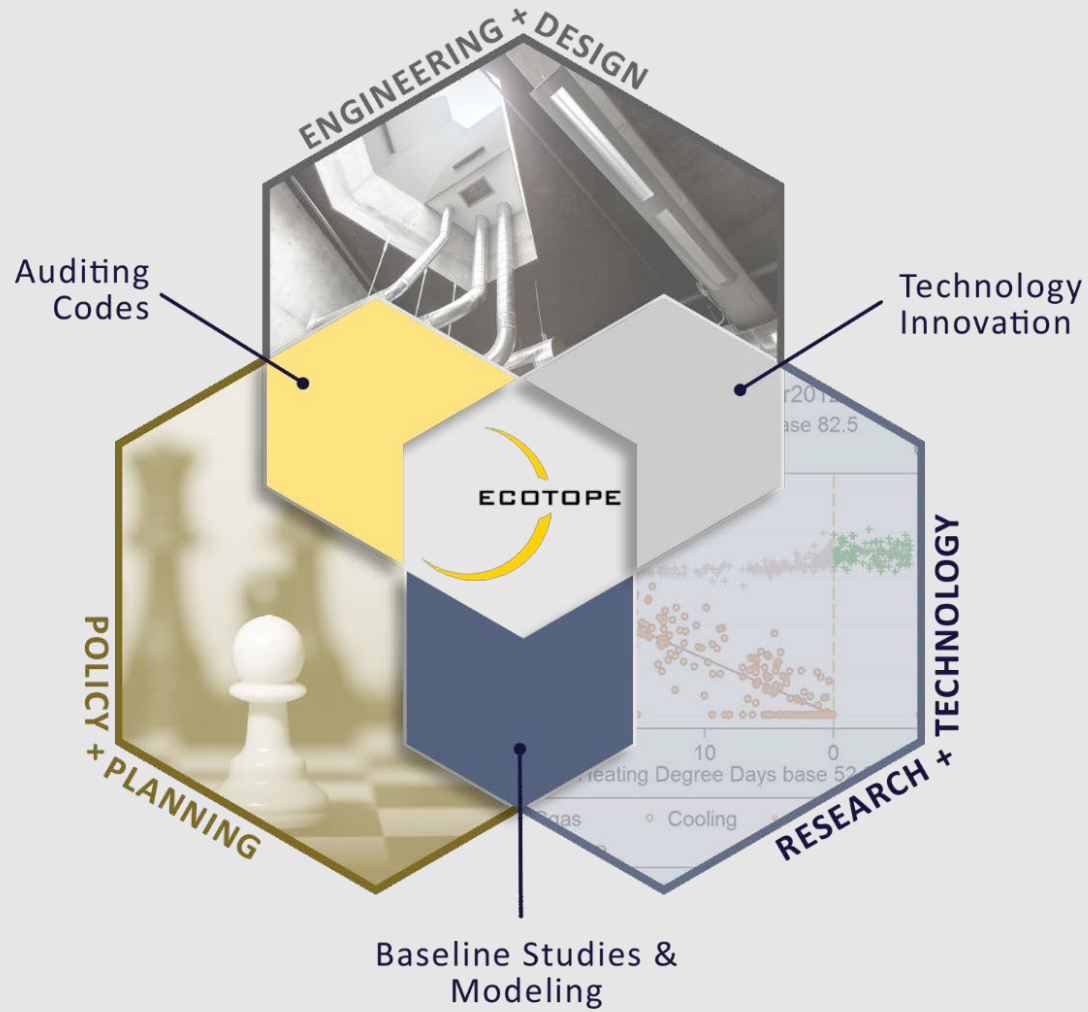


Energy Codes and New Multifamily Construction

Henry Odum, P.E.



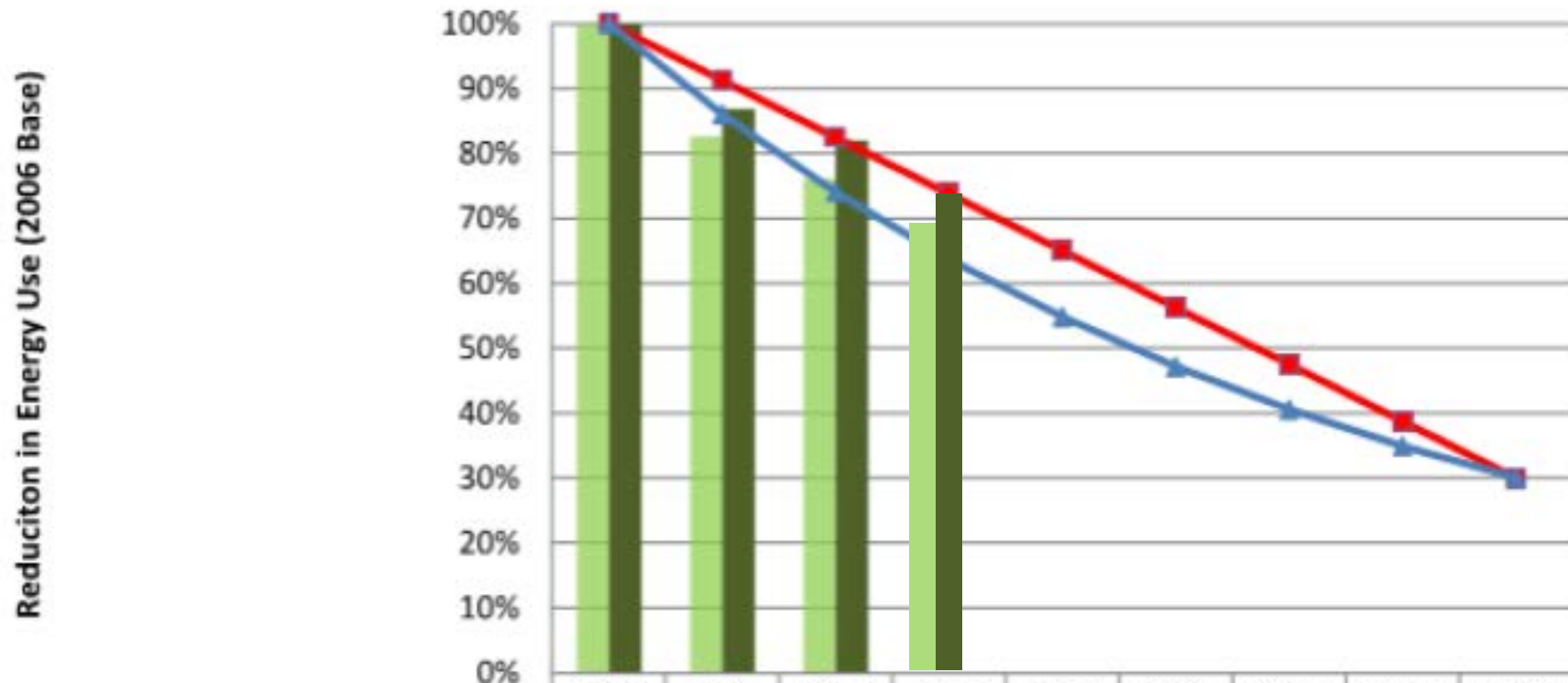


Transformation of the building industry to energy efficient carbon neutral buildings

WA State Law:
70% Reduction in
Energy Use by
2030



Incremental Improvement Compared to Targets



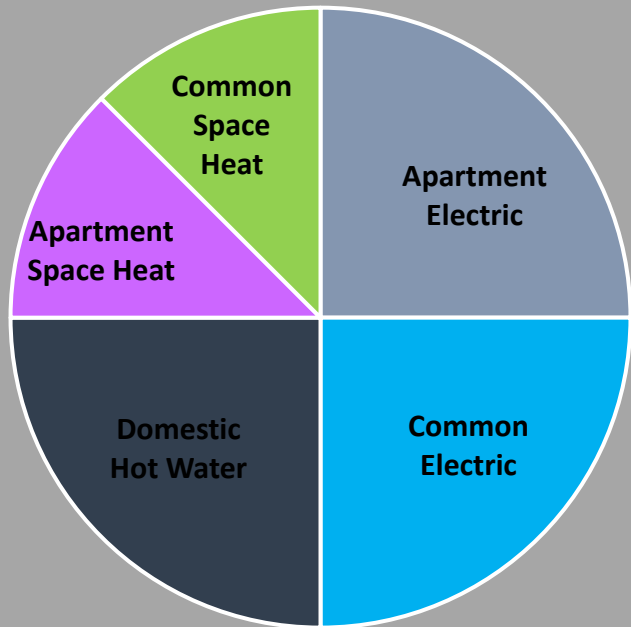
	2006	2009	2012	2015	2018	2021	2024	2027	2030
■ Residential	100%	82.7%	76.1%	68.0%					
■ Commercial	100%	86.8%	82.0%	75.0%					
■ Target: 8.75 % savings compared to the 2006 WSEC	100%	91%	83%	74%	65%	56%	48%	39%	30%
▲ Target: 14% savings compared to each previous code	100%	86%	74%	64%	55%	47%	41%	35%	30%

WA State
Improvement
Towards Targets

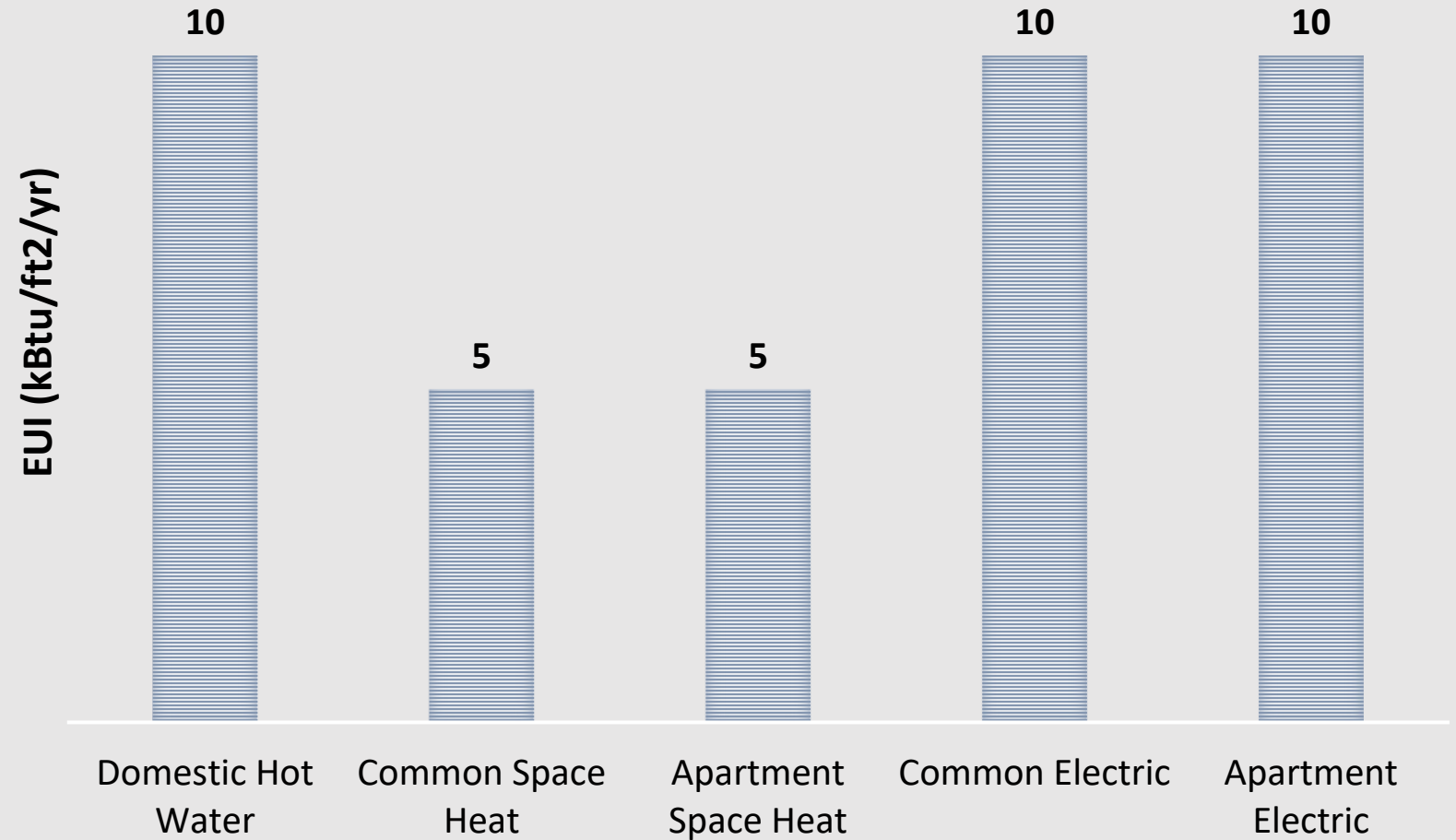
Multifamily Energy End Uses

Seattle Midrise Baseline

EUI \approx 40 kBtu/ft²/yr



EUI BY END USE (TYPICAL MID-RISE)



Central Heat Pump Water Heating



Ecotope Central HPWH Design Portfolio

Low Rise | 10-65 dwelling units

- Elizabeth James - 65 units - (4) Sanden CO2 Heat Pumps, Retrofit
- Grow Communities - 3 bldgs, 12 units each - Daikin Altherma
- Puyallup Tribal - 20 units - VRF Plant, GSHP Plant
- Alma Gamble – 12 units – Daikin Altherma retrofit

Mid Rise | 50-400 dwelling units

- Stream - 134 units - (2) 10T Colmac Air-Source HP in below-grade parking
- Sunset Electric - 92 units - Colmac in below-grade parking
- Stackhouse - 120 units - Colmac in underground parking deck
- Augusta Apartments - 224 units - Colmac in below-grade parking
- Batik Apartments - 195 units - Colmac in underground parking deck
- Yesler 3 - 227 units - Colmac in underground parking deck
- Jackson Apartments - 526 units - Colmac in underground parking deck
- Colina Apartments – 131 units, Sanden - Decentralized
- The Vale Apartments - 134 units - Versati 2, Multi-Pass
- Waterfront Place - 137 units - Versati 2, Multi-Pass
- Hopeworks – 67 units - Sanden CO2 Stacks
- Meridian Manor – 90 units - Aermec Retrofit

High Rise | 200-450 dwelling units

- 4700 Brooklyn - 284 units - Colmac with VRF Temp Maintenance
- Cascade - 430 units - Colmac with VRF Temp Maintenance
- 1200 45th -245 units - In Design
- Security House – 107 units - Daikin Altherma preheat



Investigation of Airtightness and Ventilation Interactions in New Multifamily Buildings

Field Study



Methodology

10 mid-rise and 2 high-rise MF

9 exhaust-based and 3 balanced-flow ventilation systems

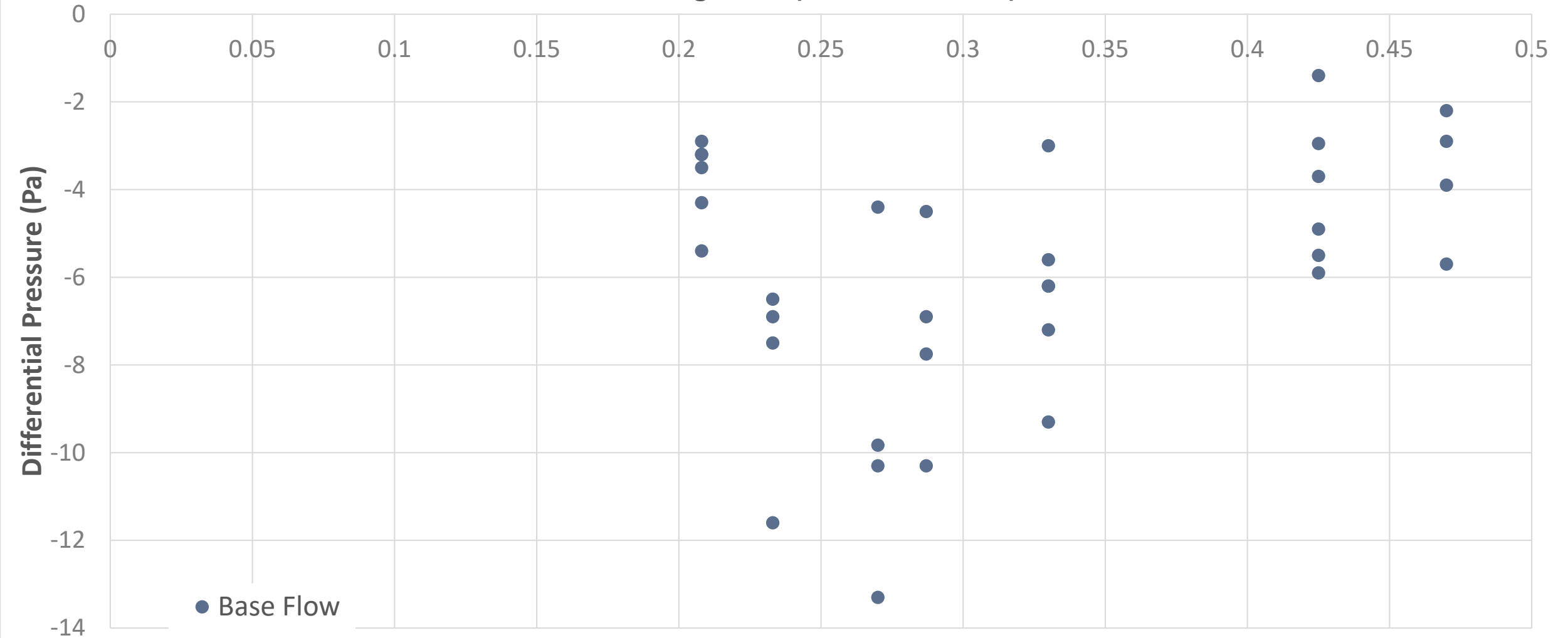
Whole-building airtightness test required

Top/bottom floors preferred (stack effect)

5 different test scenarios

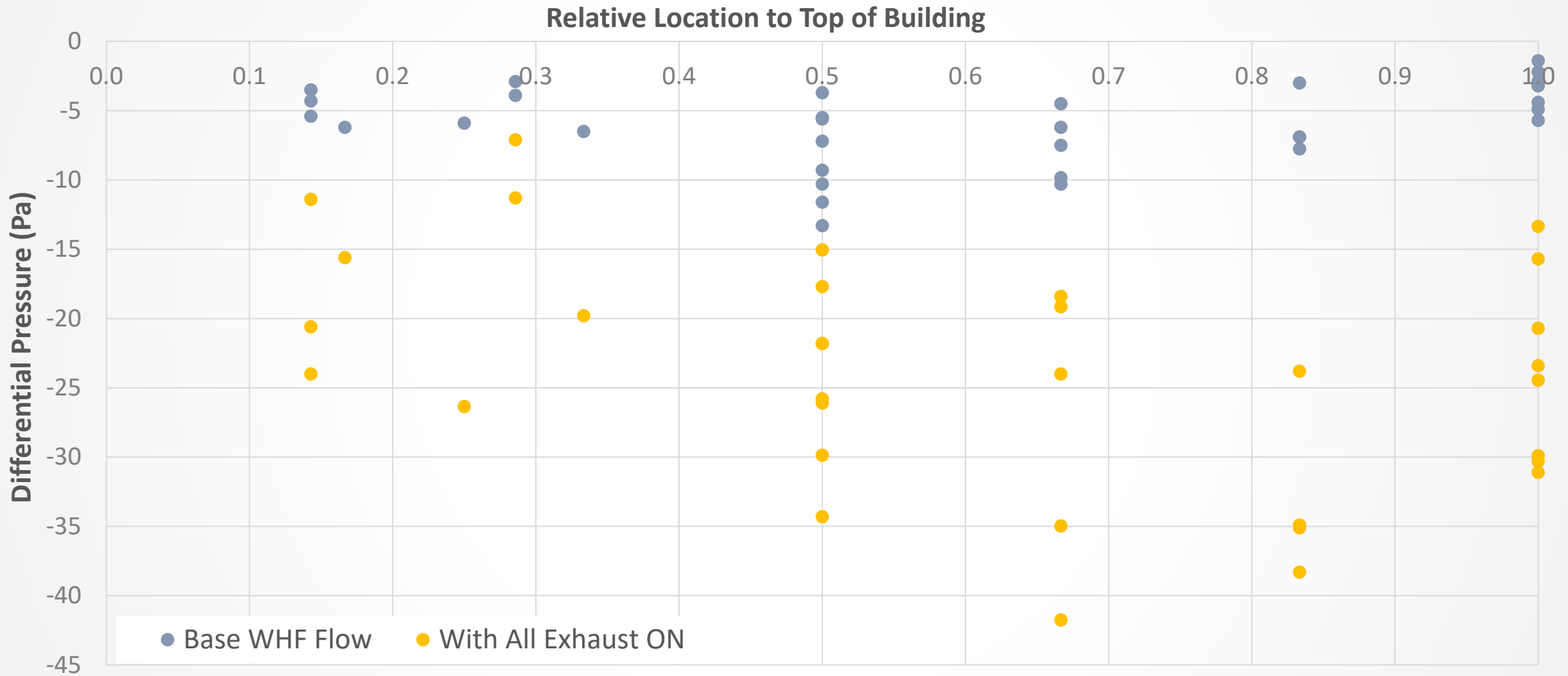


Tested leakage Rate (CFM/ft2 @ 75Pa)



Differential Pressure with respect to Exterior - Envelope Tightness

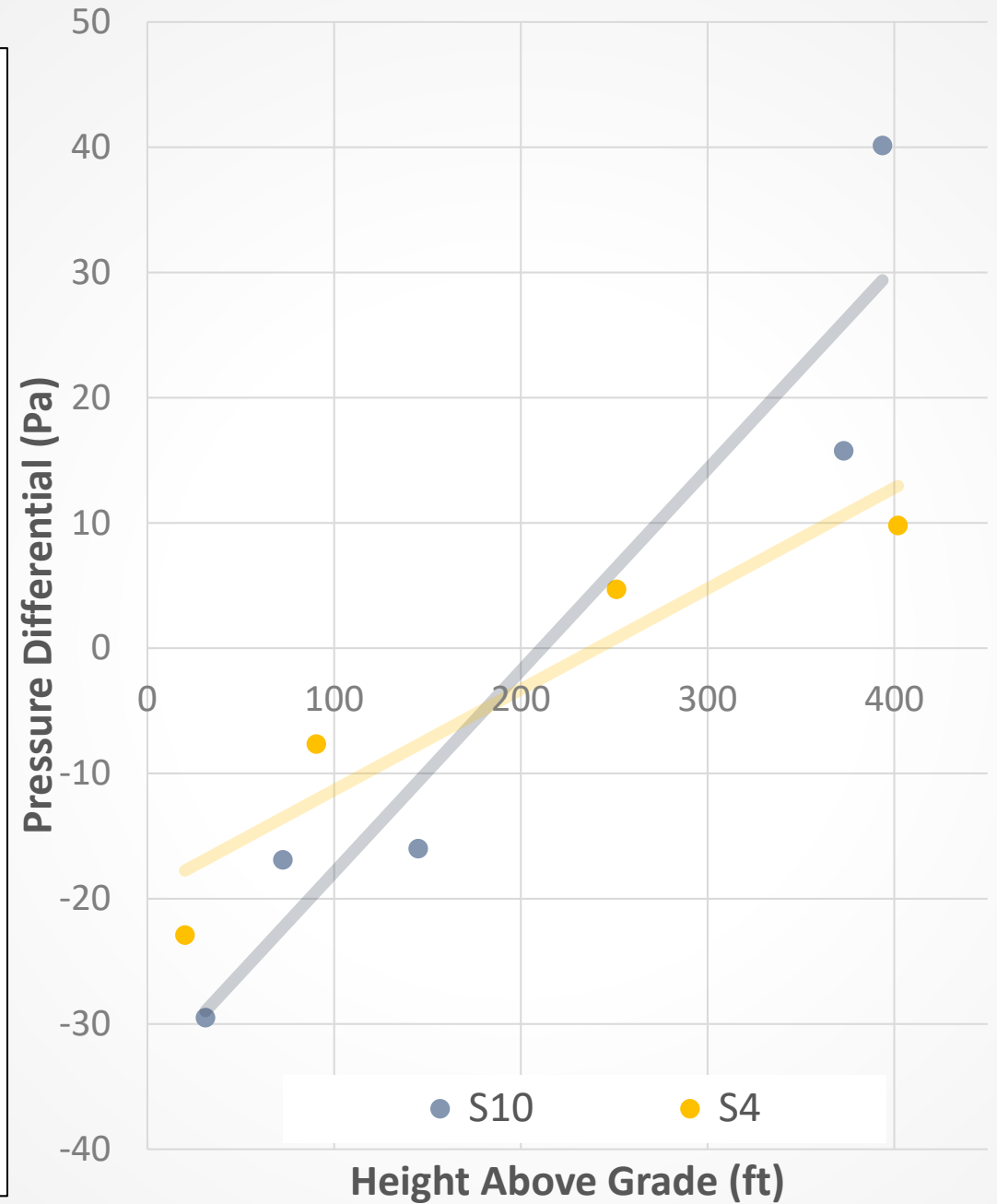
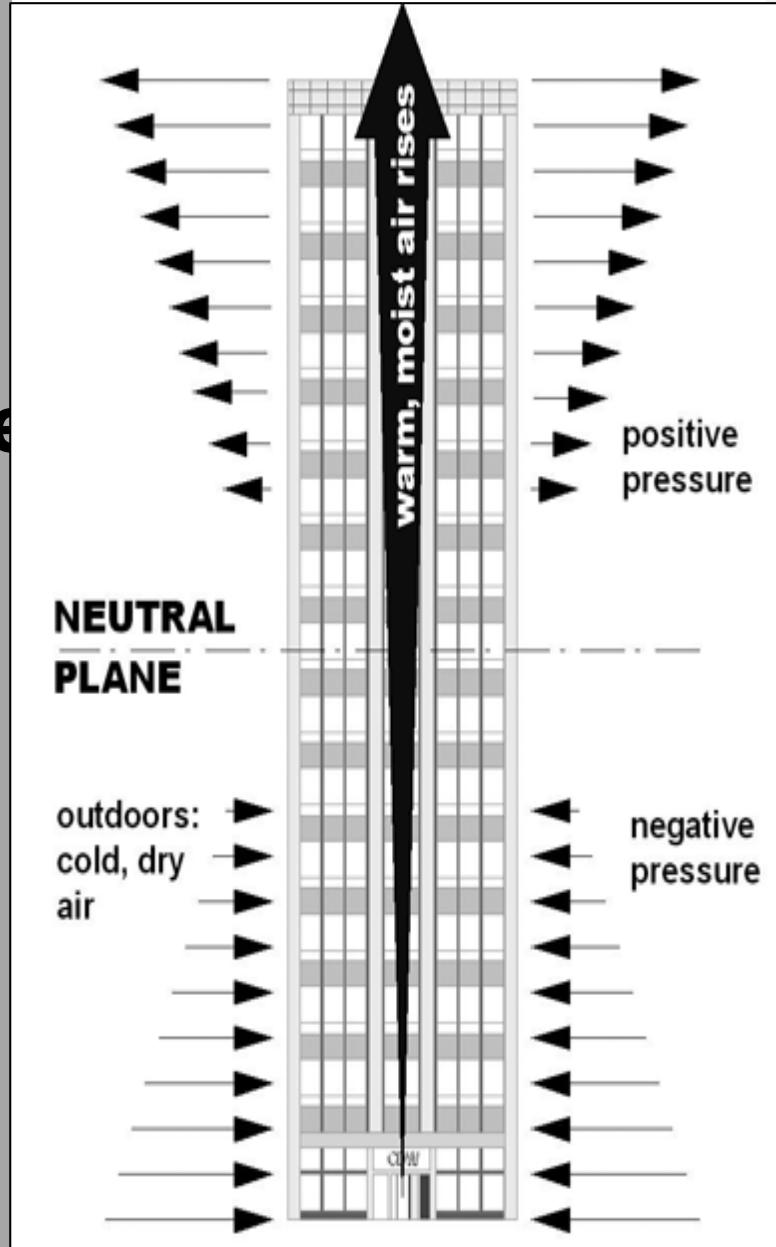
(Mid-Rise Exhaust-Based Ventilation)

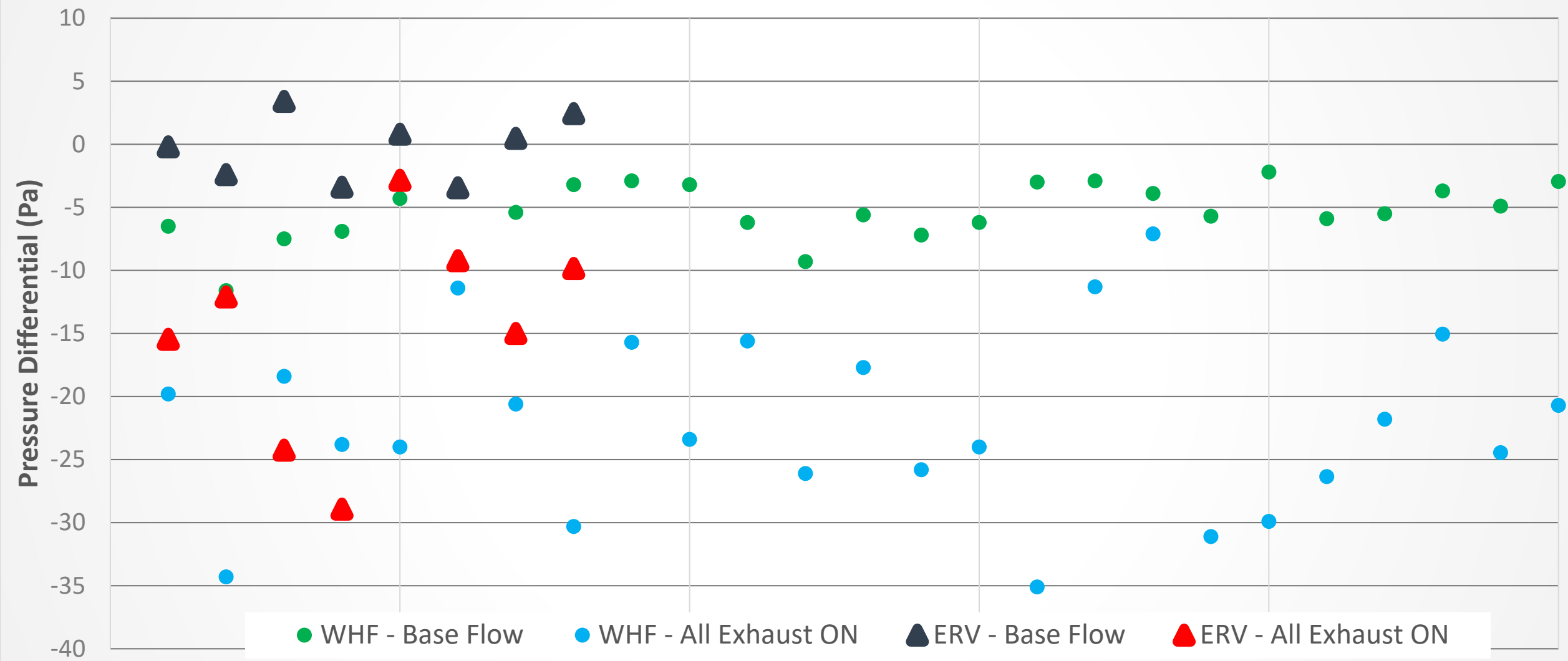


Differential Pressure with respect to Exterior – Relative Height
(Mid-Rise Only)

Differential Pressure with respect to Exterior – Base Ventilation Rate

(High-Rise Only)

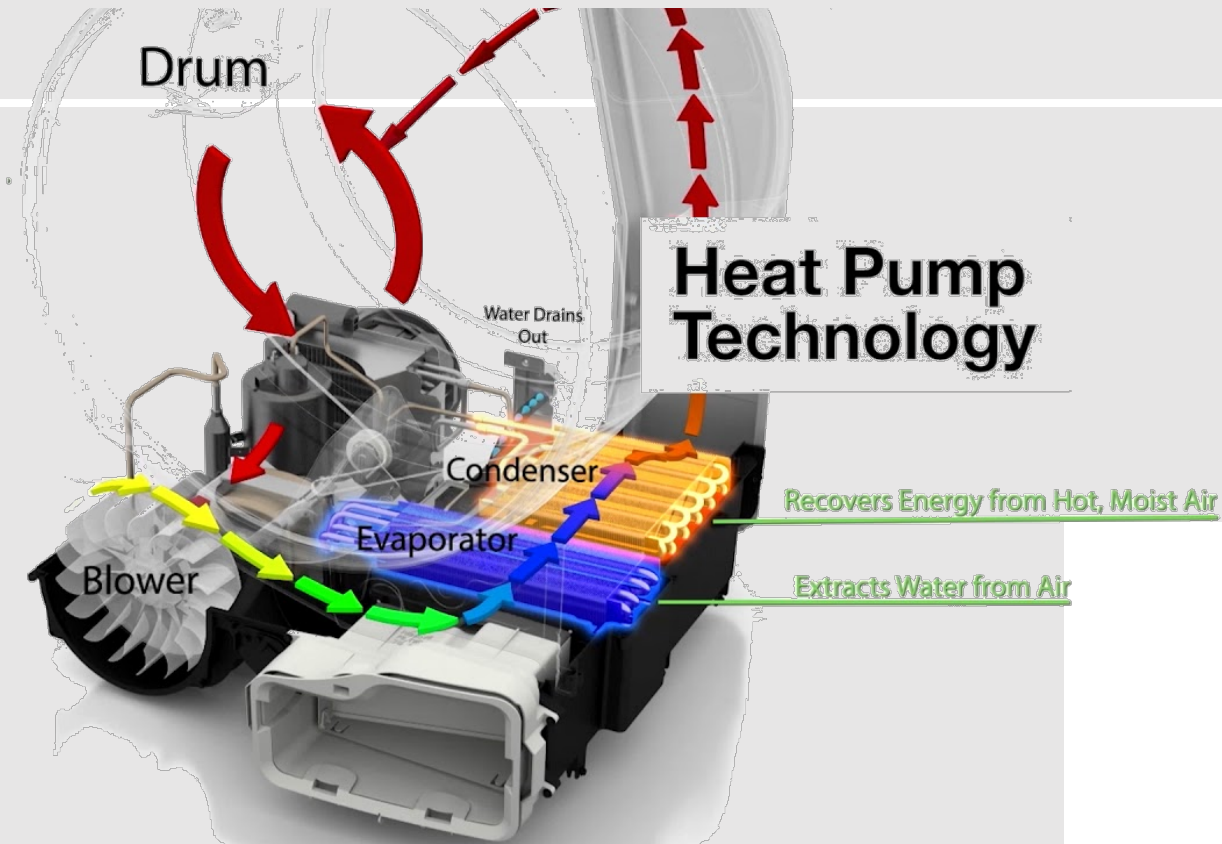




Differential Pressure with respect to Exterior – Base and All-ON

(All Mid-Rise Buildings)

Airtightness and Appliances



Traditional dryers impacted
(Ventless!)

Kitchen range hoods unaffected



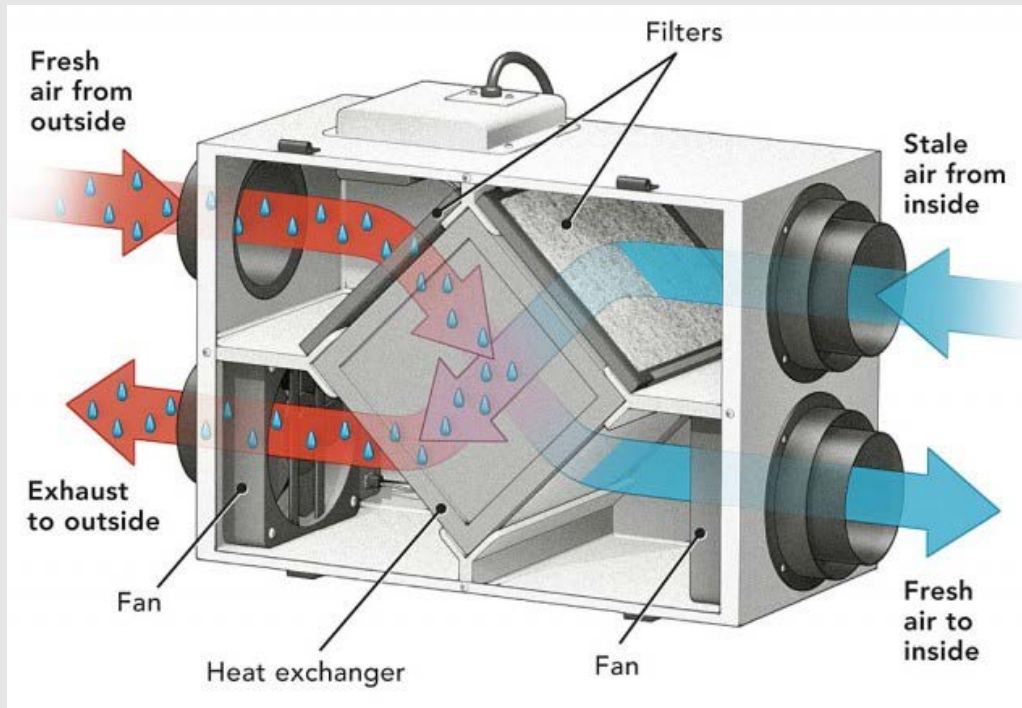
Airtightness and Ventilation

Balanced flow ventilation with ERV/HRV:

1. Whole Building
2. Floor-by-floor
3. Unit-by-unit

Ducted

Through-the-wall





Thank you!

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