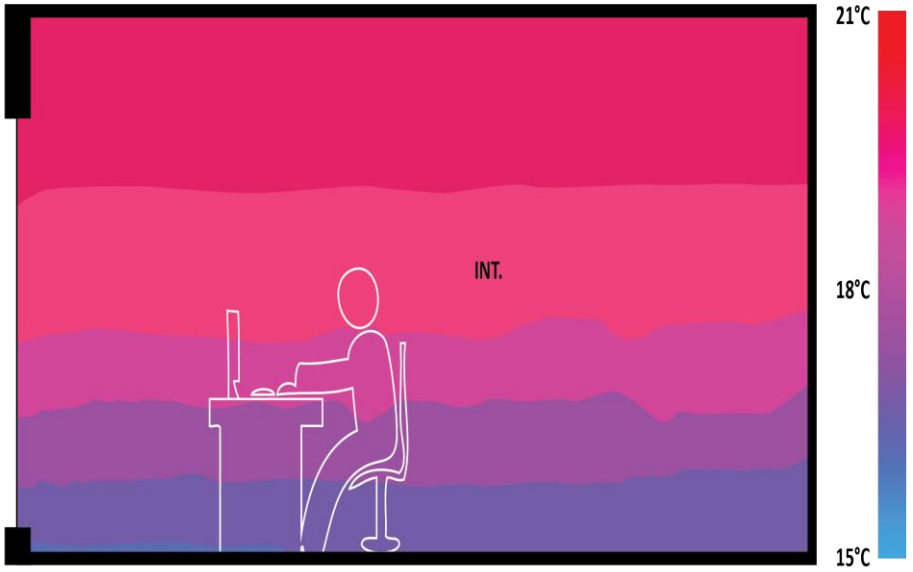
→ Passive House is the only approach that has explicit occupant comfort requirements.

- → Must maintain interior surface temperatures
- → Must meet minimum airtightness target (no drafts)
- → Controllability

TYPICAL WINDOW (U_w = 1.6 W/m²·K)



PASSIVE HOUSE WINDOW (U_w = 0.85 W/m²·K)



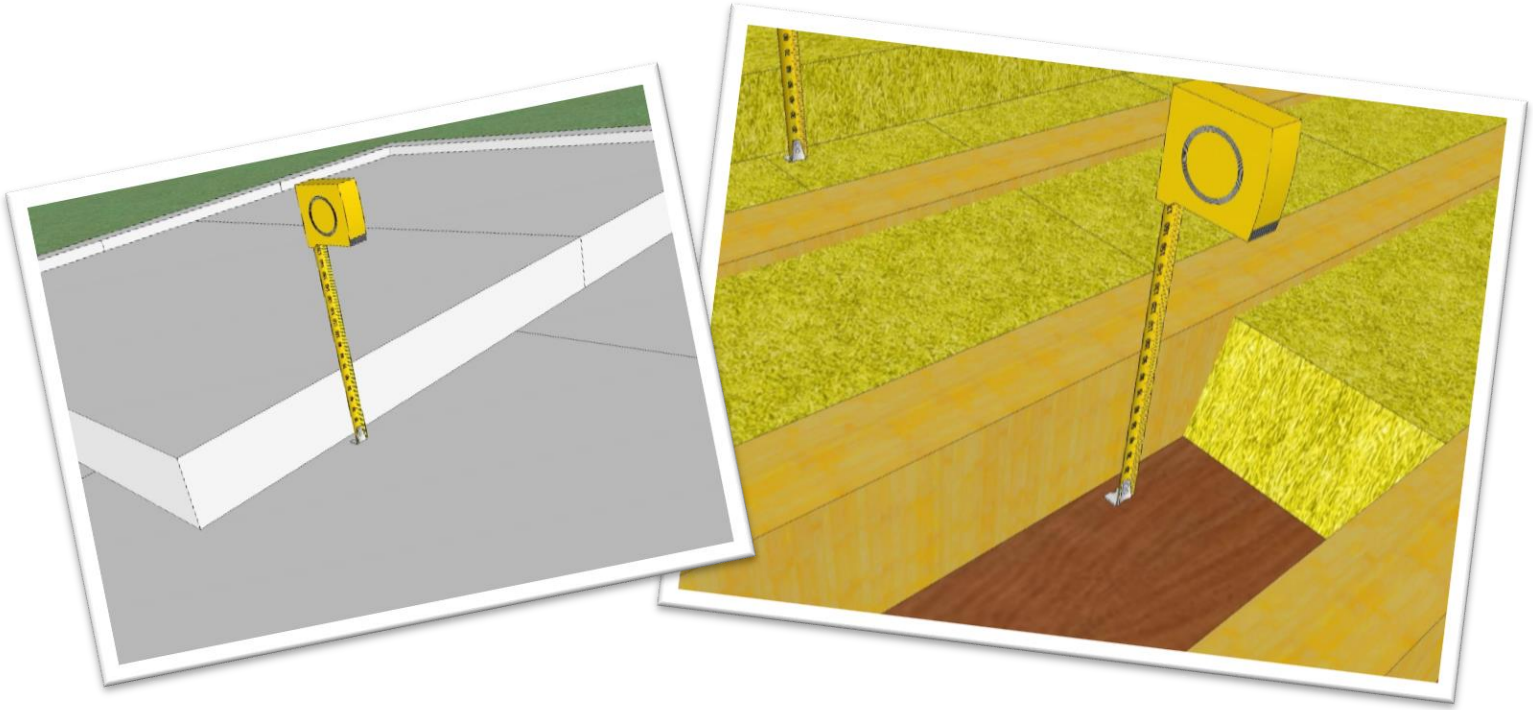
Source: PHI

No cold air drafts, no “cold feet”

Verification and Quality Control

→ Recognize that there can be a disconnect between the design and the finished building

→ Passive House is the only approach that requires review and verification from design through construction.



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"Thermally Relevant Photograph Record Requirements" by Passive House Academy

Passive House and the YorkU Institutional Sustainability Plan

→ Energy & GHG Reductions

→ Innovation & Leadership

→ Living Labs

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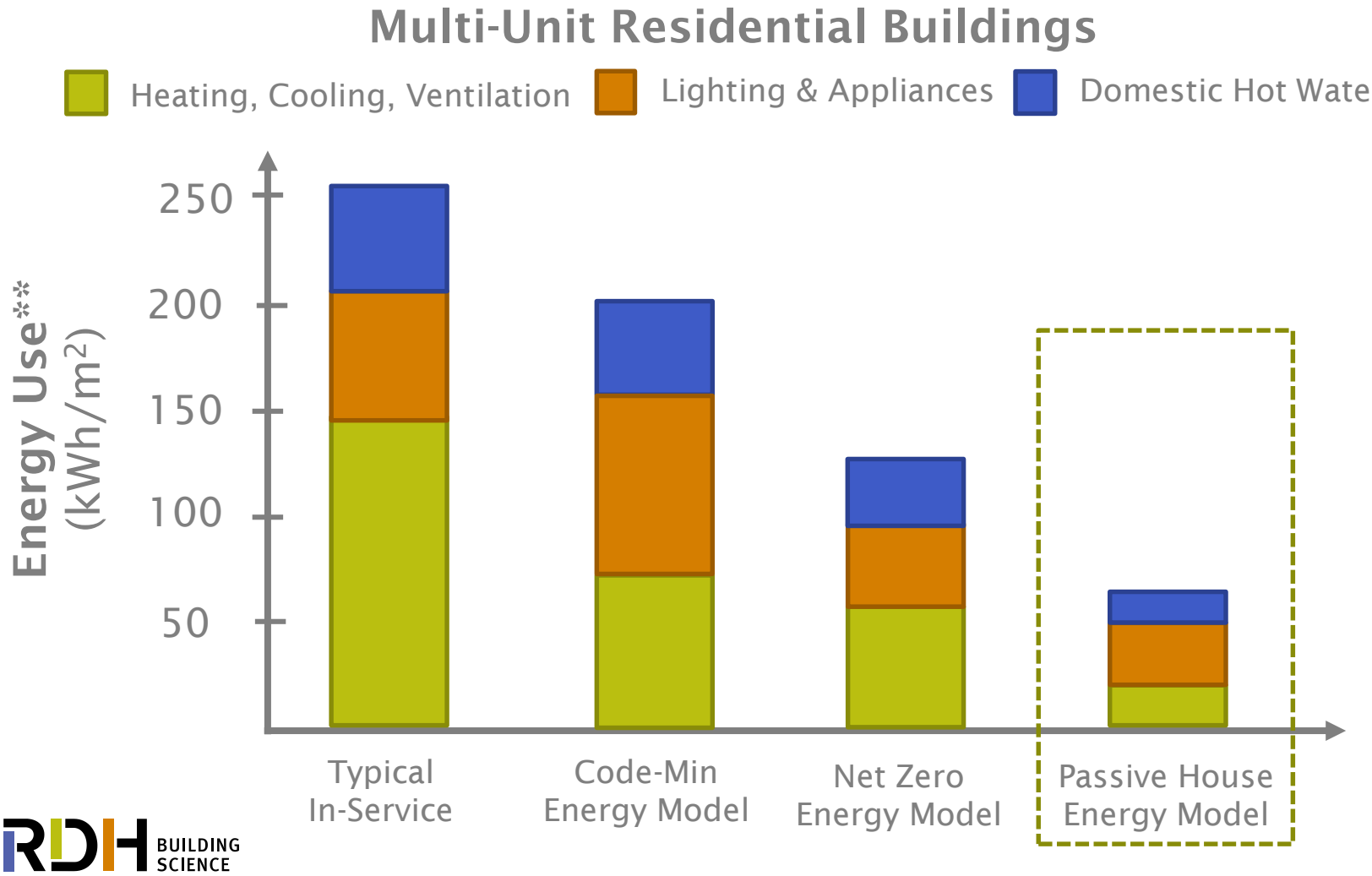
Energy & GHG Reductions

→ Absolute targets drive better energy performance



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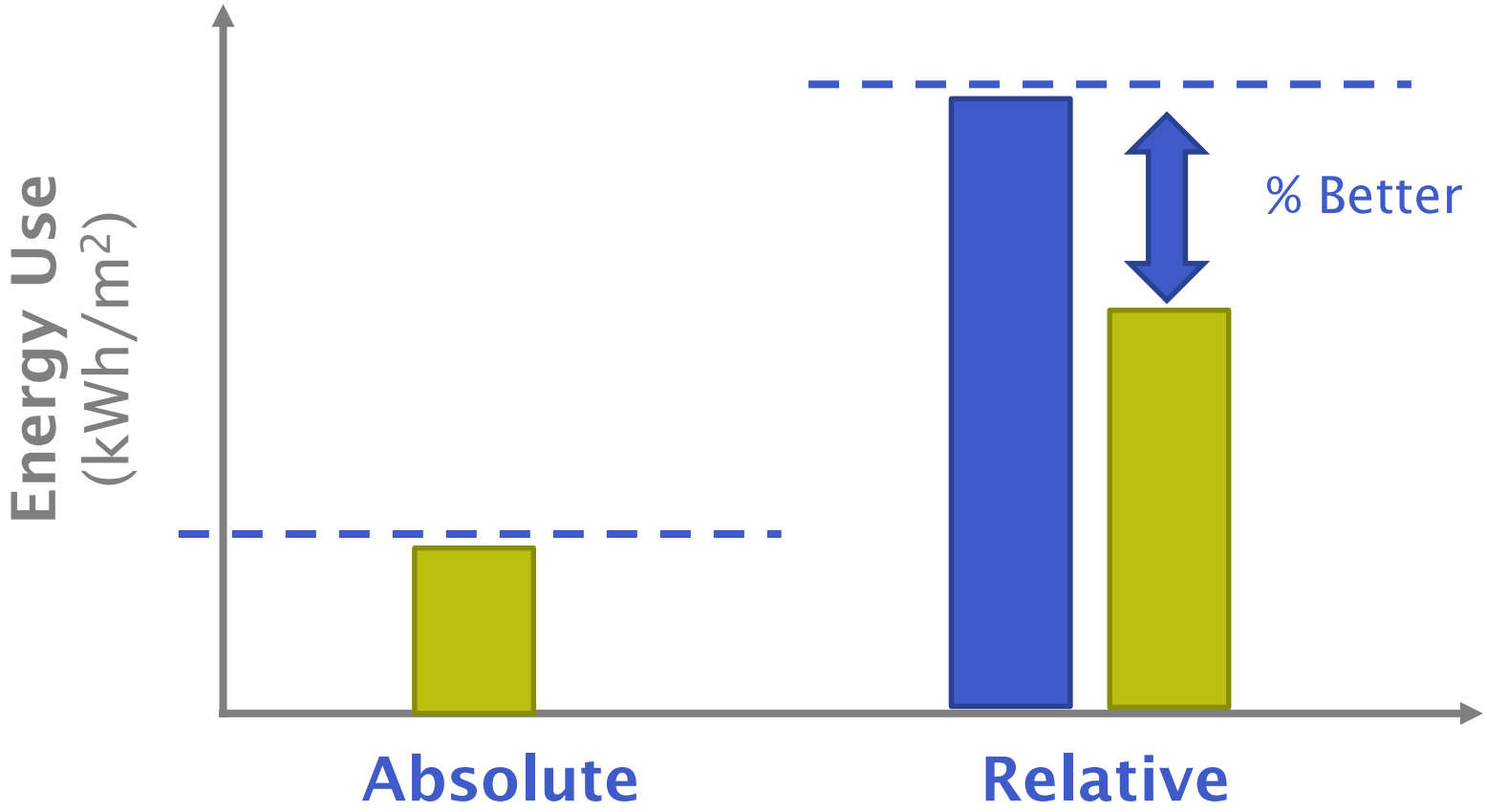
Comparison of RDH projects in Vancouver; energy use based on treated floor area.

Energy & GHG Reductions

→ Absolute vs. relative energy targets



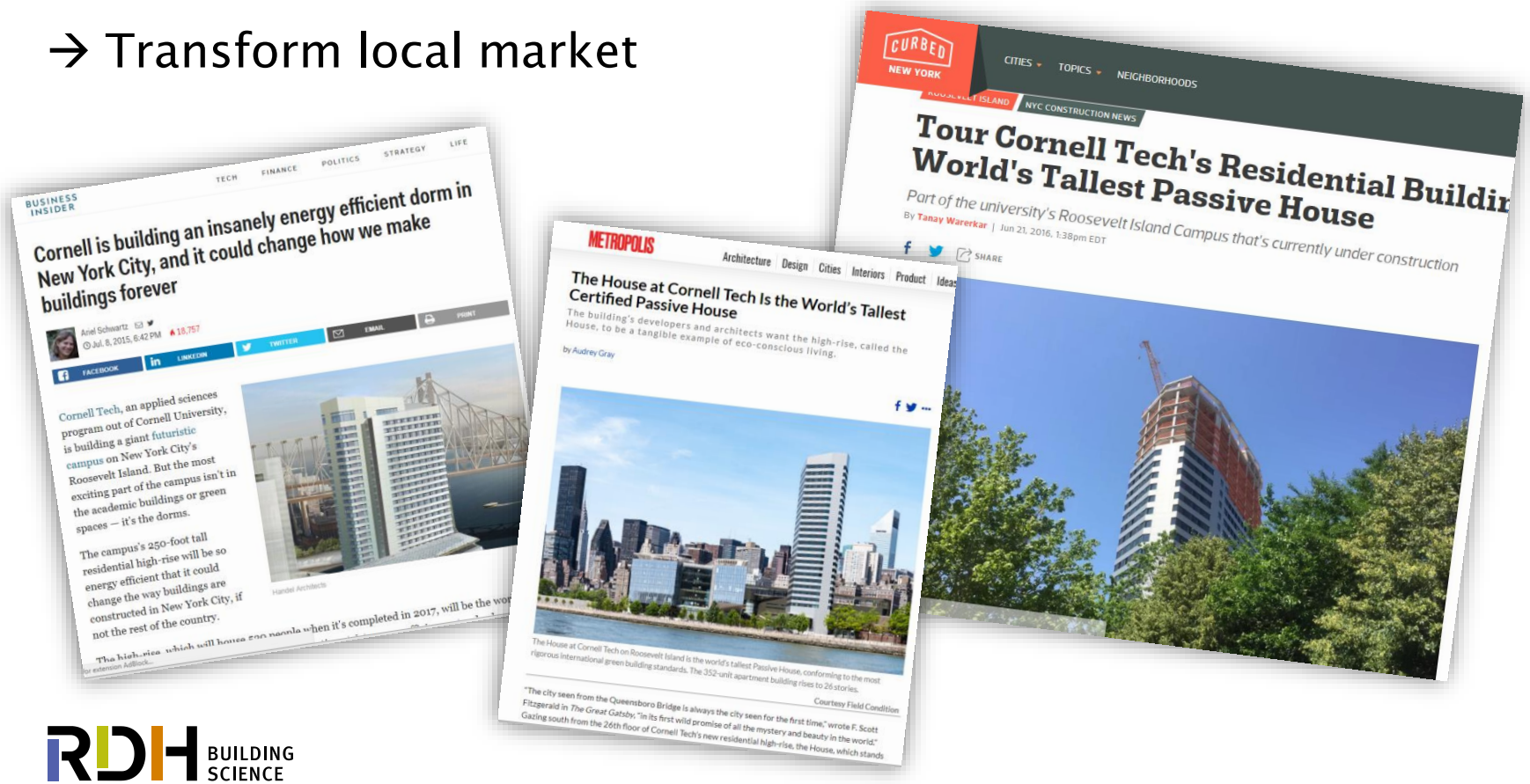
Innovation & Leadership

→ Demonstration of technical innovation

→ Shaping positive student experience

→ Build capacity of local industry

→ Transform local market



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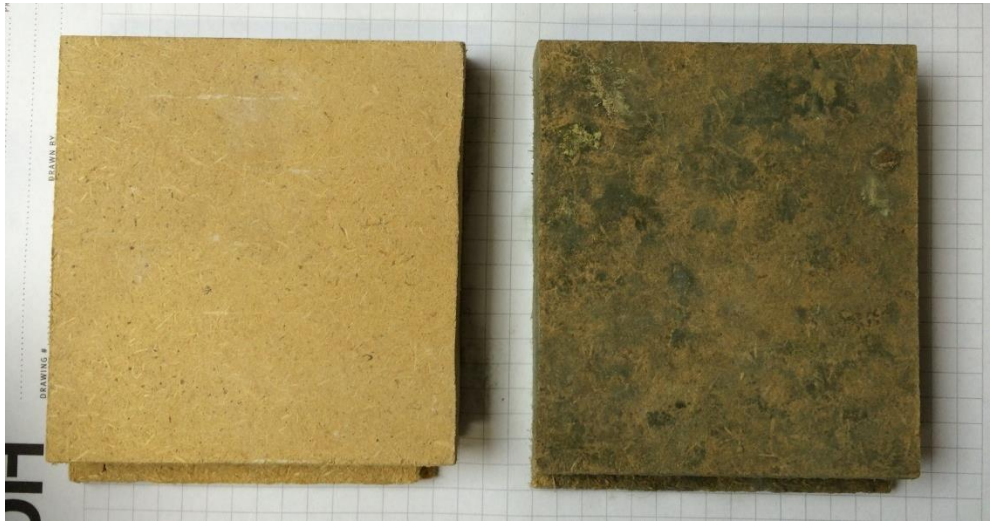
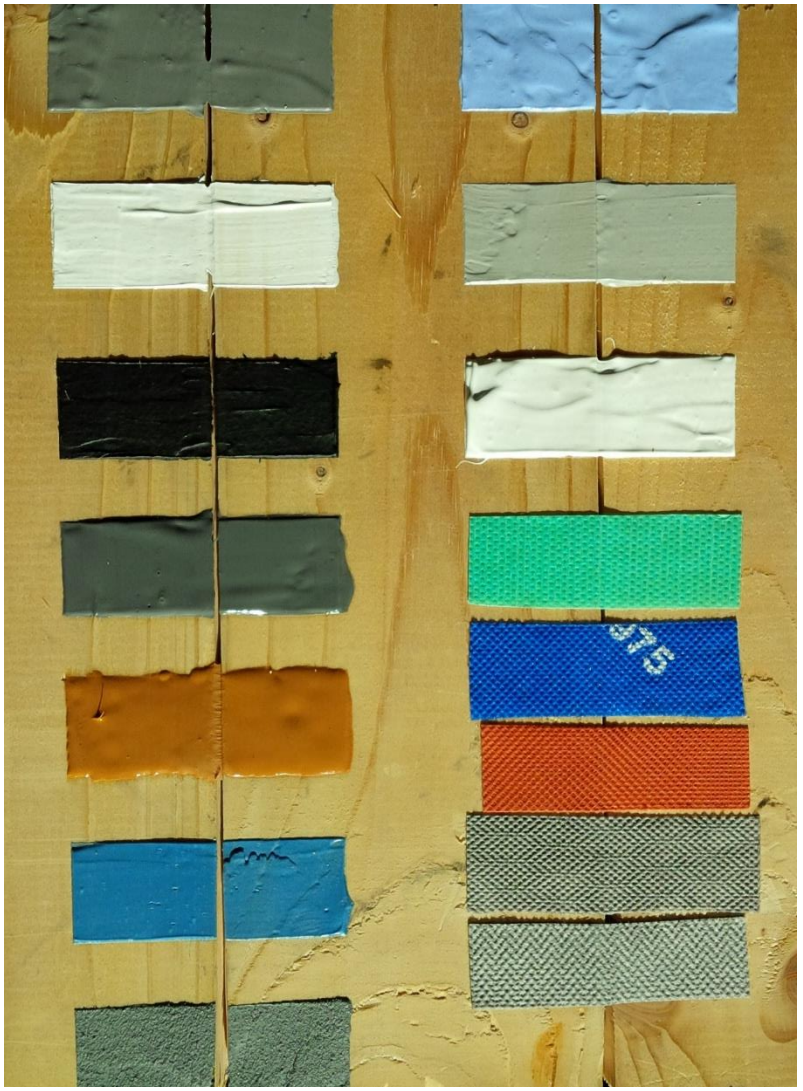
Living Labs



Agepan Sheathing before & after 60 days, 100% RH

Agepan insulation before & after 60 days, 100% RH



Summary

→ Key elements of Passive House:

- → Addresses heating demand and overall energy use
- → Requirements for occupant comfort
- → Built-In quality control during construction

→ Alignment with YorkU Institutional Sustainability Plan

- → Energy & GHG Reductions
- → Innovation & Leadership
- → Living Labs

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Resources

→ Passive House Institute
http://www.passivehouse.com/

→ Passive House Canada
http://www.passivehousecanada.com/

Discussion + Questions

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