

BUILDINGENERGY NYC

Improving Multifamily Ventilation Retrofits through Industry Collaboration

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**Changing the way the
Industry learns**



Agenda

- **What is Show me the Data?**
- **Ventilation Overhaul Workshop**
- **3 Case Studies**
- **Cross Cutting Insights**
- **Panel Discussion**
- **Audience Questions**

The Problem



Few deep retrofits completed



Even fewer share performance data



The industry learns slowly

Less marketing.

More measurement.

More Sharing.

**SHOW ME
THE
DATA**







Gather
Participants

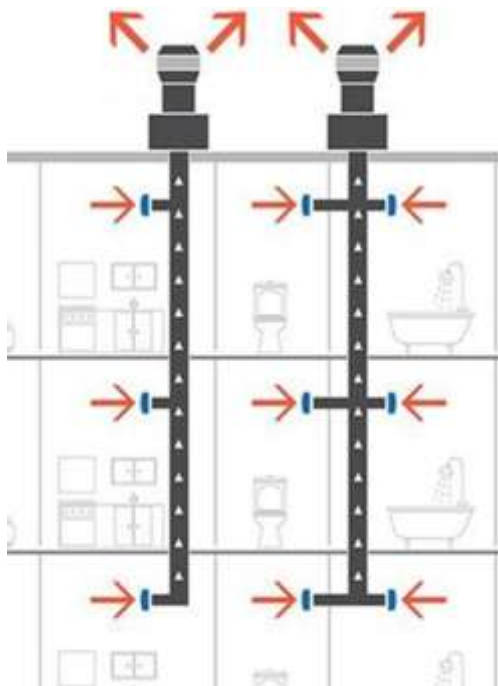
Beg for
Data

Align
analysis

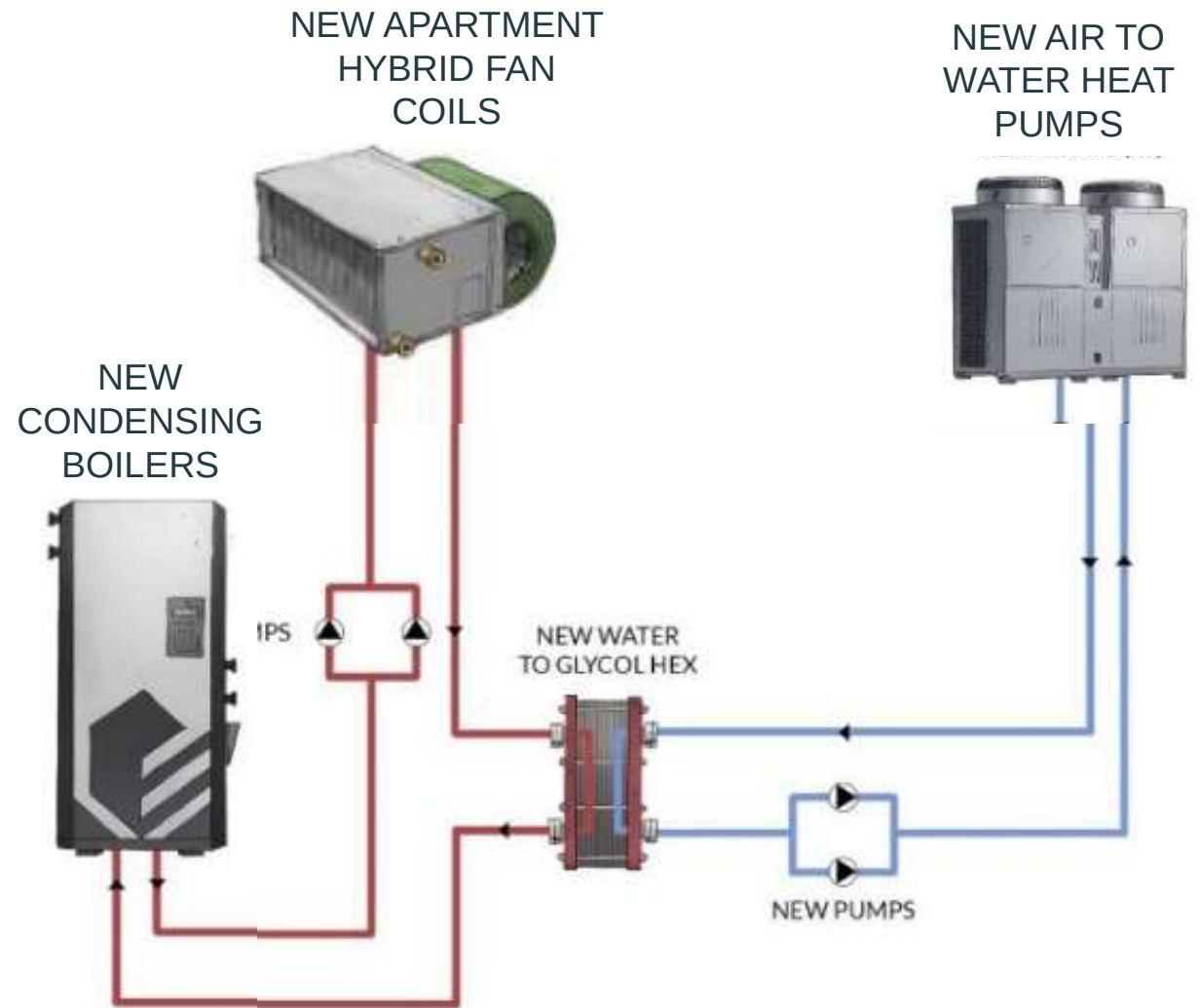
Structured
discussion

Industry
insights

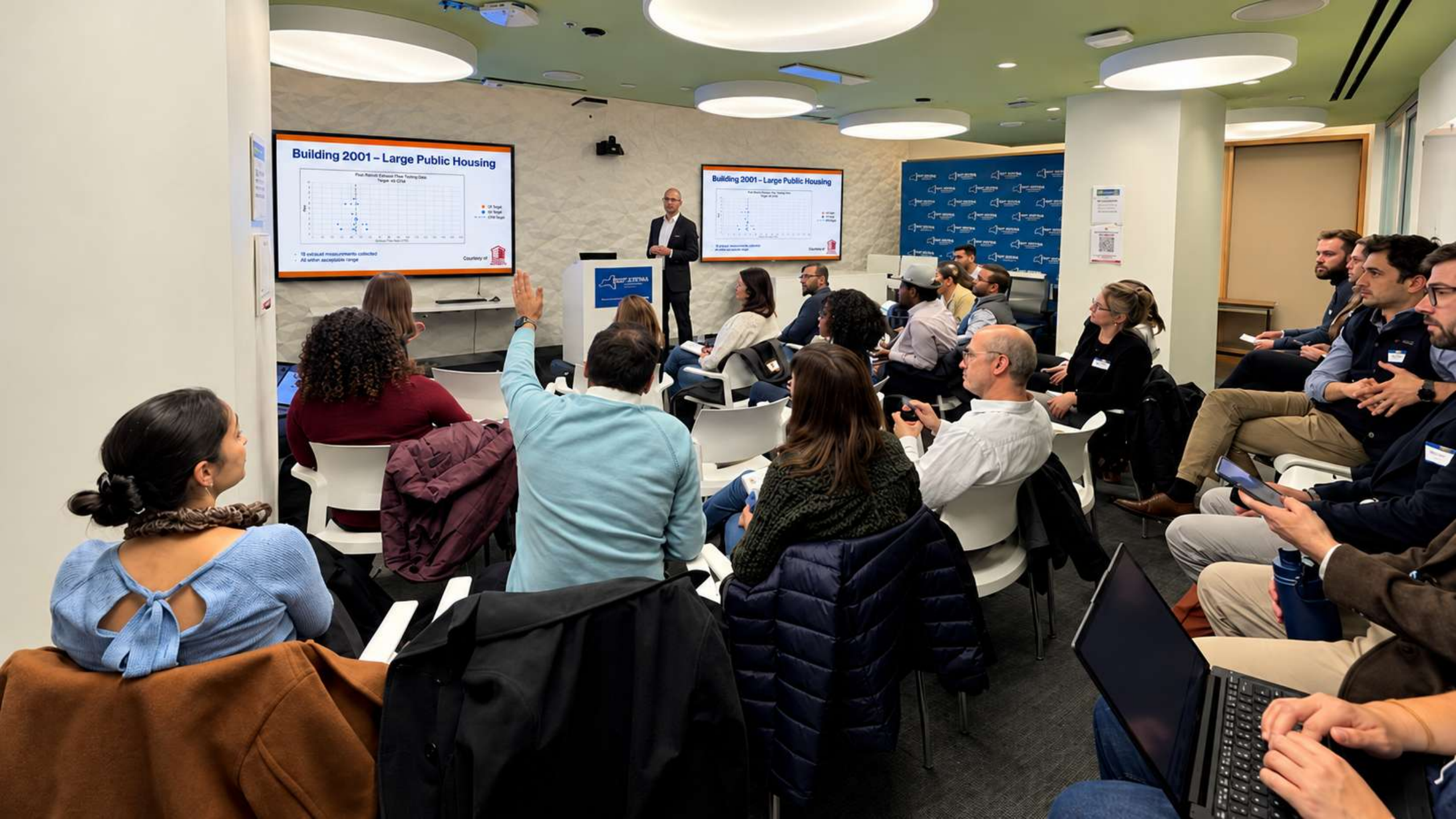
Pilot Workshops



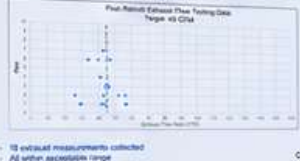
WORKSHOP 1:
VENTILATION OVERHAUL



WORKSHOP 2:
PARTIAL ELECTRIFICATION



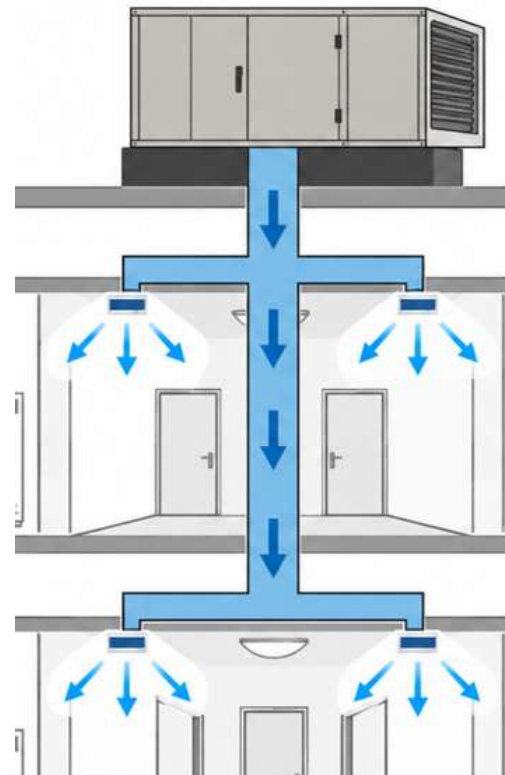
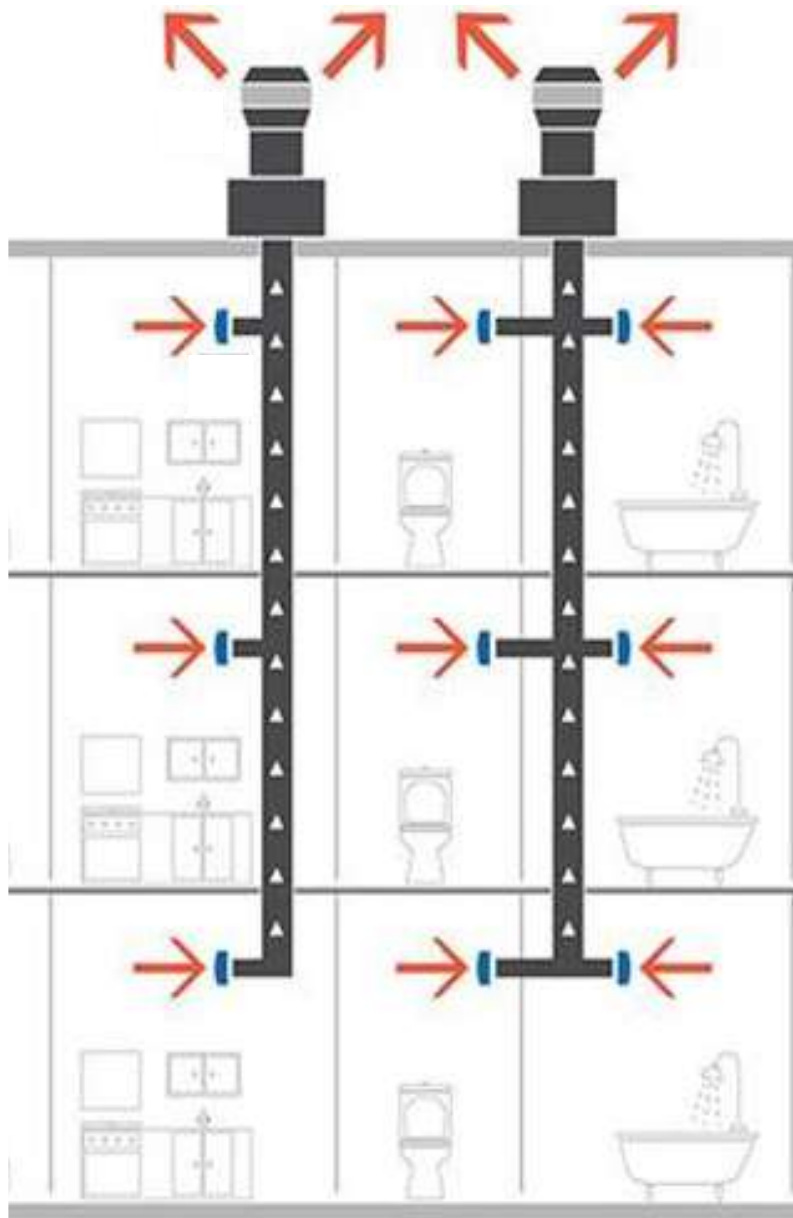
Building 2001 - Large Public Housing

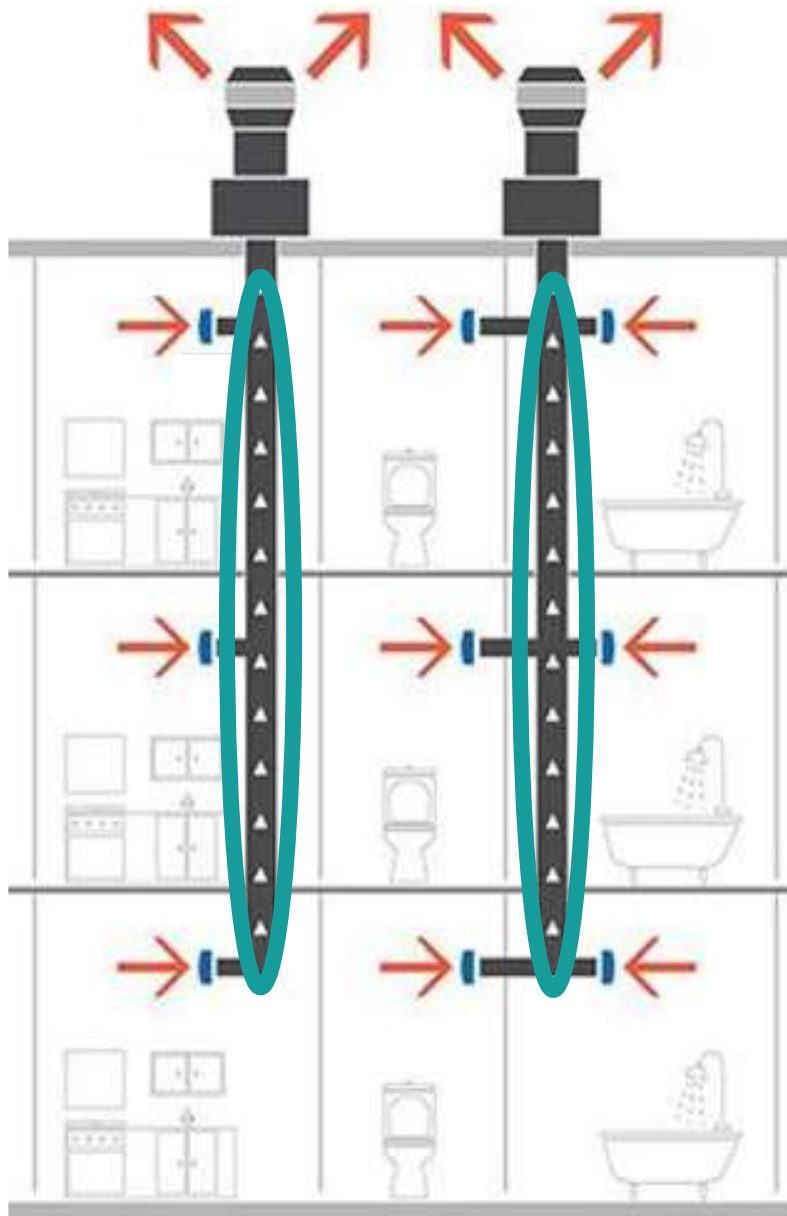


Building 2001 - Large Public Housing



Workshop #1





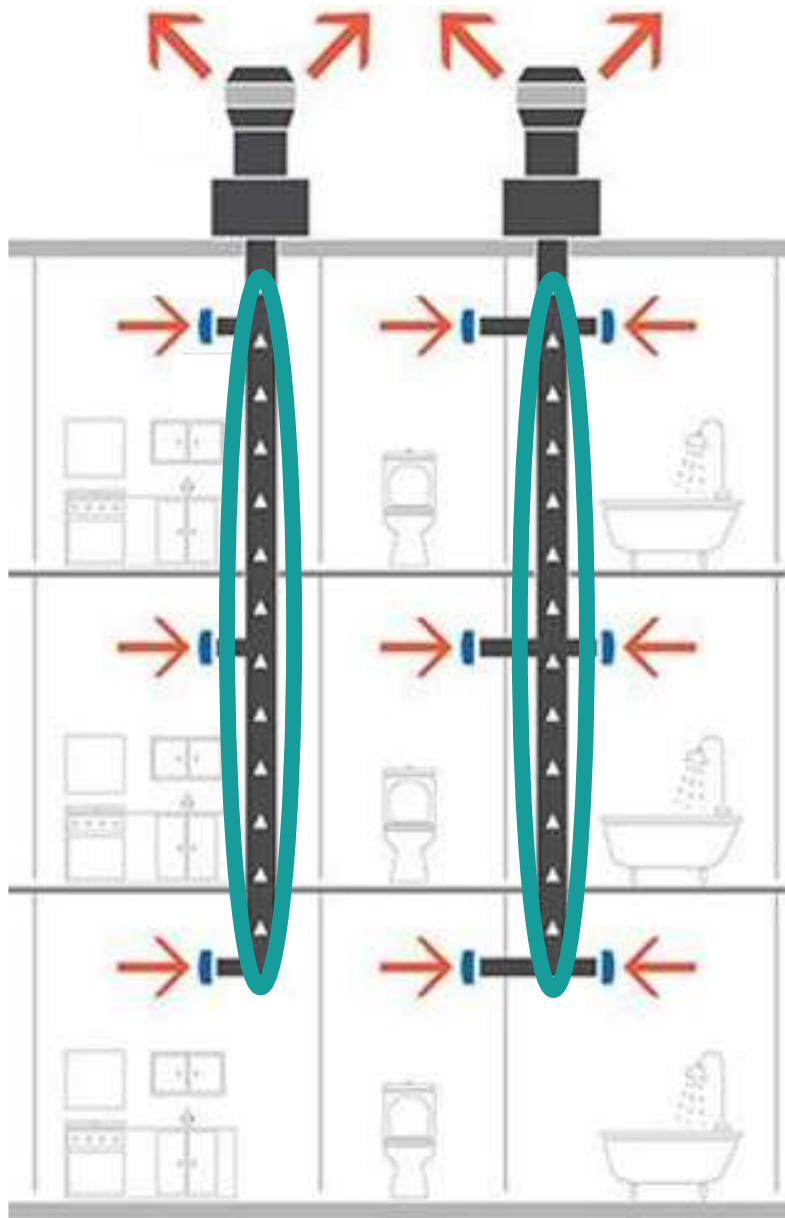
Step 1: Clean



Curb Sealing (Before)

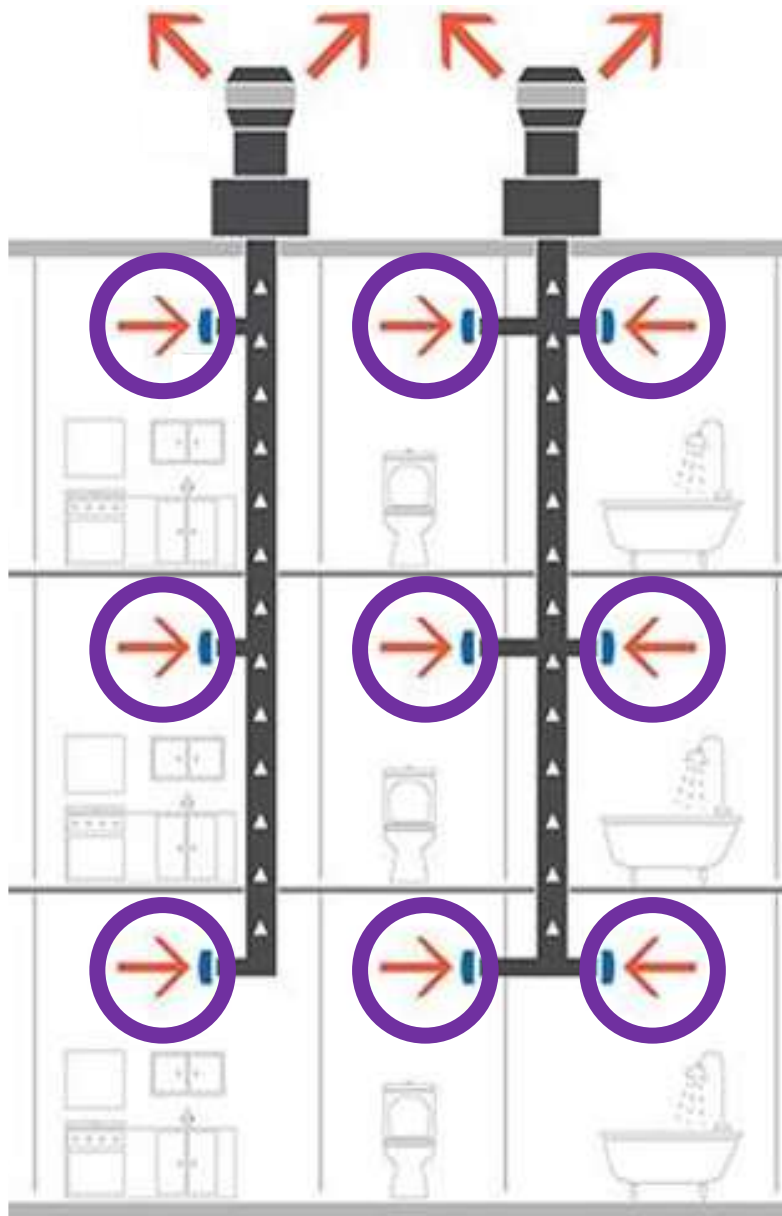


Curb Sealing (After)



Step 2: Seal





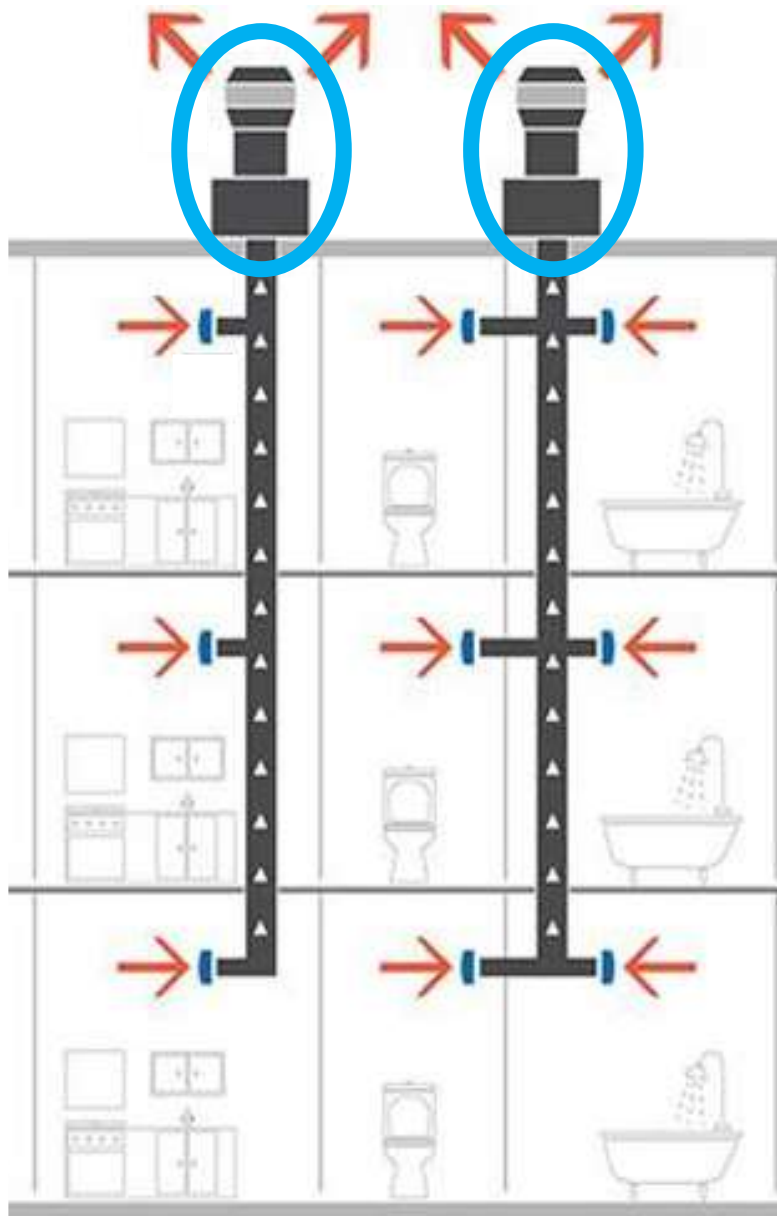
Step 3: Balance



Exhaust Register (Before)



Exhaust Register (After)



Step 4: Adjust



Fan Installation (Before)



Fan Installation (After)

Projects Submitted

Participant	Total Projects	Ventilation Only	Ventilation + Additional Measures
Bright Power	3	2	1
EN-POWER GROUP	4	2	2
NYSERDA	2*	0	2
NYCHA	4	4	0
SWA	4	0	4
MaGrann	1	0	1
Total	18	8	10



Case Study #1:
Two Paths to Better Ventilation in a Multifamily Building

Case Study #1:

Two Paths to Better Ventilation in a Multifamily Building

Building Characteristics	
Year Built	1975
# of Apartments	272
Occupancy Type	Co-op Market Rate
Gross Floor Area	243,200 SF
Stories	18



Case Study #1: Two Paths to Better Ventilation in a Multifamily Building

Building Systems

System	Pre-Retrofit	Post-Retrofit
Heating Distribution	2-Pipe Steam	No change
Heating Terminal units	Radiators	
Heating Energy Input	Natural Gas	
Cooling System	Through-Wall AC	
Heating Controls	Standard	
Envelope	Masonry	



Case Study #1:

Two Paths to Better Ventilation in a Multifamily Building

Apartment Ventilation

Component	Pre-Retrofit	Post-Retrofit
Type	Rooftop exhaust	No change
Fans	Belt-driven	Motor replacement - Variable speed direct drive
Risers	CMU: Leaky	CMU: Mastic sealing
Balancing	Manual Dampers	CARs
Construction Period	May 2021 – Oct 2023	



Case Study #1:

Two Paths to Better Ventilation in a Multifamily Building

Corridor Ventilation

Component	Pre-Retrofit	Post-Retrofit
Type	Rooftop exhaust	No change
Fans	Belt-driven	Motor replacement: Variable speed direct drive
Risers	Sheetrock: Leaky	Sheetrock: Aeroseal
Balancing	Manual Dampers	CARs
Construction Period	May 2021 – Oct 2023	



Case Study #1: Two Paths to Better Ventilation in a Multifamily Building

Costs

Ventilation System

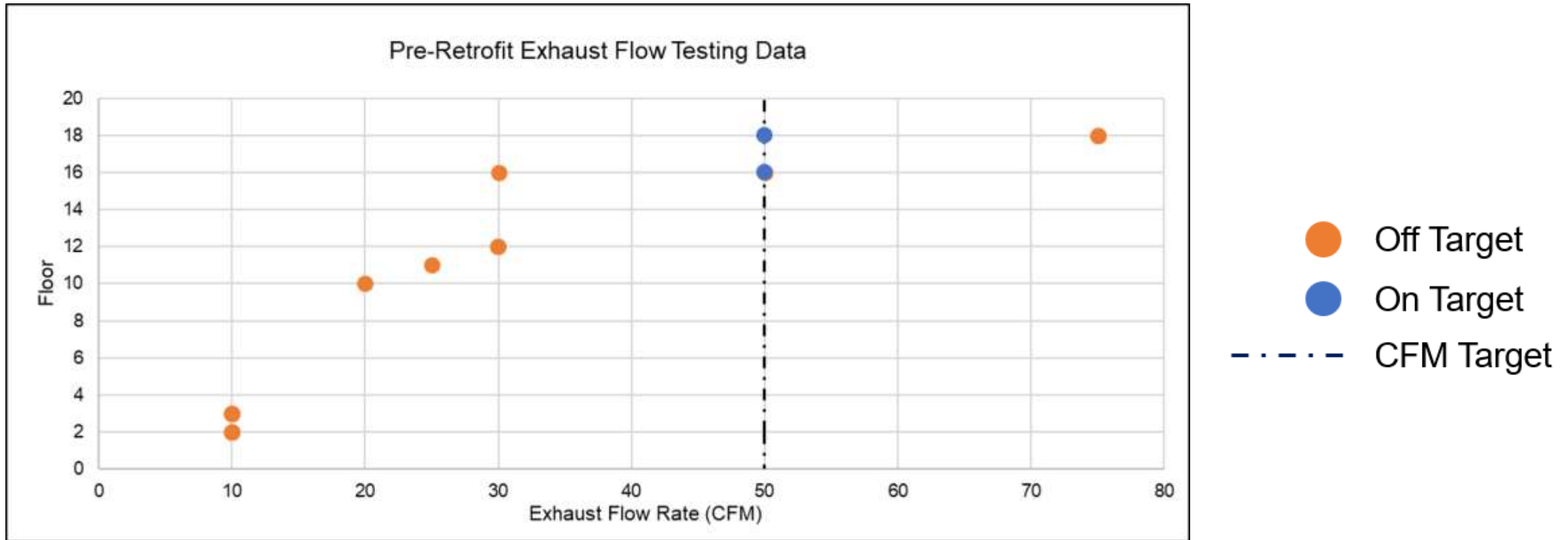
\$1.23/ SF
\$1,100/ apartment

Detail

- Total Project Cost: \$265,122
 - Engineering + PM costs: \$34,000
- Con Ed MFEEP Incentives: \$75,000

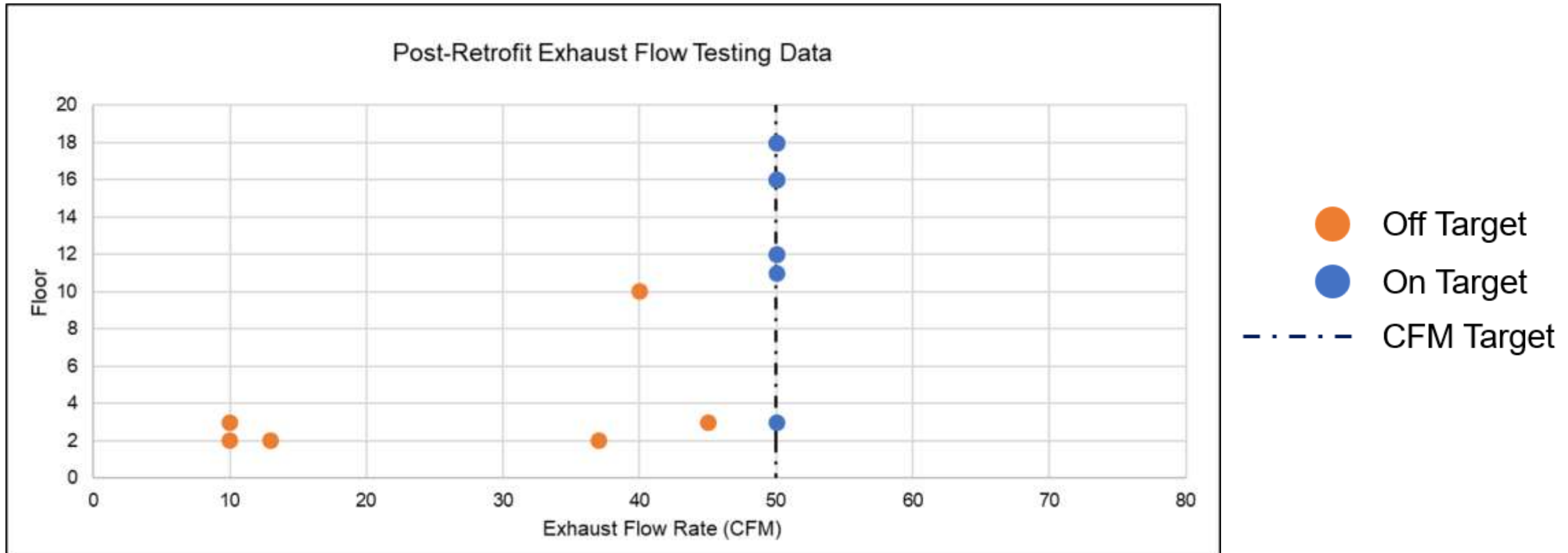


Case Study #1: Two Paths to Better Ventilation in a Multifamily Building



- 16 exhaust measurements collected in Kitchen and Bathrooms
- 3 exhaust measurements at 50 CFM target
- 19% pass

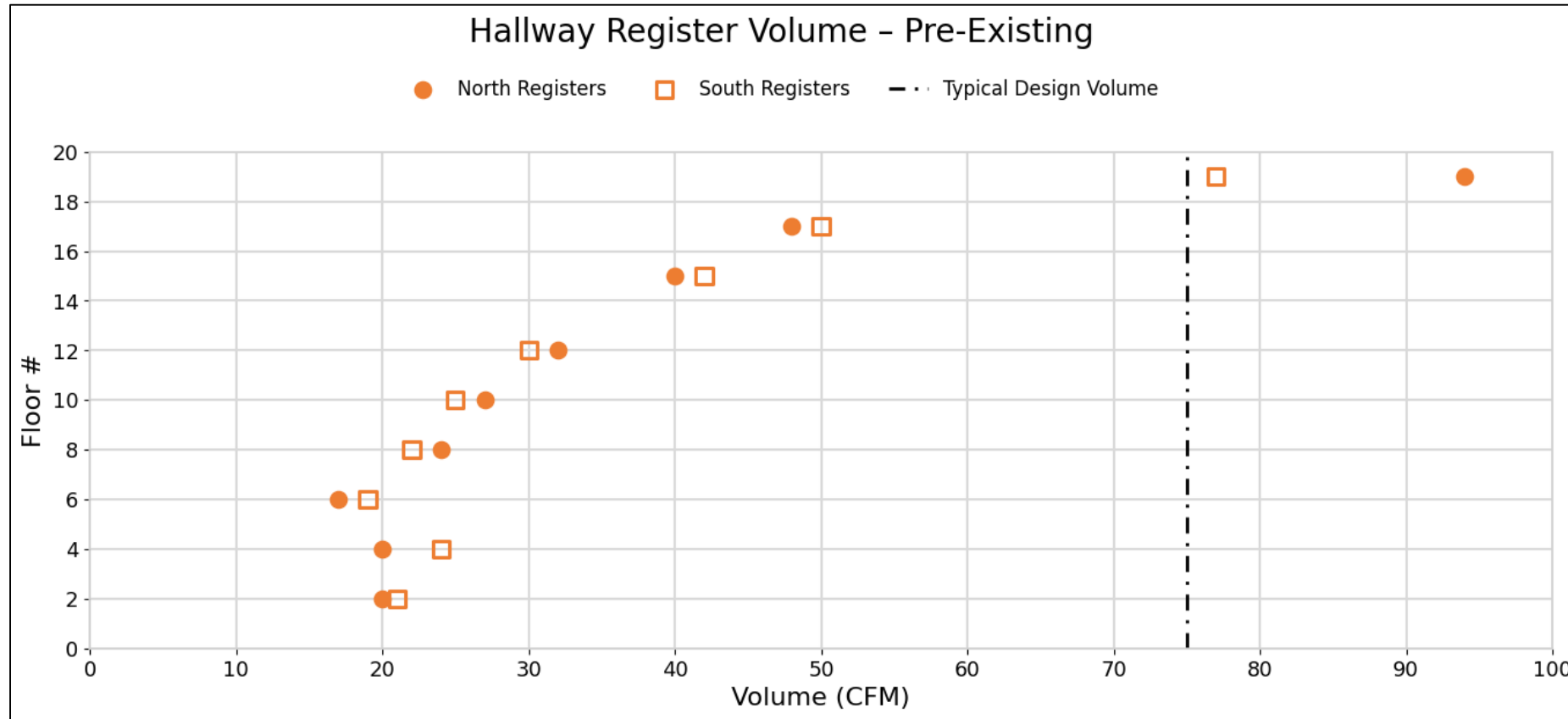
Case Study #1: Two Paths to Better Ventilation in a Multifamily Building



Conservative design approach developed due to existing duct conditions, minimum design targets challenging to achieve

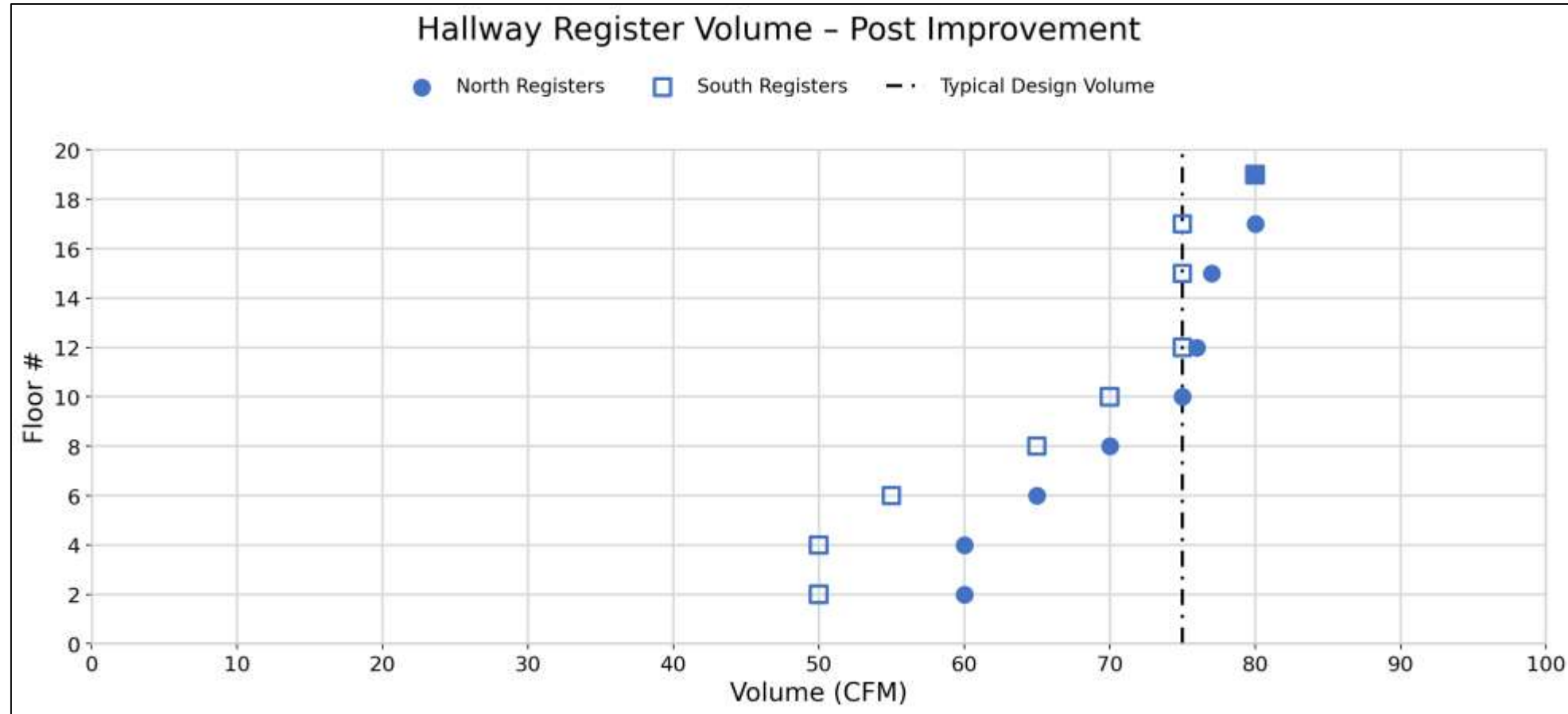
- 16 exhaust measurements collected
- 10 exhaust measurements at 50 CFM target
- 63% pass

Case Study #1: Two Paths to Better Ventilation in a Multifamily Building



- 18 exhaust measurements collected
- 16 exhaust measurements below 75 CFM target
- 11% pass

Case Study #1: Two Paths to Better Ventilation in a Multifamily Building



- 18 exhaust measurements collected
- 9 exhaust measurements below 75 CFM target
- 50% pass
- Reduced differential from 76 to 30 CFM

Case Study #1: Two Paths to Better Ventilation in a Multifamily Building

Energy Savings Summary			
Metric	Pre-Energy Use	Post-Energy Use	% Energy Savings
HDD Coefficient (Therm/ HDD)	26	25	2.2%
Baseline Electricity Coefficient (kWh/day)	4493	4065	9.5%



Case Study #1

High-rise Multifamily Ventilation Project

Key Takeaways

- Real world challenges prevent perfect implementation. Occupied buildings have access limitations, varying tenant conditions and existing system degradation, which can impact performance.
- Meeting code-minimum ventilation requirements supports energy efficiency goals, but performance can vary in existing buildings.
- Combining traditional ventilation controls with advanced sealing technologies like Aeroseal can improve consistency across the system, support better indoor air quality, and maintain energy performance.



Case Study #2

Senior Affordable Building

Case Study #2

Senior Affordable Building

Building Characteristics	
Year Built	1979
# of Apartments	187
Occupancy Type	Rental, Senior Affordable
Gross Floor Area	93,654 SF
Stories	12



Case Study #2

Senior Affordable Building



Comprehensive Energy Efficiency Retrofit

- Ventilation Upgrades
- Common Area Lighting
- DCW Booster Pump Upgrade
- Heating Controls
- New DHW Boilers
- Low Flow Fixtures
- Apartment Lighting

Case Study #2

Senior Affordable Building

Mechanical Systems		
System	Pre-Retrofit	Post-Retrofit
Heating Distribution	Gas Boiler	Improved controls
Heating Terminal units	Hot Water Baseboard	Limiting Thermostats
Heating Energy Input	Gas	No change
Cooling System	Sleeve ACs	No change



Old MUA

Case Study #2

Senior Affordable Building

Apartment Ventilation		
Component	Pre-Retrofit	Post-Retrofit
Type	Rooftop exhaust w/Hallway makeup air	Upgraded fans and MAU
Fans	Belt-driven	Fan replacement- Variable speed direct drive
MAU	Designed to balance apt Exhaust	Right sized for common area fresh air
Risers	Sheetrock: Leaky	Sheetrock: Cleaned, Sealed
Balancing	None	CAR Dampers



CAR & Fire Dampers

Case Study #2

Senior Affordable Building

Ventilation System Changes

Component	Pre-Retrofit	Post-Retrofit
Total Exhaust Fan Airflow	20,900 CFM	12,480 CFM
Exhaust Leakage	6,998 CFM	761 CFM
Avg Kitchen/Bath Exhaust	37 CFM	31 CFM
Exhaust Fan Horsepower	11.75 hp	4.5 hp
Make Up Air Unit Airflow	19,227 CFM	3,920 CFM
Make Up Air Horsepower	15 hp	1.5 hp

*New MAU
& EFs*



Case Study #2

Senior Affordable Building

Boulevard Senior Citizens In-Unit Vent Inlet Airflow Readings (CFM's) Completed by RSI: 8/5/22

Apt. Line	Top Floor (11th)		Mid-Floor (5th)		Bottom Floor (1st)	
	Kitchen	Bath 1	Kitchen	Bath 1	Kitchen	Bath 1
A	30 CFM	31 CFM	30 CFM	30 CFM	30 CFM	30 CFM
B	30 CFM	30 CFM	30 CFM	28 CFM	30 CFM	27 CFM
C	30 CFM	31 CFM	30 CFM	30 CFM	29 CFM	30 CFM
D	30 CFM	30 CFM	30 CFM	29 CFM	30 CFM	30 CFM
E	30 CFM	31 CFM	32 CFM	29 CFM	30 CFM	28 CFM
F	30 CFM	30 CFM	31 CFM	27 CFM	30 CFM	30 CFM
G	30 CFM	30 CFM	30 CFM	32 CFM	30 CFM	31 CFM
H	31 CFM	32 CFM	30 CFM	30 CFM	31 CFM	30 CFM
J	32 CFM	31 CFM	30 CFM	29 CFM	30 CFM	27 CFM
K	30 CFM	30 CFM	30 CFM	29 CFM	31 CFM	30 CFM
L	30 CFM	31 CFM	30 CFM	30 CFM	31 CFM	28 CFM
M	30 CFM	30 CFM	30 CFM	29 CFM	31 CFM	29 CFM
N	30 CFM	31 CFM	30 CFM	30 CFM	30 CFM	30 CFM
P	31 CFM	30 CFM	30 CFM	30 CFM	30 CFM	30 CFM
R	30 CFM	31 CFM	30 CFM	30 CFM	30 CFM	30 CFM
S	31 CFM	30 CFM	30 CFM	30 CFM	30 CFM	30 CFM
T	31 CFM	30 CFM	30 CFM	30 CFM	30 CFM	29 CFM



Flow Testing

Case Study #2

Senior Affordable Building

Costs	
Ventilation System	\$1.38/ SF \$693/ apartment
Total Project Cost	\$716,971 (44% incentive)
Construction Period	Jan 2022 – Feb 2023



Incentives: PSEG MF Program

Case Study #2

Senior Affordable Building

Energy Savings			
Metric	Pre	Post	% Change
Heat Slope (kbtu/sf/yr)	77.83	59.68	-23%
Includes reductions associated with boiler and thermostat controls			

14%

Gas savings
reduced leakage
smaller MAU

16%

Electric Savings
reduced motor
horsepower fans and MAU

34%

Total Savings
(all measures)

Case Study #2

Senior Affordable Building

Keys to Success:

- Collaborative contracting partners
- Management team w/good tenant relations
- Operational existing ventilation systems
- Shafts w/depth for CAR & Fire dampers
- Makeup air system that can be upgraded



Case Study – 3

High-rise Multifamily Ventilation Project

Case Study – 3

High-rise Multifamily Ventilation Project

Building Characteristics	
Year Built	1981
# of Apartments	279
Occupancy Type	Condominium Market Rate
Gross Floor Area	268,000 SF
Stories	24



Case Study – 3

High-rise Multifamily Ventilation Project

Building Systems	
System	Pre-Retrofit
Heating Distribution	2-Pipe Steam
Heating Terminal units	PTAC
Heating Energy Input	Natural Gas
Cooling System	PTAC
Heating Controls	Standard
Envelope	Masonry



Case Study – 3

High-rise Multifamily Ventilation Project

Apartment Ventilation		
Component	Pre-Retrofit	Post-Retrofit
Type	Rooftop exhaust	No change
Fans	Belt-driven	Motor replacement -Variable speed direct drive
Risers	Sheetrock: Leaky	Sheetrock: Cleaning Blockage removal Aeroseal
Balancing	Manual dampers	CARs
Construction Period	Oct 2024 – Oct 2025	



Exhaust shaft before



... and after

Case Study – 3

High-rise Multifamily Ventilation Project

Costs

Ventilation Overhaul Project	\$1/ SF \$956/ apartment
------------------------------	-----------------------------

Detail

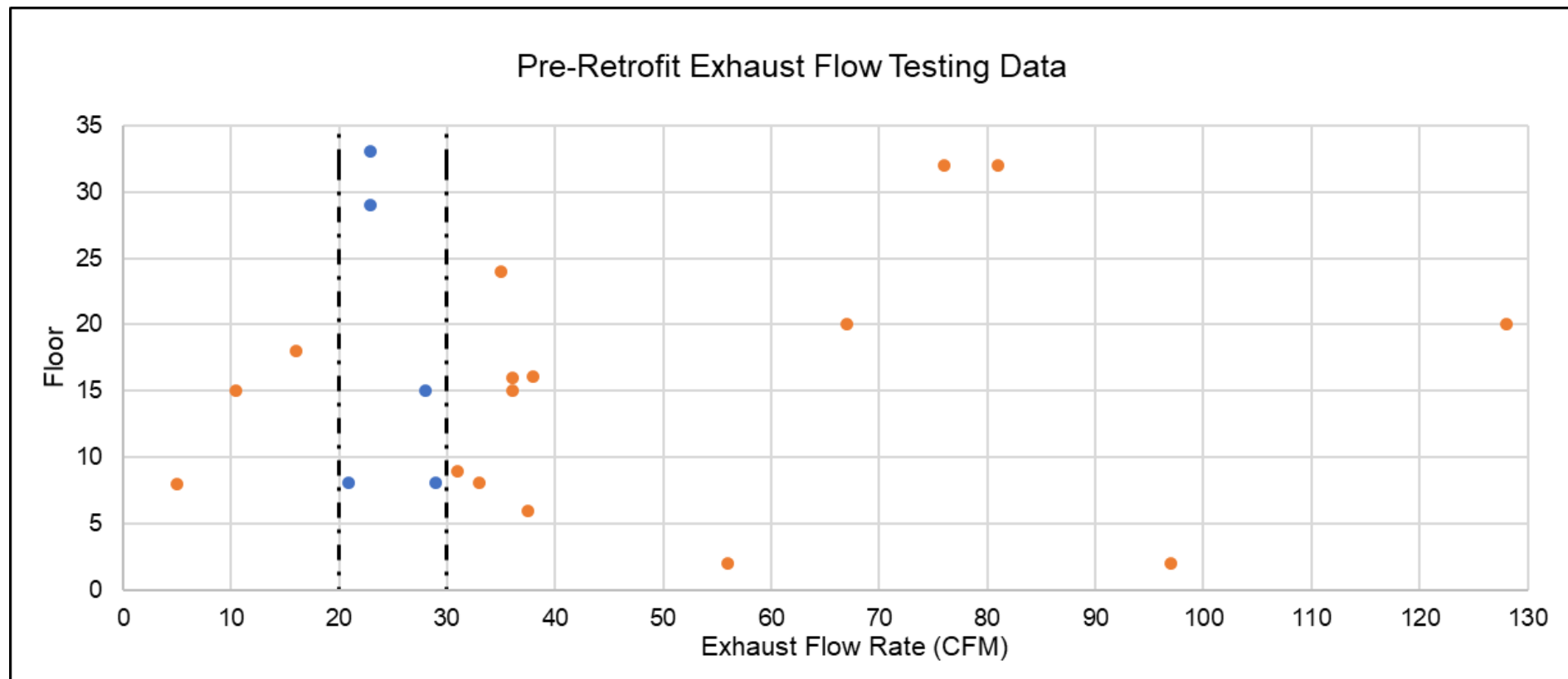
- Total Cost: \$234,716
 - Engineering + PM costs: \$32,000
- No incentives



Sealing @ Grille

Case Study – 3

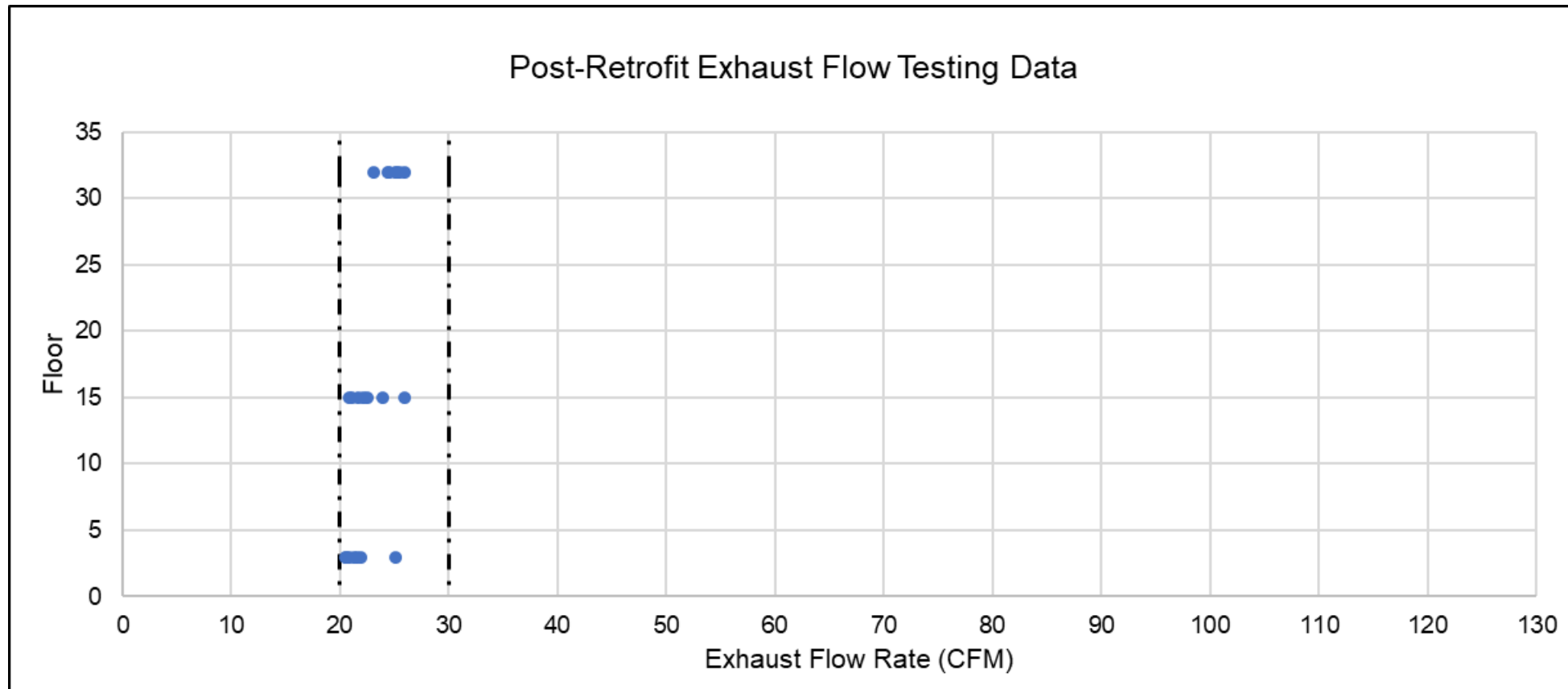
High-rise Multifamily Ventilation Project



- 21 exhaust measurements collected
- 4 exhaust measurements within 20 – 30 CFM target
- 19% pass

Case Study – 3

High-rise Multifamily Ventilation Project



- 21 exhaust measurements collected
- 21 exhausts within 20 – 30 CFM target
- 100% pass
- 51% reduction in total CFM

Case Study – 3

High-rise Multifamily Ventilation Project

Energy Savings Summar

Metric	Pre-Energy Use	Post-Energy Use	% Energy Savings
HDD Coefficient (Therms/H DD)	24.1	22.8	5.4%



Case Study – 3

High-rise Multifamily Ventilation Project

Key Takeaways

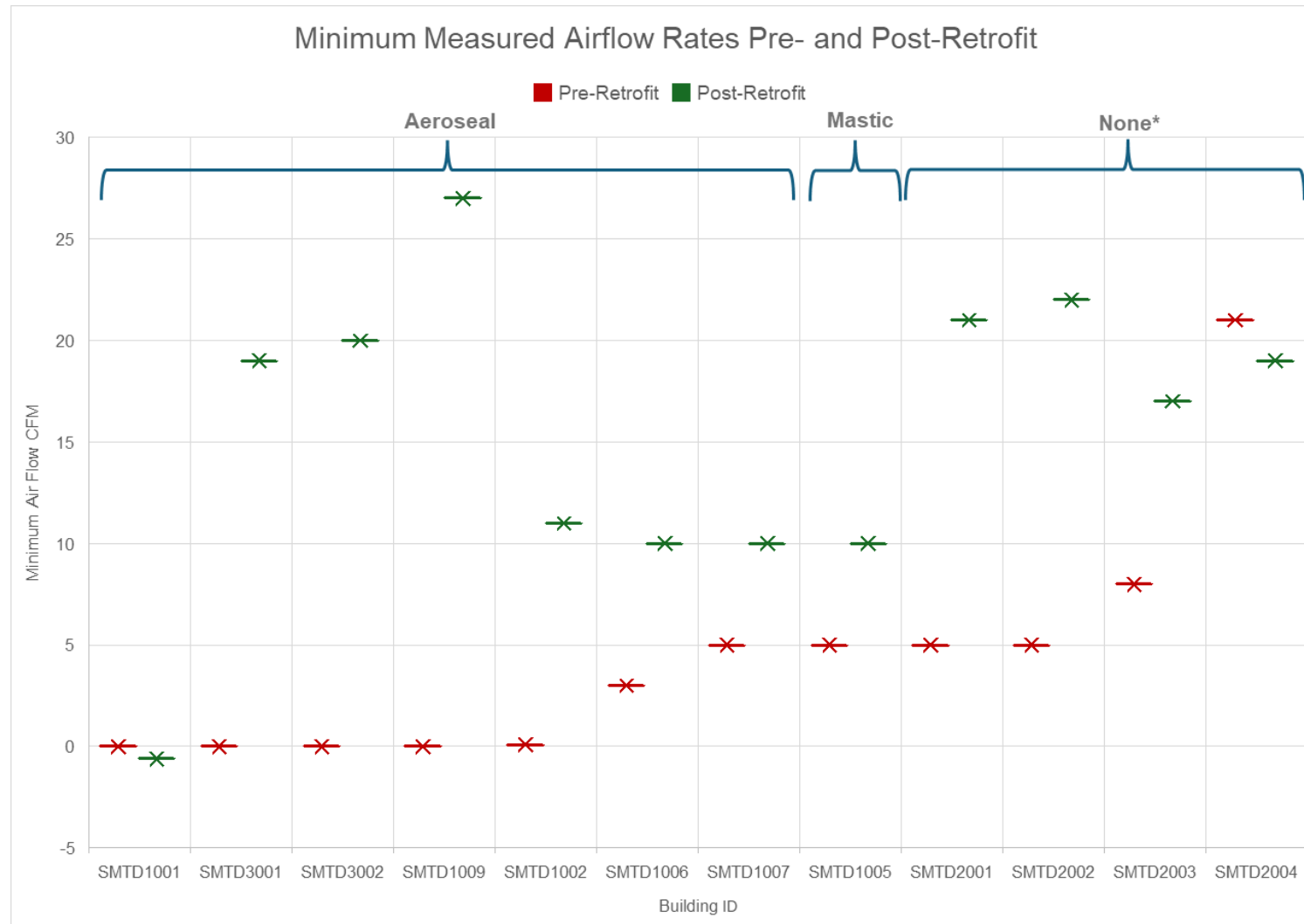
- Invest in thorough pre-construction field verification - early discovery turns a surprise change order into a planned design adjustment.
- Account for contingency into the scope and include measurement & verification to confirm results post-installation.
- Success depends on working closely with ownership, site staff, and residents.



Cross-Project Insights

Do ventilation upgrades increase the minimum flow rate?

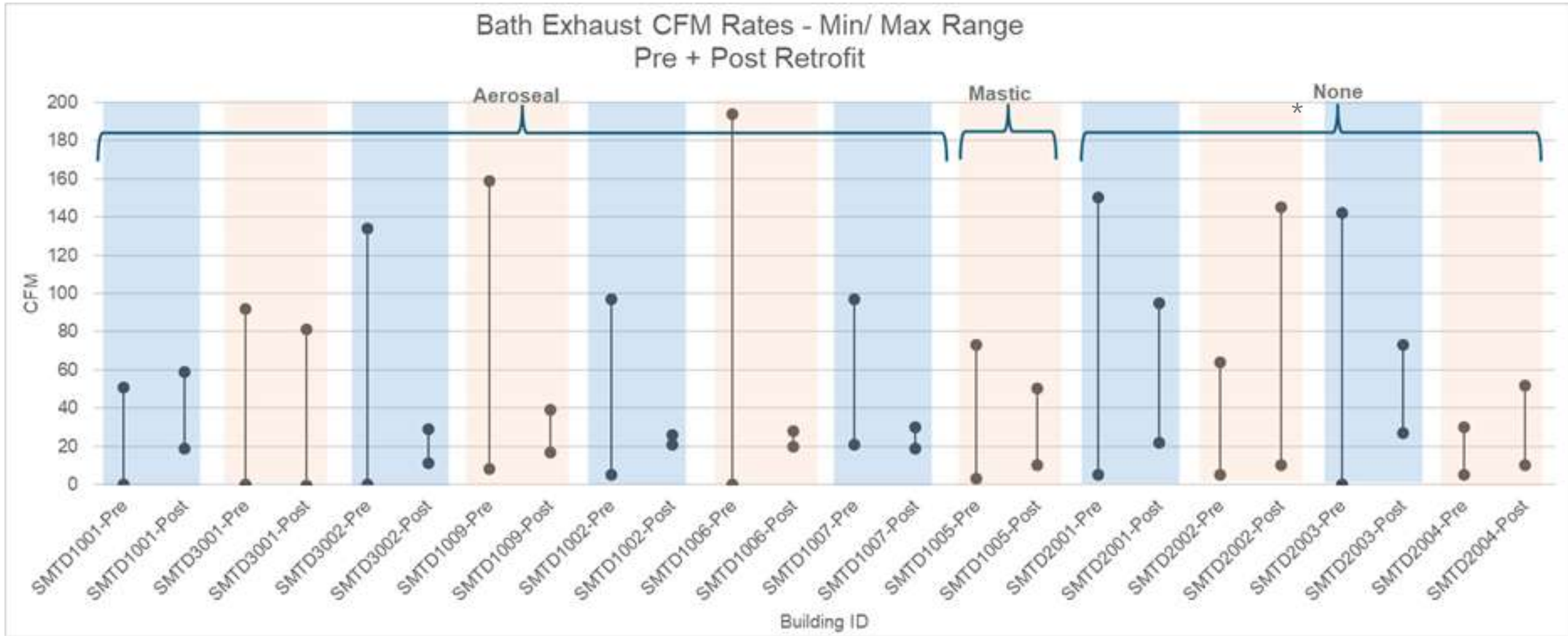
Pre + Post Minimum CFM Rates



*None = No sealing of the shaft, but manual sealing at the grille was included

Does sealing make the air flow rates in apartments more consistent?

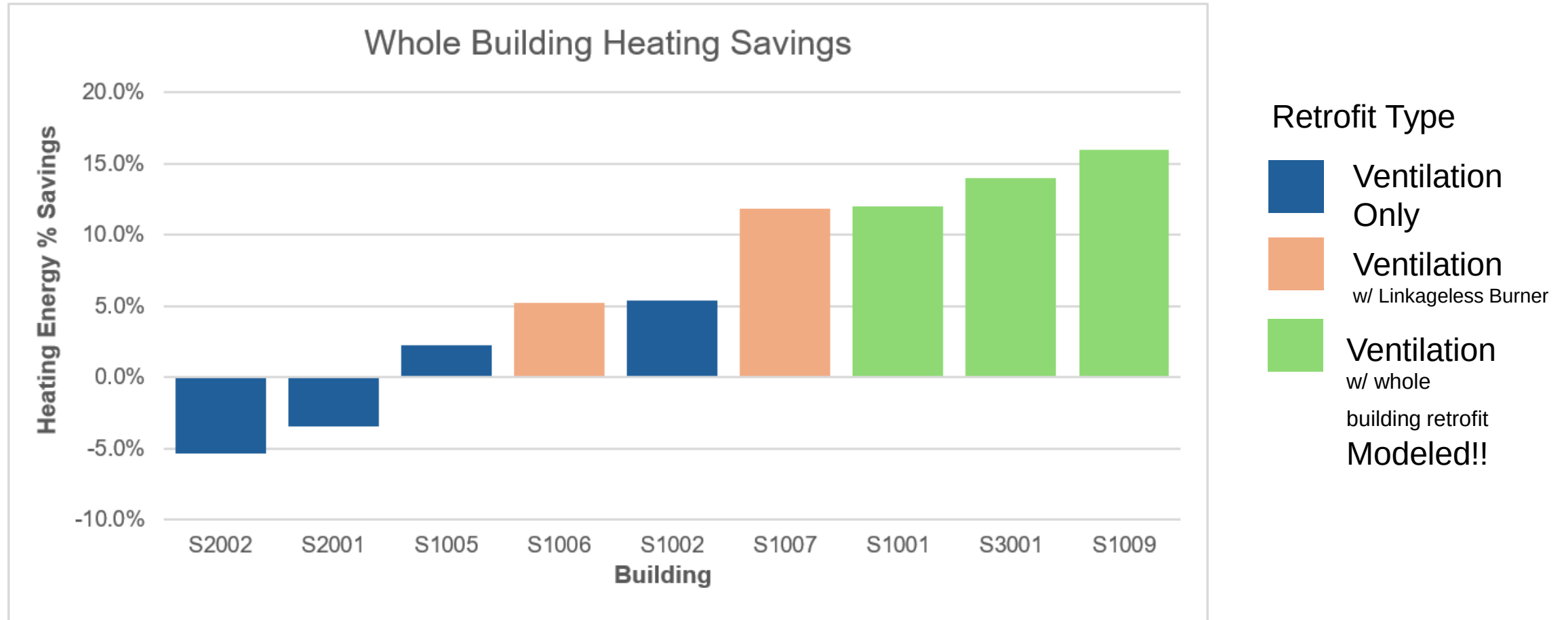
Pre + Post CFM Rates



*None = No sealing of the shaft, but manual sealing at the grille was included

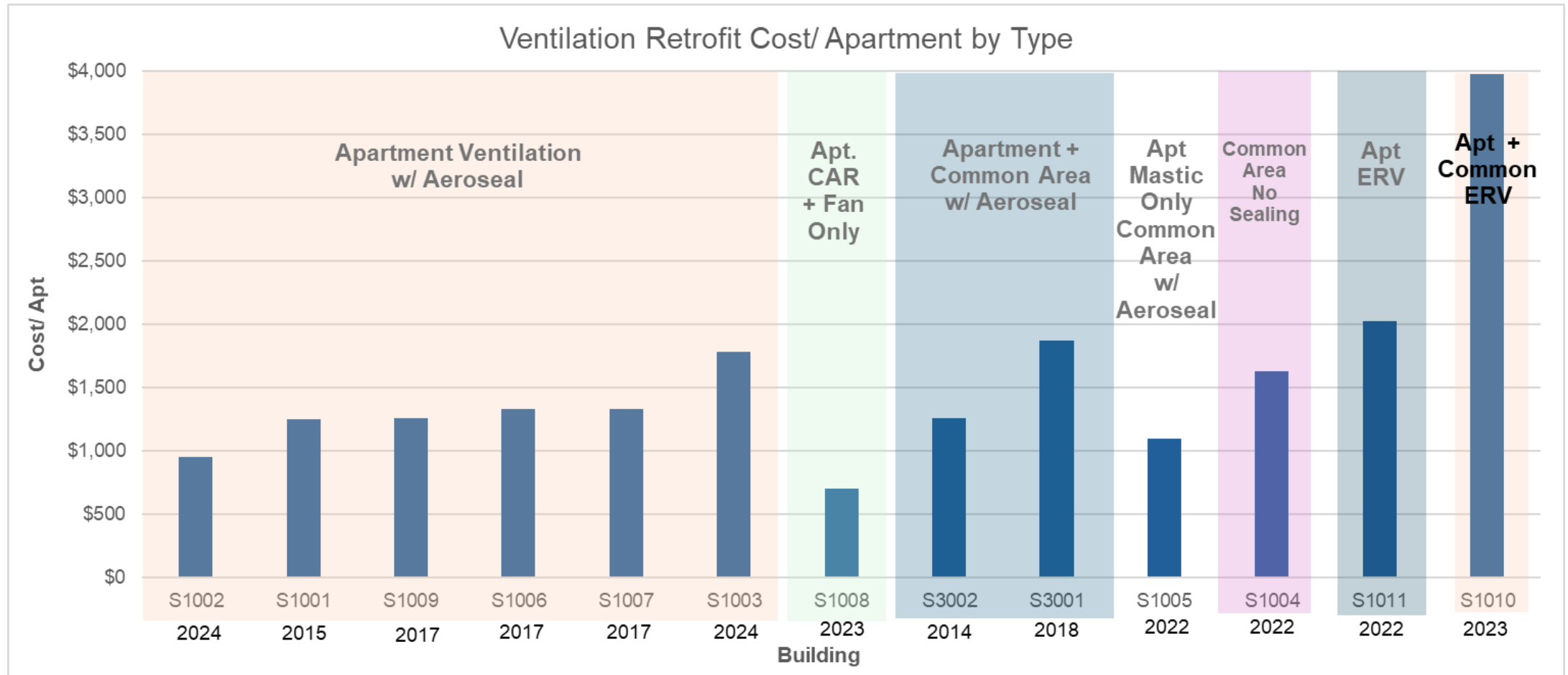
What can the data tell us about Energy Consumption?

Heating Energy Savings



What can the data tell us about Installation Costs?

Cost/ Apartment



Cross-Project Insights

Your Insights

Next 4 Workshops!

- Simplified Controls for Multifamily
- All-Electric Tenant Bills & Peak Electric Demand
- The Real Incremental Cost of Electrification Retrofits
- Building Envelope Measures (air sealing or roof insulation)

**SHOW US
YOUR
DATA**





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Thank you!



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Please fill out an evaluation for this session



or: nesea.org/eval

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