Impact of Large Building Airtightness Requirements

Buildings XIII Conference

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Outline

- → Intro to Requirements
- → Measured Performance
- → Industry Impact
- → What it Is, and What it Isn't
  - → Airtightness vs Air Leakage

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Why We Care

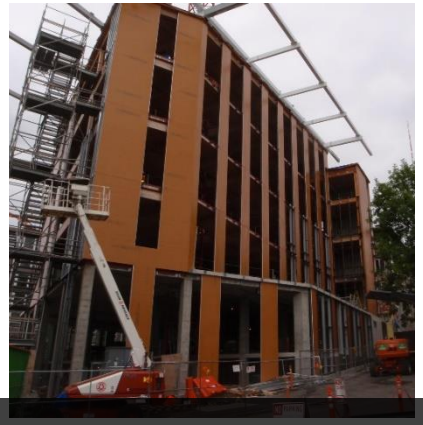
→ Infiltration and Exfiltration Affect:

- → Building Energy Consumption – Heat Loss and Gains ($)
- → Indoor Air Quality - Pollutants
- → Building Durability - Condensation
- → Occupant Comfort - Thermal & Acoustics

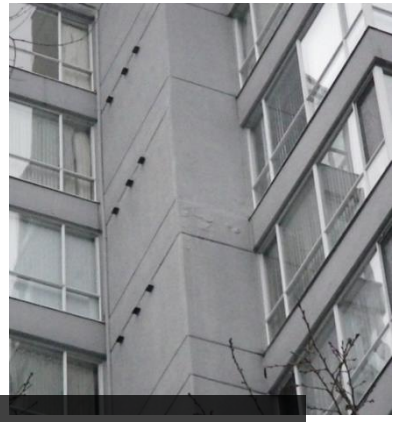
Many Air Barrier Systems Available

Loose Sheet Applied Membrane – Taped Joints & Strapping

Sealed Gypsum Sheathing – Sealant Filler at Joints

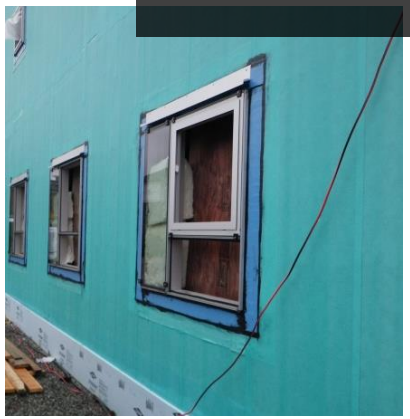


Liquid Applied Sealants/Membranes

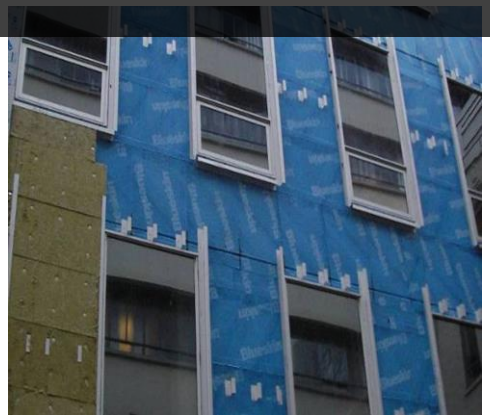


Mass Walls (concrete)

BUT, IT'S THE DETAILS THAT MATTER



Self-Adhered vapor permeable membrane



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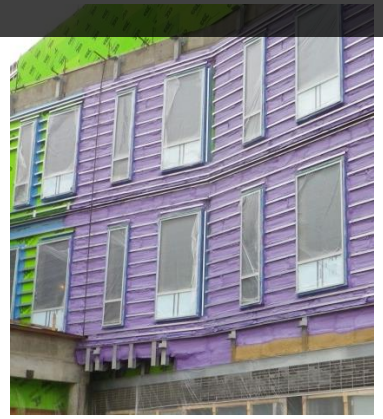
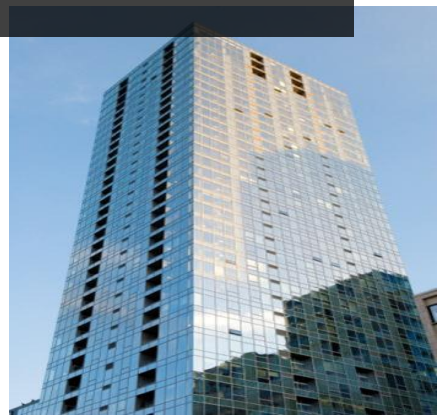


Sprayfoam



Curtainwall, window-wall & glazing systems

Materials **Components** **Accessories**

Whole Building Airtightness

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Standards & Qualifications

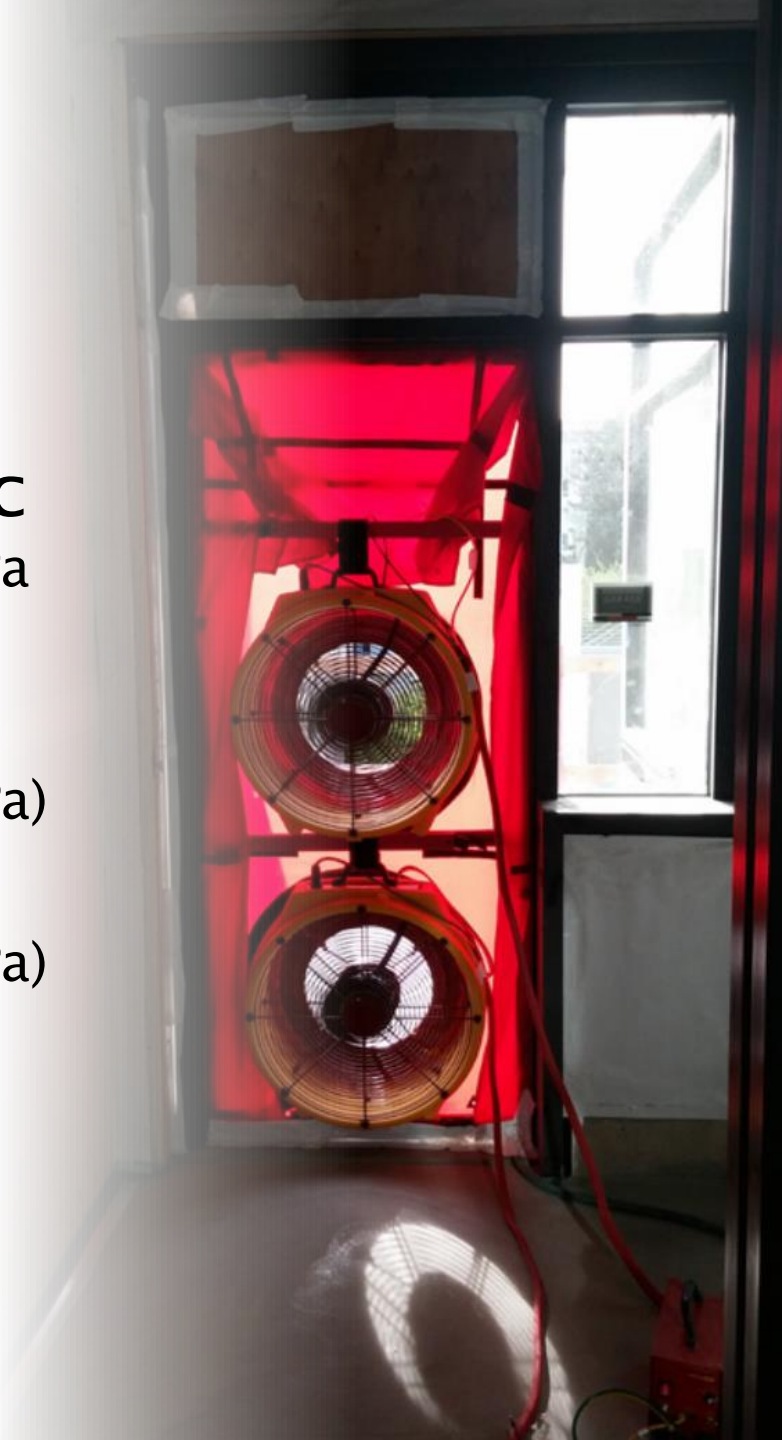
→ **Washington State & Seattle, ABAA Target, GSA, IBC/IECC Option**
< 2.0 L/(s·m²) [0.40 cfm/ft²] @ 75 Pa

→ **US Army Corps of Engineers & IGCC**
< 1.26 L/(s·m²) [0.25 cfm/ft²] at 75 Pa

→ **Passive House**
0.6 ACH50
(~0.60 L/(s·m²) [0.12 cfm/ft²] at 75 Pa)

→ **LEED, 6-sided apartment test**
(~1.25 L/(s·m²) [0.25 cfm/ft²] at 50 Pa)

→ **UK (AATMA) Large Buildings**
~0.70 to 1.75 L/(s·m²) at 75 Pa
[~0.14 to 0.34 cfm/ft² at 75 Pa]



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Measured Performance

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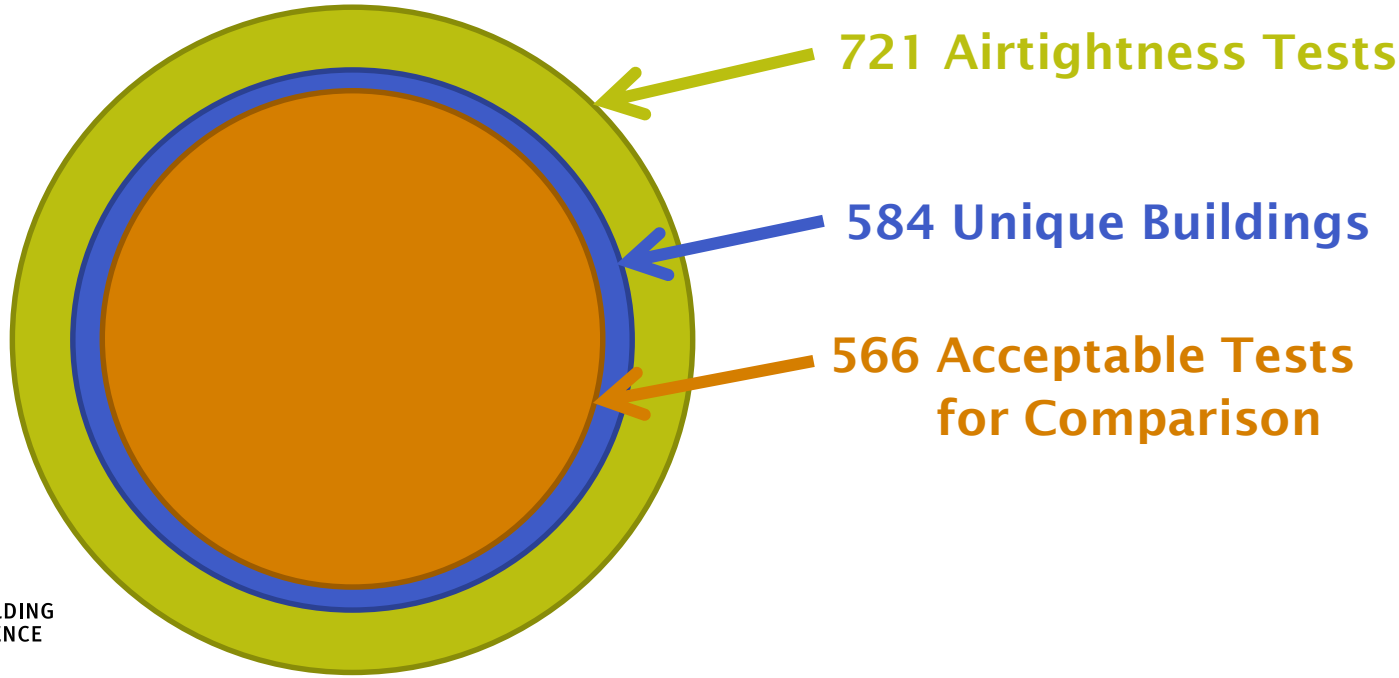
Where We're At – The Numbers

→ Airtightness testing data was compiled in a database from the following sources:

- → Published literature
- → Industry members
- → Unpublished data provided by the project team



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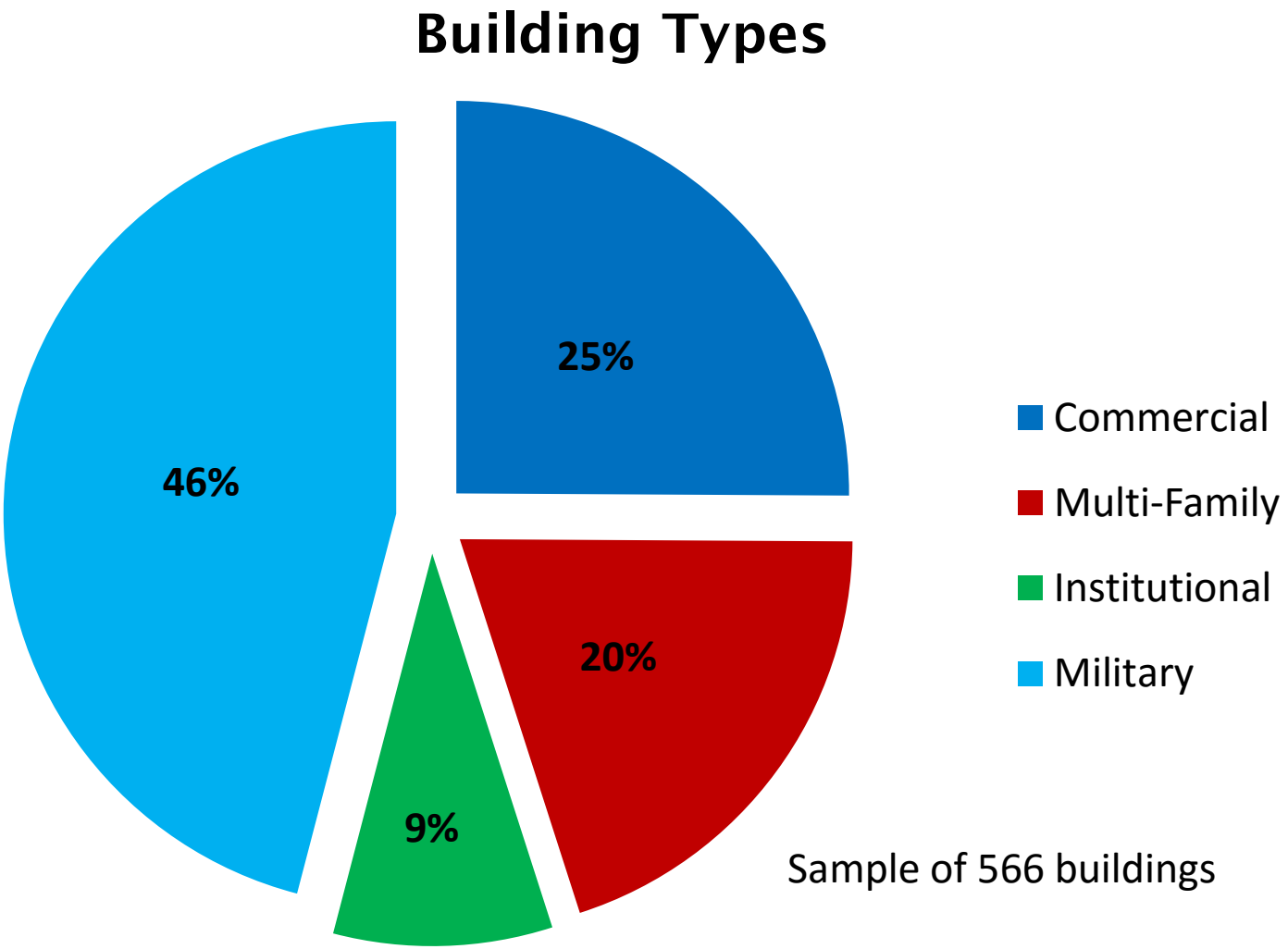

Sample of 566 buildings

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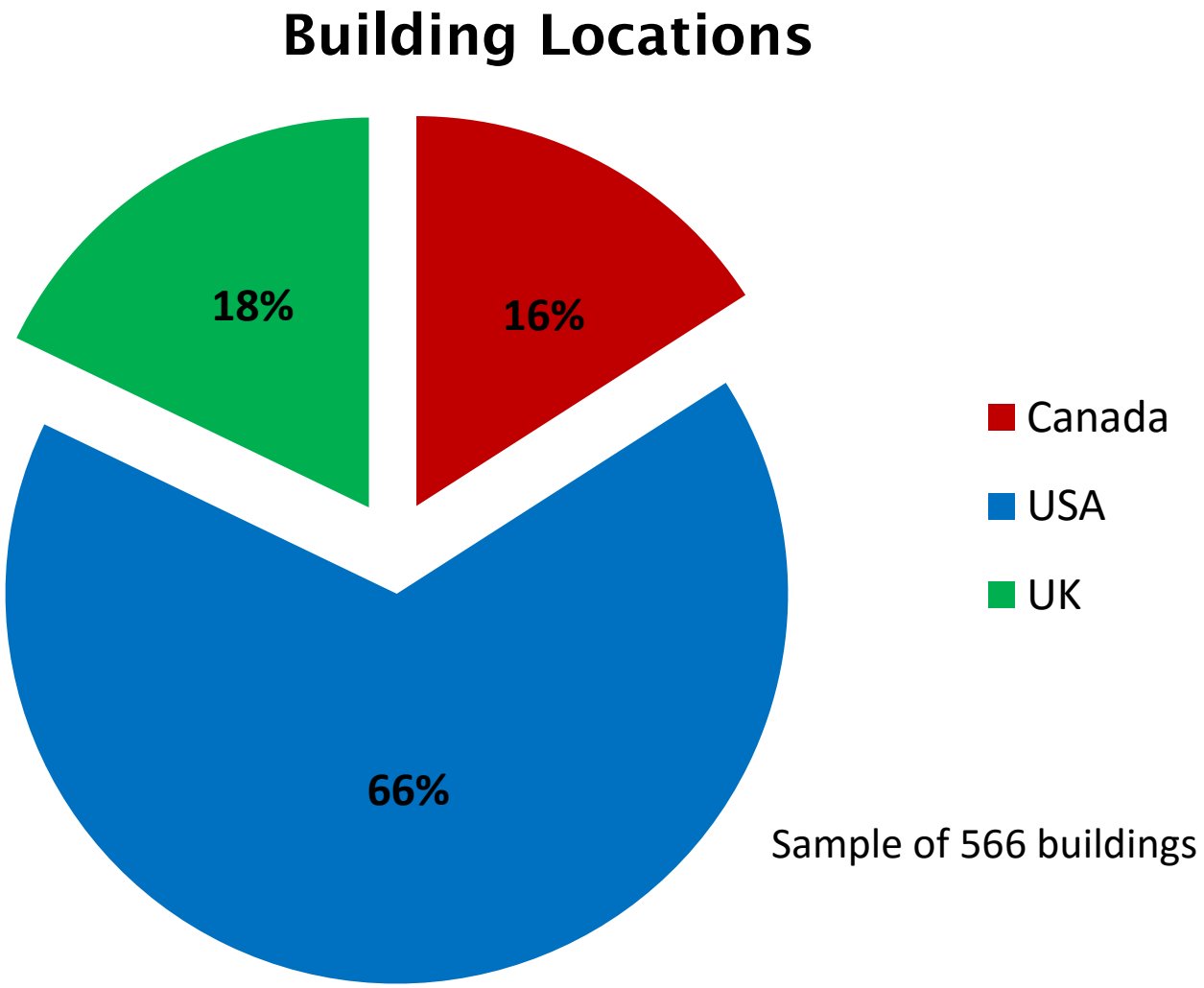
Where We're At – The Numbers



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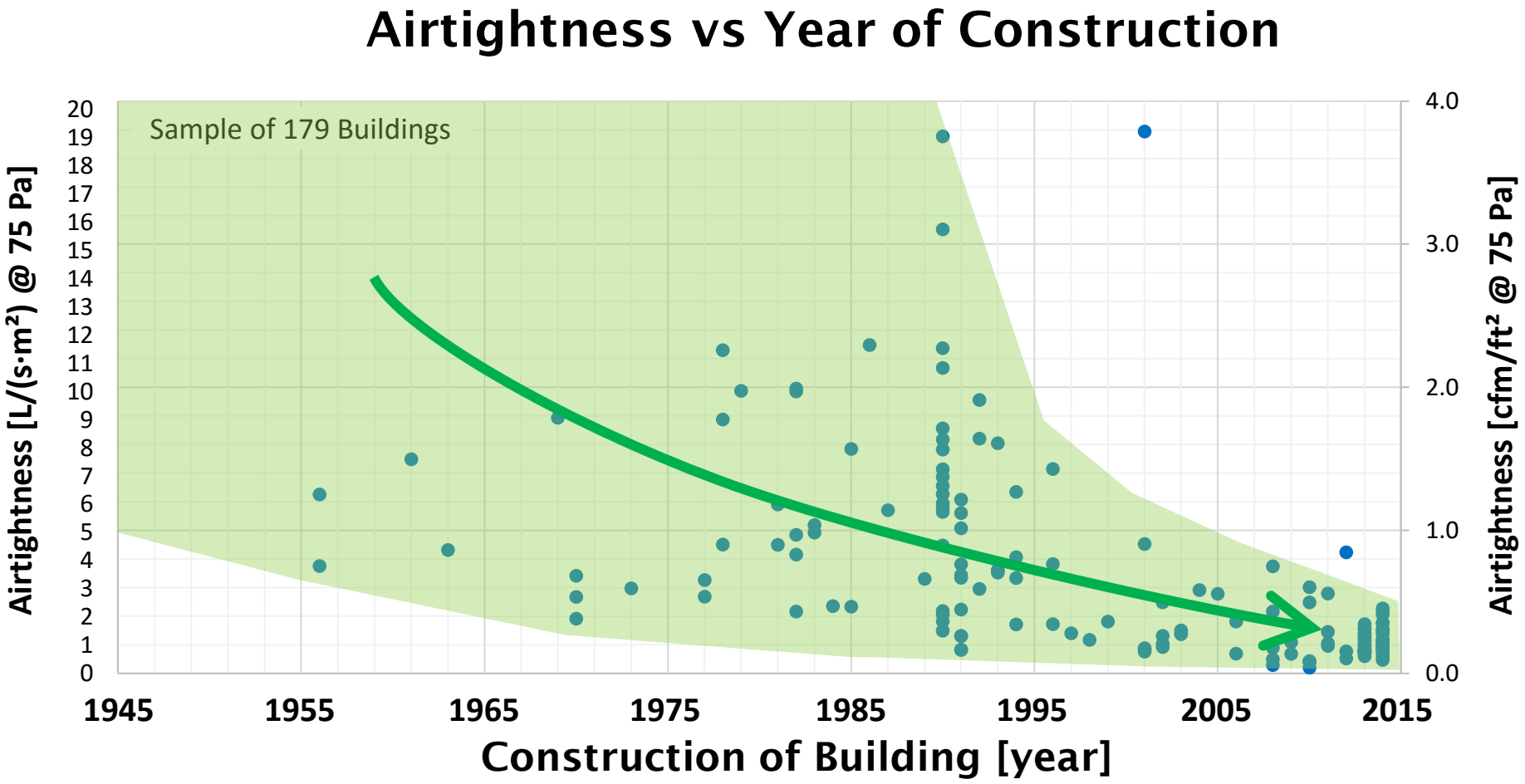

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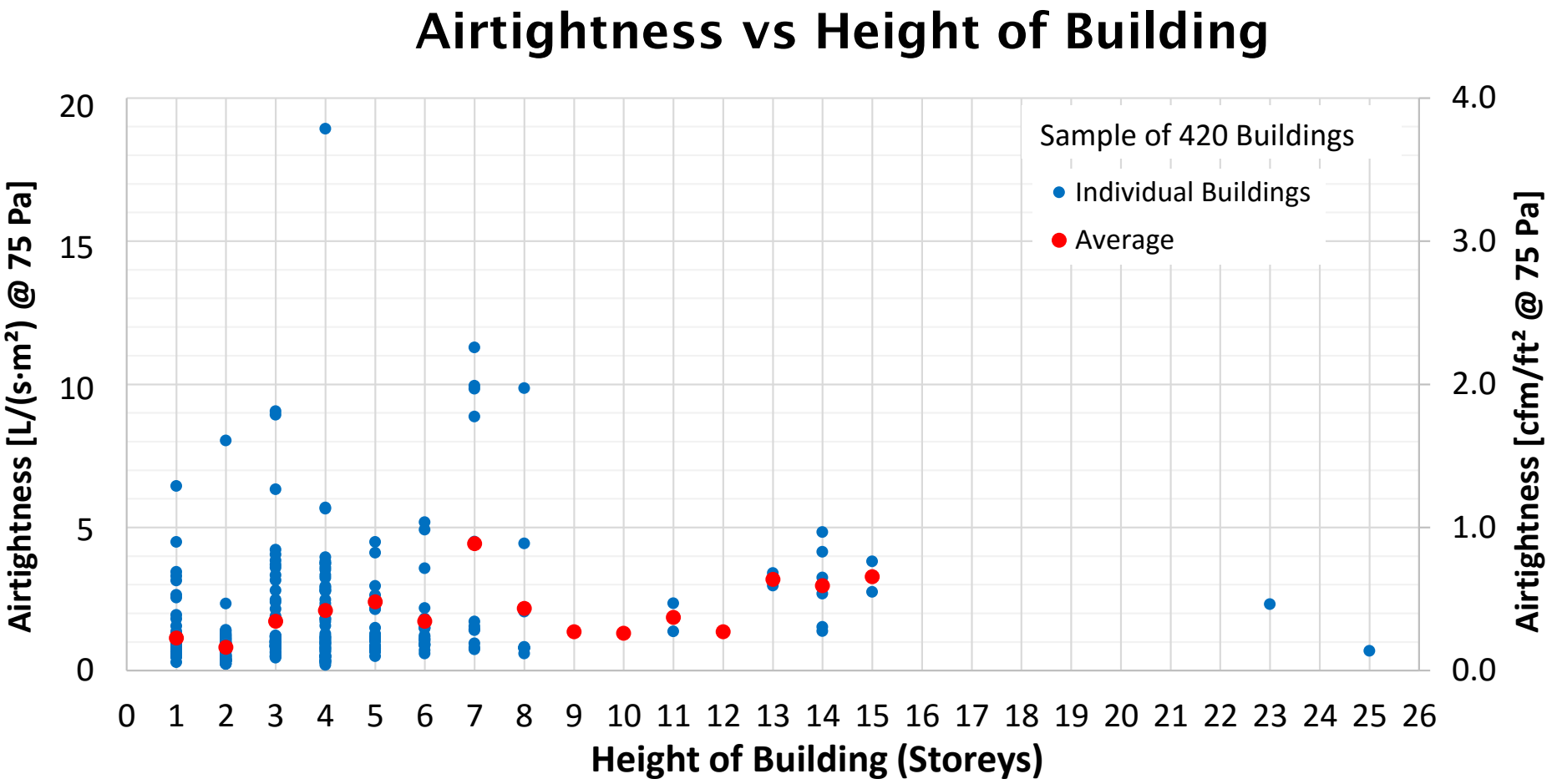

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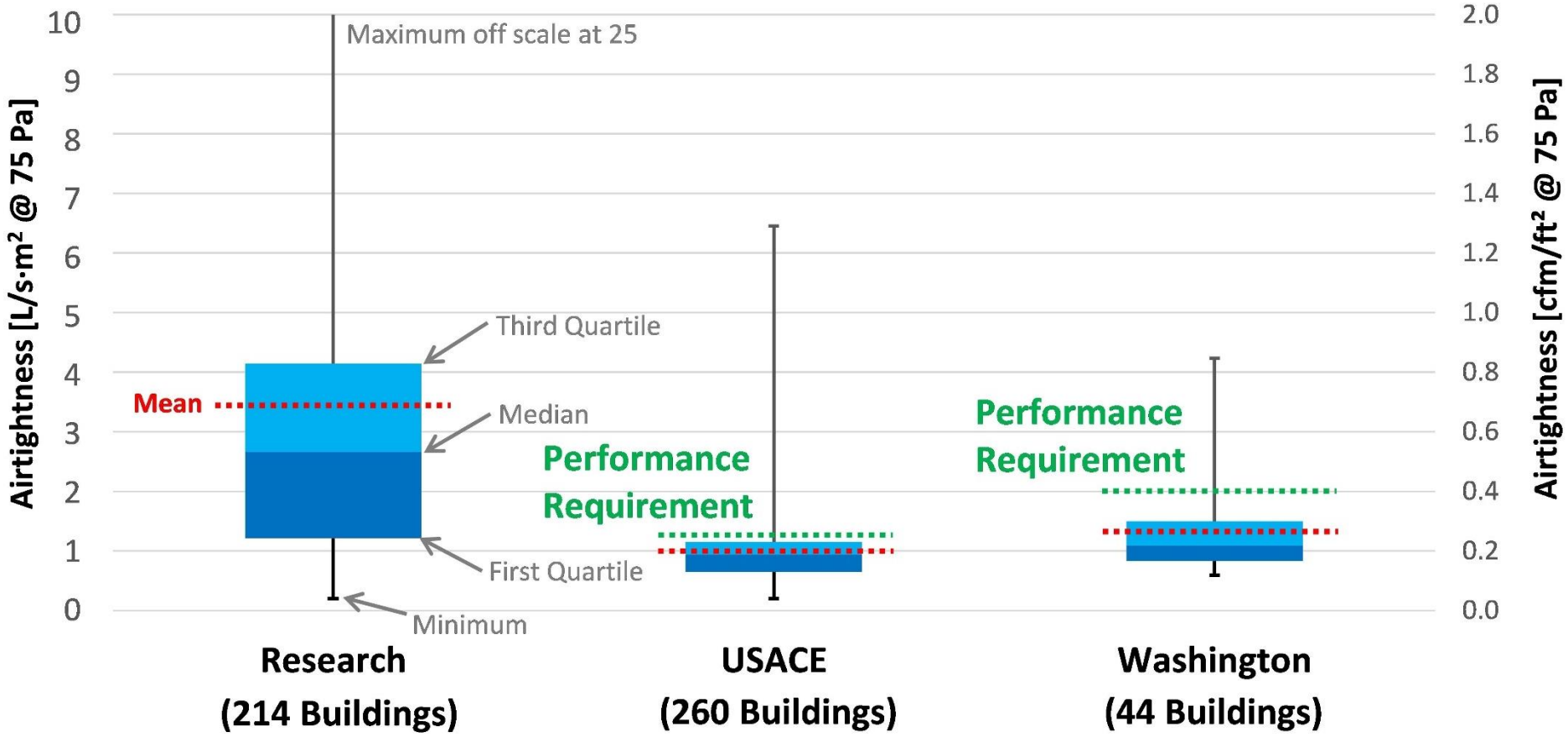
Impact of Requirements



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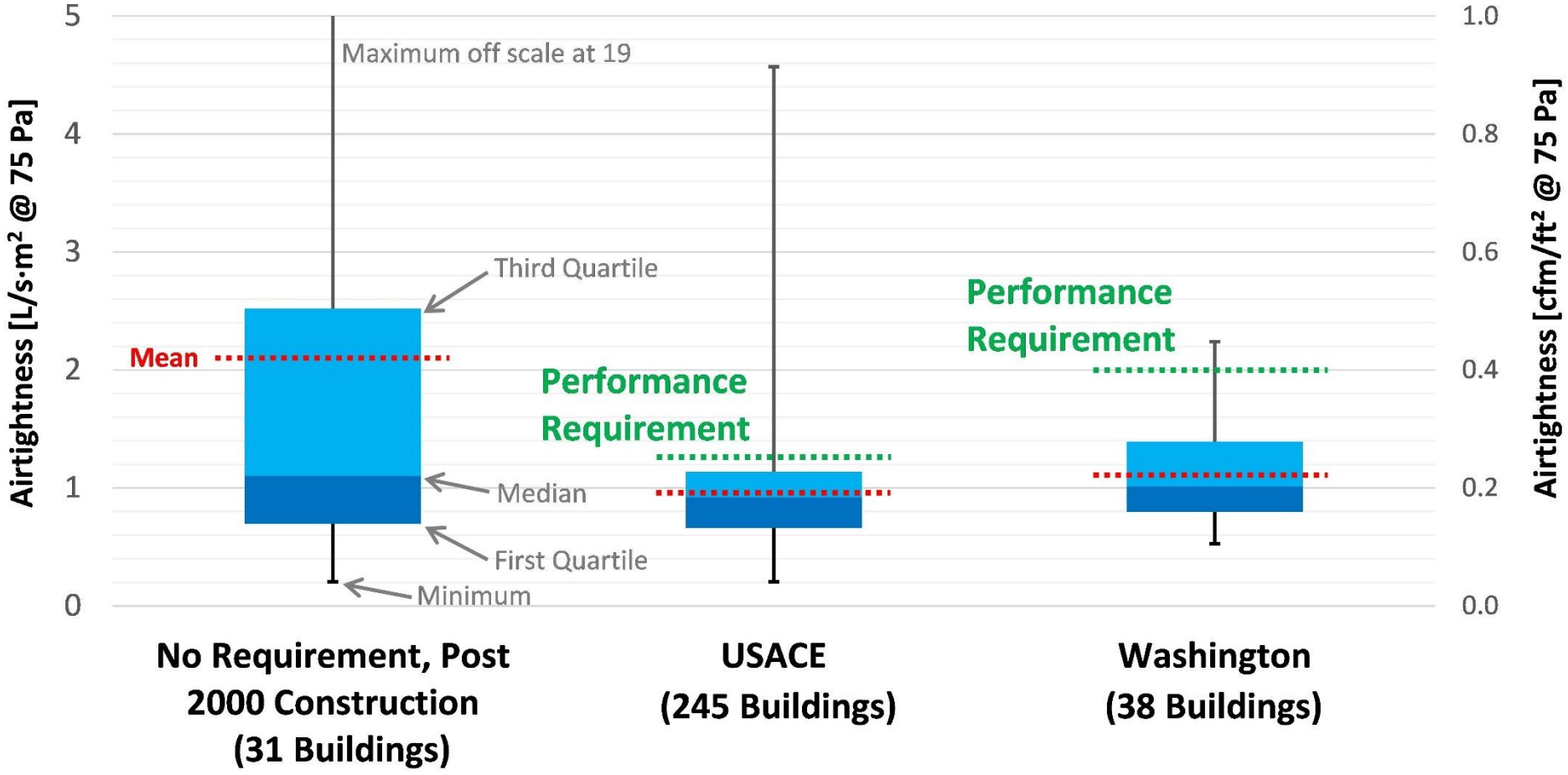
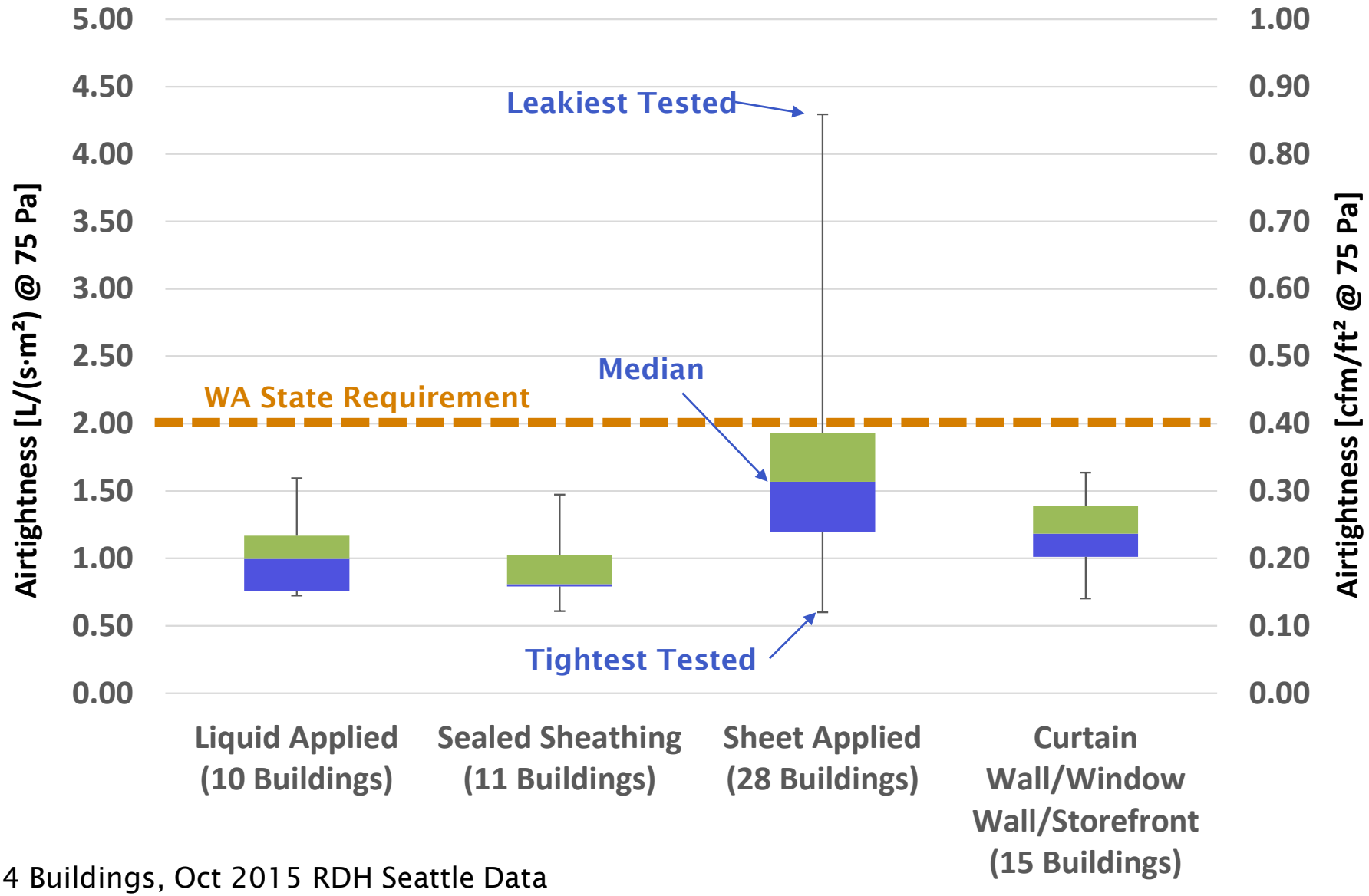


Performance of Air Barrier Systems



54 Buildings, Oct 2015 RDH Seattle Data

Impact of Testing

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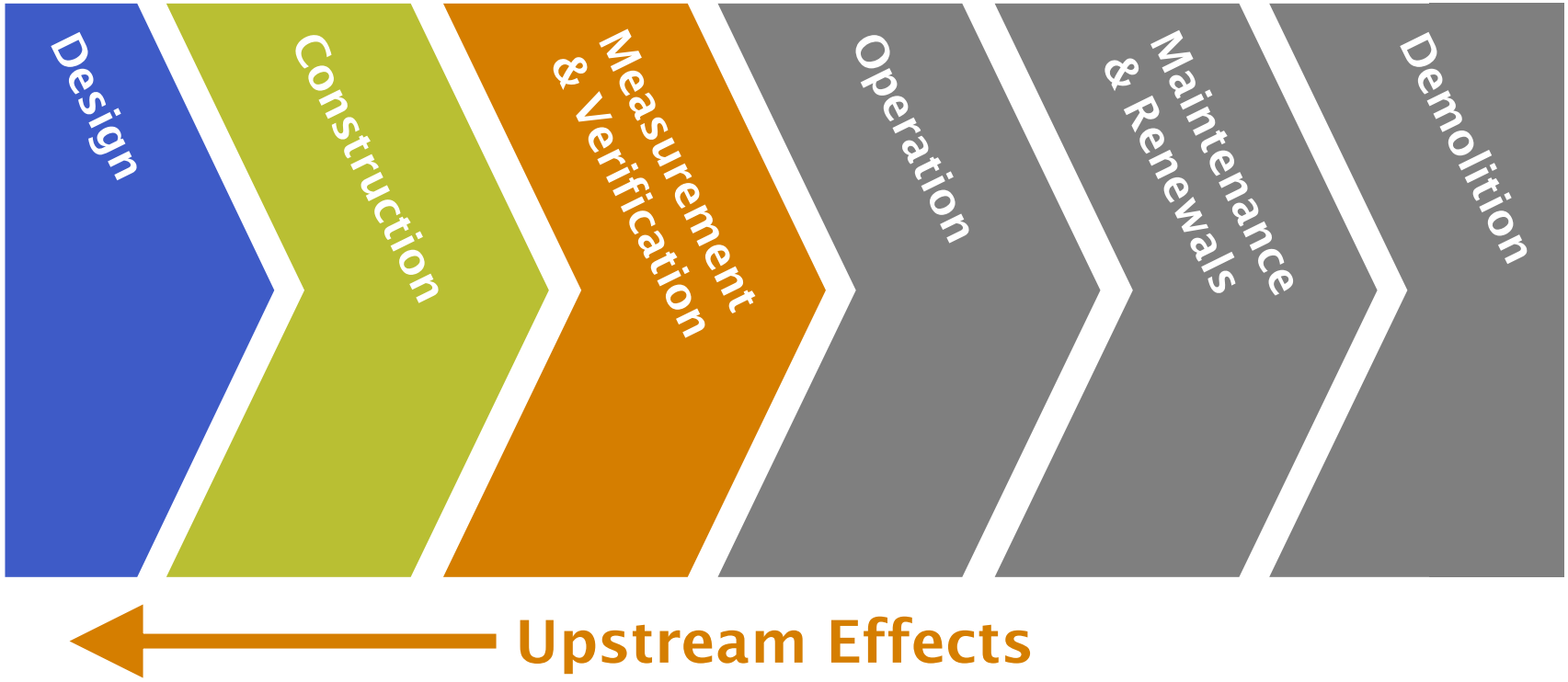
The Life of a Building

The Life of a Building



Material Selection

Assembly Design

Quality Control

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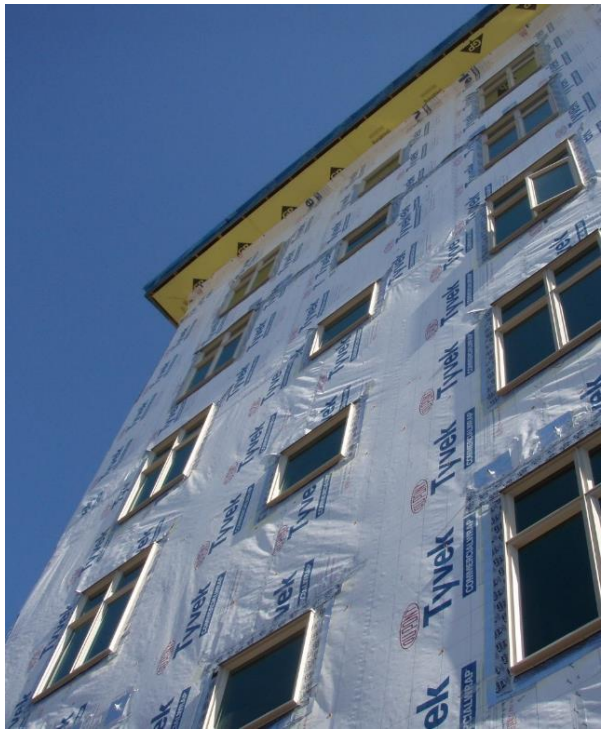
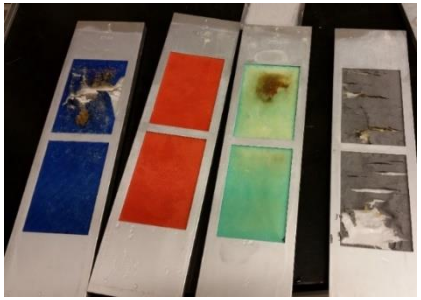
Changes in Air Barrier System Selection

→ Seeing shifts from **Mechanically Attached** to **Self-Adhesive** & **Liquid Applied** membranes



New AB/WRB Materials

→ Many new self-adhered and liquid applied vapour permeable sheathing membranes available on the market



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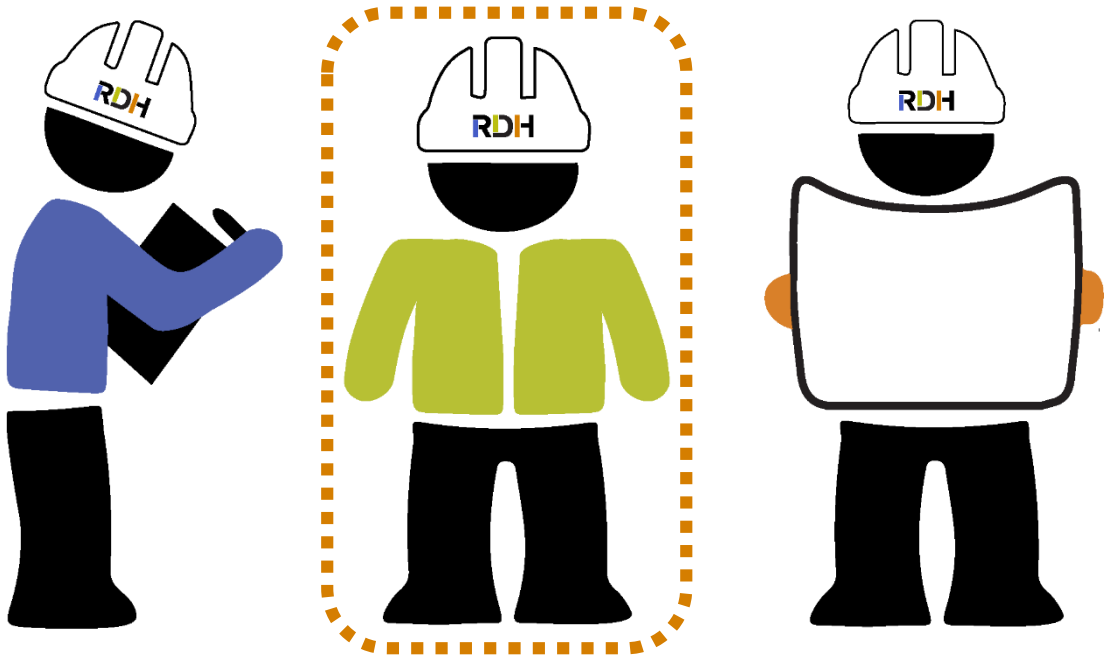
Changes in Quality Control

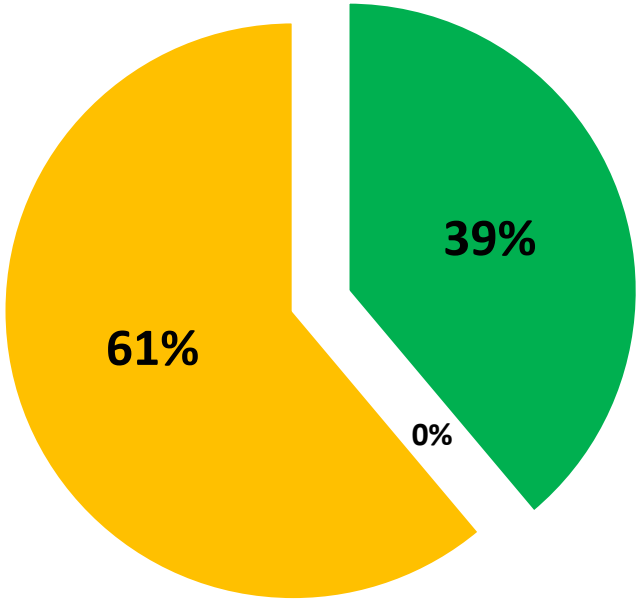
→ Noticeable improvements as soon as somebody cares – specific people designated to look at air barrier

→ Coordination between all team members essential

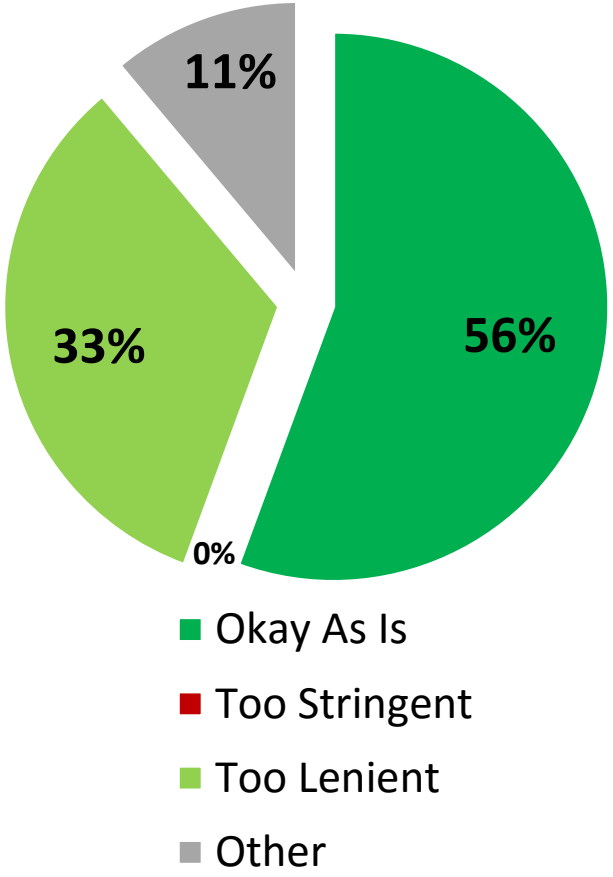


Impact of Requirements

Does airtightness requirement increase cost?



Opinions of the Current Airtightness Target
(< 0.40 cfm/ft² at 75 Pa)
[< 2.0 L/s·m² at 75 Pa]



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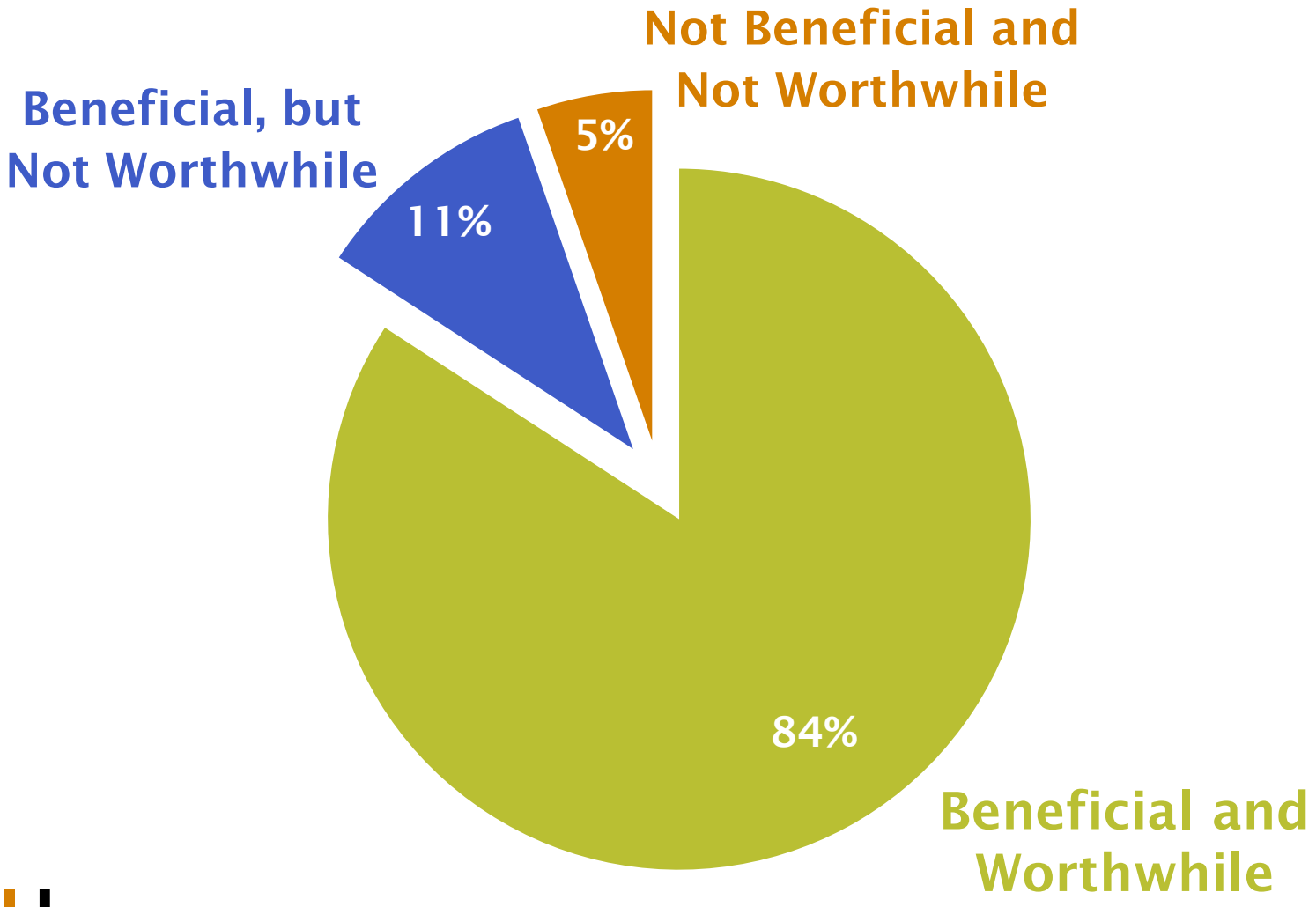

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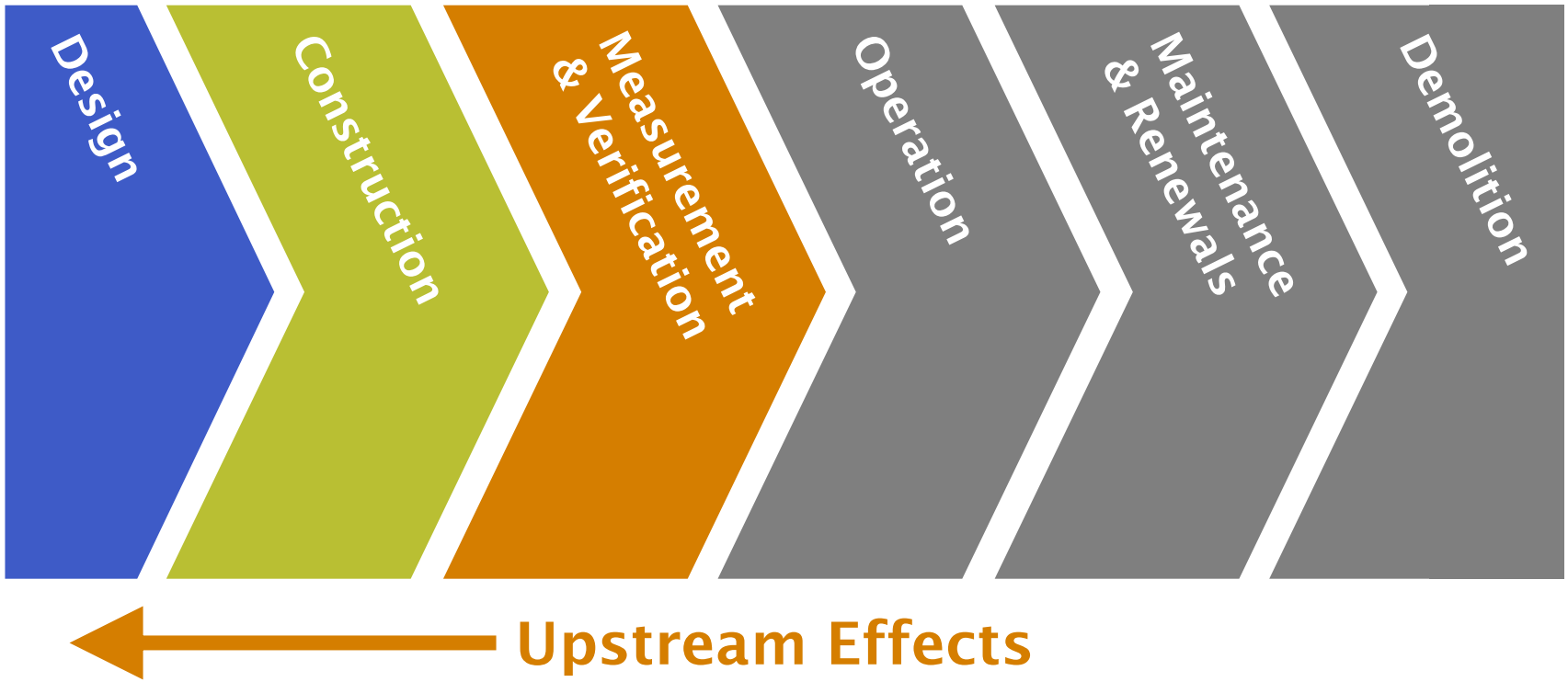
The Life of a Building



Material Selection

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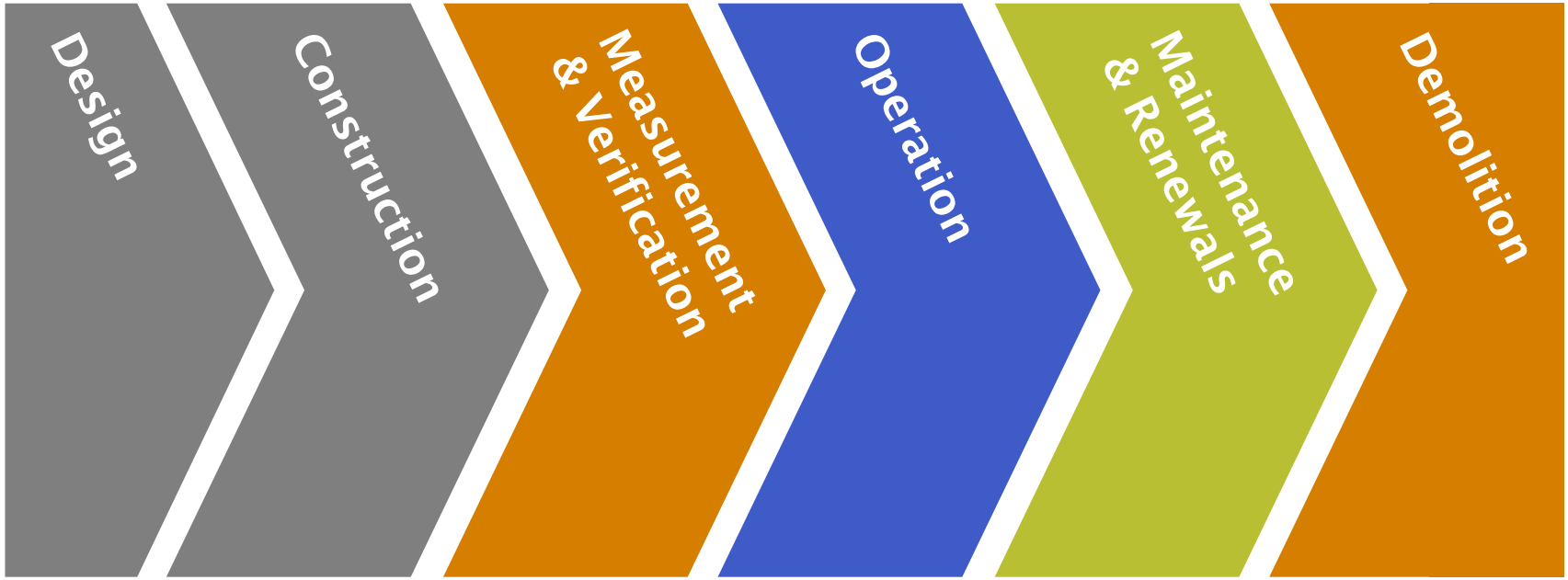

Downstream Effects

Energy Consumption

Indoor Air Quality

Acoustics

Durability

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What it Is, and What it Isn't

→ Airtightness vs Air Leakage

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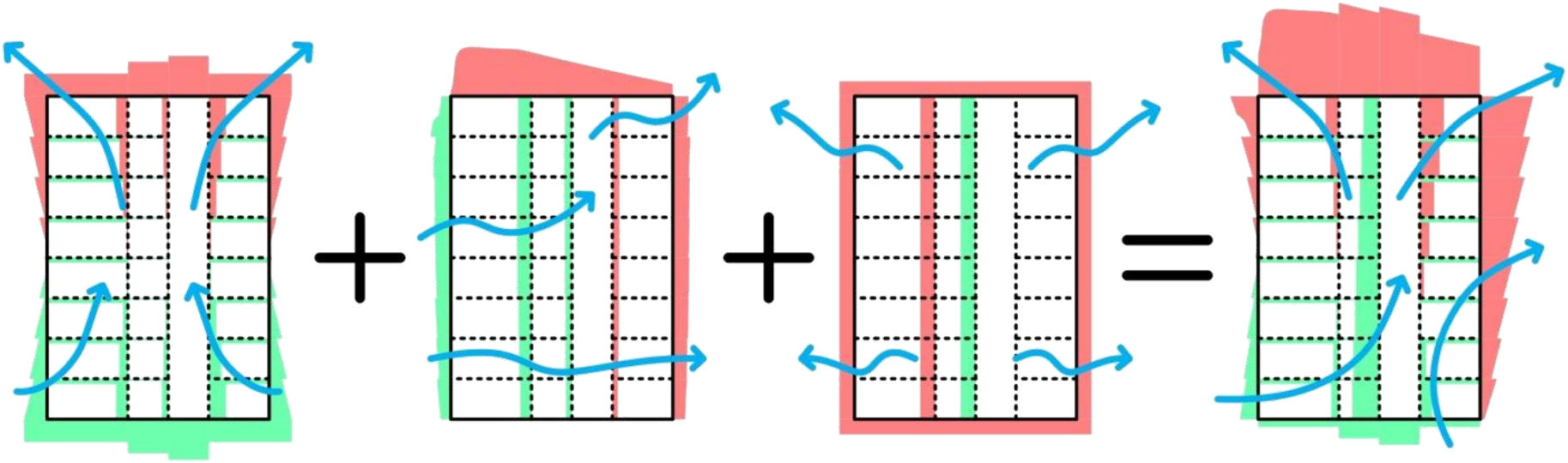
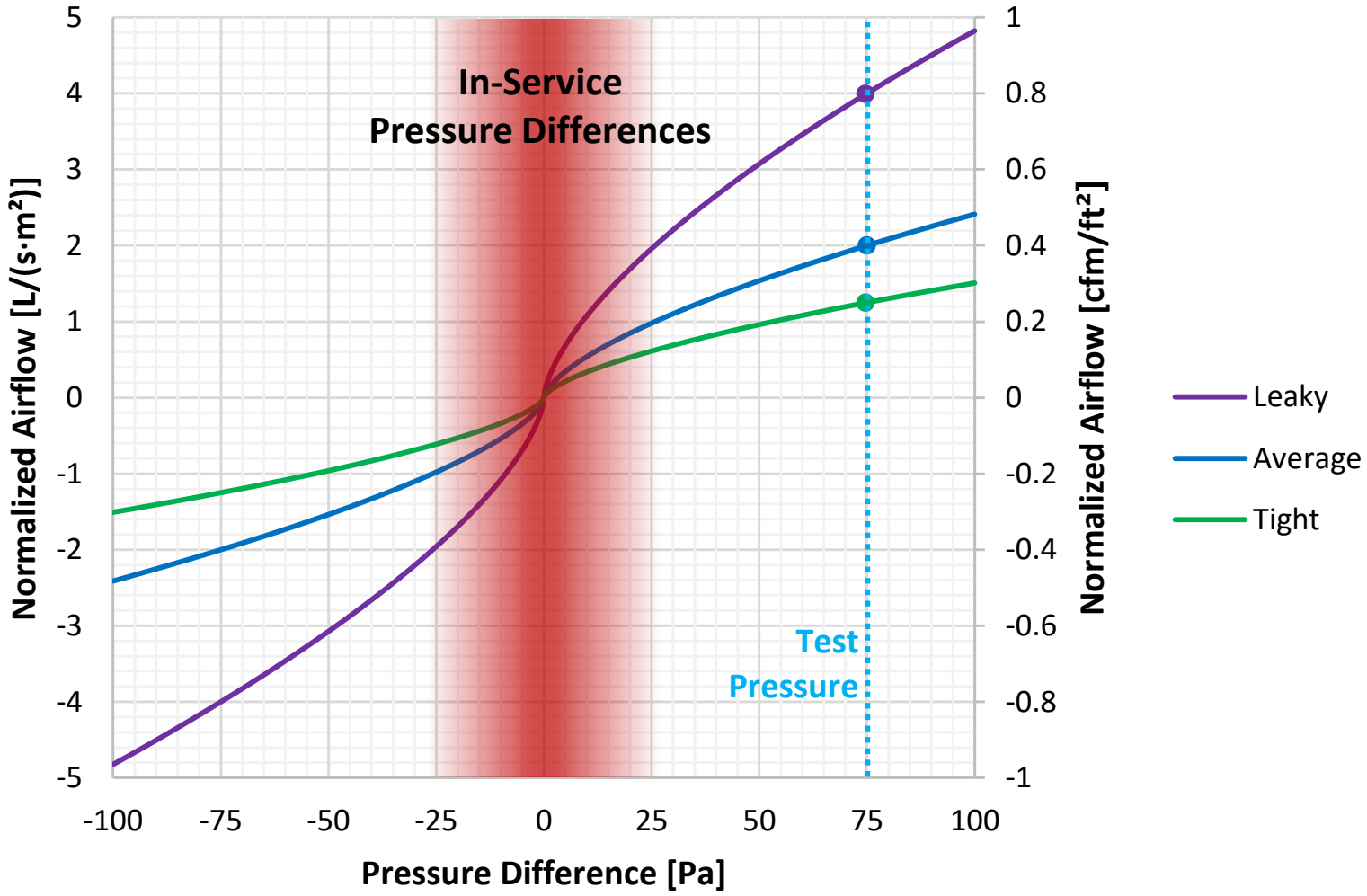
Airtightness vs Air Leakage

→ In-service air leakage is the combination of airtightness and pressure differences created by the driving forces of airflow



Determining Air Leakage from Airtightness

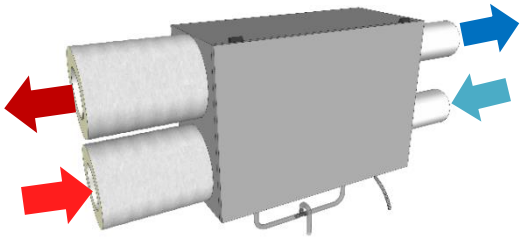
→ Difficult to extrapolate from airtightness test results to air leakage rates



Only One Piece Of the Puzzle

Whole Building Airtightness

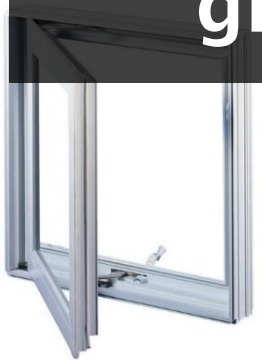
Controls



Ventilation Equipment

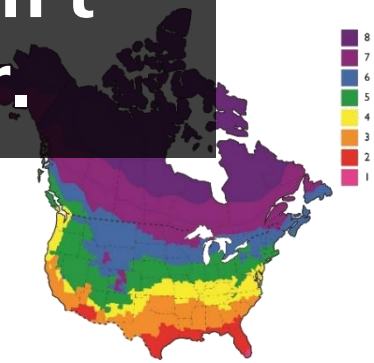
Building Airflows

Airtightness testing helps with modelling inputs, but doesn't give us the whole answer.



Operable Windows

Occupants



Climate

Summary

→ Airtightness performance and testing requirements **have been successfully implemented** in jurisdictions such as Washington State, the USACE, and the GSA.

  → Target of 2.0 L/(s·m²) (0.40 cfm/ft²) at 75 Pa is common and demonstrated to be **consistently achievable**

→ Overall **perceptions** of whole building airtightness testing seem **positive**

→ Airtightness is **part of the puzzle** for understanding building airflows & energy efficiency, but further research required to tie directly to indoor air quality and energy savings

Discussion + Questions

FOR FURTHER INFORMATION PLEASE VISIT

→ www.rdh.com

→ www.buildingsciencelabs.com

OR CONTACT ME AT

→ lricketts@rdh.com

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