Optimizing Indoor Environments: Strategies and Configurations for Ventilation and Air Barrier Testing in Multifamily and Commercial Buildings

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Considerations in Greater Seattle

- Area becoming less of a “moderate” climate
- Wildfire smoke events
- Affordability
- Mold/moisture
Outline

- **Air Barrier Testing Strategies**
  - Utilizing mechanical closets and balanced ventilation ductwork
  - Linking “zones” via jump ducts

- **Balanced Ventilation Configurations**
  - Centralized, building wings with vertical stacks
  - Hybrid of centralized, horizontal (floor-by-floor) zones and unitized (individual units) systems
Pax Futura

Owner: 3700 Hudson LLC
Architect: NK Architects
Mechanical Engineer: Staengl Engineering
General Contractor: Cascade Built
Building Enclosure
Building Layout
Final Testing Part I

0.0534 cfm/sqft at 50Pa
Air Sealing of L1/Mezzanine
Final Testing
Part II

0.0479 cfm/sqft at 50Pa
Final Results

0.069 cfm/sqft at 75Pa
Ellie Passivhaus

Owner/Developer: Sound West Group
Architect: NK Architects
Mechanical Engineer: Staengl Engineering
General Contractor: Cascade Built
Building Enclosure
Preliminary Test Set-Up

Preliminary Air Barrier Test Set-Up:
(Air distribution via HVAC ducts/openings, elevator shaft & intentional openings)
Fans Required: 1

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Ellie Passivhaus
Preliminary Test Results

0.034 cfm/sqft at 50Pa
Final Air Barrier Test Set-Up

**Final Air Barrier Test Set-Up:**
(Air distribution via HVAC ducts, elevator shaft & "jump ducts")
Fans Required: 1
Final Test – Jump Ducts
Final Results

0.050 cfm/sqft at 50Pa
Balanced Ventilation
Hobson Place South

Owner/Developer: DESC
Owners Rep: Lotus Development Group
Architect: Runberg Architecture Group
Mechanical Engineer: Rushing Company
General Contractor: Walsh Construction Co.
Systems & Efficiencies

- Three Swegon rooftop ERVs serving four residential floors
  - Two Gold RX25s
  - One Gold RX11
- Minimum calculated heat recovery efficiency of 80%
Treatment of Main Trunks at Top Floor
Balancing & Commissioning

- Involved TAB/mechanical contractor early on in process
- Equipment needed to verify Phius air flow targets
Centralized Building Wings

PROS
• Keeps most of the ductwork within building enclosure.
• Maintenance – fewer units and less invasive to residents.

CONS
• Need additional height in top floor to accommodate ductwork (trunk).
• Requires code exception/alternate at jurisdiction’s and Fire Marshal’s discretion.
Ellie Passivhaus – Balanced Ventilation

Owner/Developer: Sound West Group
Architect: NK Architects
Mechanical Engineer: Staengl Engineering
General Contractor: Cascade Built
Systems & Efficiencies

- Fifteen HRVs
  - Twelve Zehnder Q600s (heat recovery efficiency up to 87%)
  - Three Zehnder CA160s (heat recovery efficiency up to 95%)
Unitized Systems
Centralized Horizontal, Floor-by-Floor
Mechanical Spaces
Balancing & Commissioning
Hybrid: Centralized, Horizontal (Floor-by-Floor) & Unitized Systems

• Pros:
  • No area required on roof
  • No vertical shafts running through each floor
  • Equipment is within building enclosure

• Cons
  • Room(s) or closet(s) on each floor
  • Locating intake and exhaust through side of building
  • More floor height to accommodate corridor soffit for horizontal trunk ducts
Advantages of Optimized Balanced Ventilation Configurations

- Additional solar panels
- More marketable amenity space

Credit: Runberg Architecture Group
Conclusions

• Integration of key testing and commissioning players (rater/verifier, TAB, etc.) early on in design.
• Pre-construction meetings for testing to get buy-in early on from project team to implement cost-effective testing methods.
• Design what makes sense for building type and project goals.

Credit: Vivian Hsu Photography 2018
Acknowledgement

• Exemplary Building Program by Housing Development Consortium (HDC) of Seattle-King County
Questions?
Thank you!

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