

CLEAResult<sup>®</sup>

**PHIUS+ CERTIFICATION: *Lessons learned  
through the eyes of the verifier***

# PRESENTERS

## Jon Erickson

- PHIUS+ CPHC, Builder and Verifier
- HERS Rater
- BPI Building Analyst

## Jeremy Dagold

- PHIUS+ CPHC and Verifier
- HERS Rater
- LEED AP Homes
- BPI Building Analyst



# TODAY'S AGENDA

- PHIUS+ Ventilation Requirements
- Case Study #1: 4 Highland Ave.
- Case Study #2: Westminster St.
- Case Study #3: Brookside Terrace
- Case Study #4: Sheridan Small Homes



# Ventilation Requirements

## Energy Star Homes:

8. Local Mechanical Exhaust - In each kitchen and bathroom, a system is installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow and manufacturer-rated sound level standards: <sup>47, 57</sup>						
Location		Continuous Rate	Intermittent Rate <sup>58</sup>			
8.1 Kitchen	Airflow	≥ 5 ACH, based on kitchen volume <sup>59, 60</sup>	≥ 100 CFM and, if not integrated with range, also ≥ 5 ACH based on kitchen volume <sup>59, 60, 61</sup>	<input type="checkbox"/>	<input type="checkbox"/>	-
	Sound	Recommended: ≤ 1 sone	Recommended: ≤ 3 sones			
8.2 Bathroom	Airflow	≥ 20 CFM	≥ 50 CFM	<input type="checkbox"/>	<input type="checkbox"/>	
	Sound					

<http://www.energystar.gov/newhomesguidance>. As an alternative to Item 8.1, homes are permitted to use a continuous kitchen exhaust rate of 25 CFM per 2009 IRC Table M1507.3, if they are either a) PHIUS+ or PHI certified, or b) provide both dwelling unit ventilation and local mechanical kitchen exhaust using a balanced system, and have a Rater-verified whole-building infiltration rate ≤ 1.0 ACH50 or ≤ 0.05 CFM50 per sq. ft. of Enclosure Area, and a Rater-verified dwelling unit compartmentalization rate ≤ 0.30 CFM50 per sq. ft. of Enclosure Area if multiple

Dwelling Unit Mechanical exhaust - In each dwelling unit kitchen and bathroom, a system is installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow and manufacturer-rated sound level standards: <sup>54, 66</sup>						
Location		Continuous Rate	Intermittent Rate <sup>67</sup>	Must Correct	Rater Verified <sup>4</sup>	N/A <sup>5</sup>
8.1 Kitchen	Airflow	≥ 5 ACH, based on kitchen volume <sup>68, 69</sup>	≥ 100 CFM and, if not integrated with range, also ≥ 5 ACH based on kitchen volume <sup>68, 69, 70</sup>	<input type="checkbox"/>	<input type="checkbox"/>	-
	Sound	Recommended: ≤ 1 sone	Recommended: ≤ 3 sones			
8.2 Bathroom	Airflow	≥ 20 CFM	≥ 50 CFM	<input type="checkbox"/>	<input type="checkbox"/>	-
	Sound	Required: ≤ 2 sones	Recommended: ≤ 3 sones			
Mechanical Exhaust for Common Spaces <sup>2</sup> and Shared Garages						
8.3 Measured exhaust rates are ≥ ASHRAE 62.1 rates (2c). <sup>57</sup>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.4 Where an exhaust system is installed in a shared garage, it is equipped with controls that sense CO and NO2.				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## HOW PHIUS TREATS VENTILATION

- Phius has adopted the Energy Star requirements for exhaust flows.
- Required balanced
- Added a maximum balance variance of 10% between supply and exhaust.



## 4 HIGHLAND AVE.

- Single-family residential



Stephen C. DeMetrick

building a sustainable future

- Experienced Builder
  - Three PHIUS Certified homes
  - Seven Certified ZER Homes



## 4 HIGHLAND AVE.

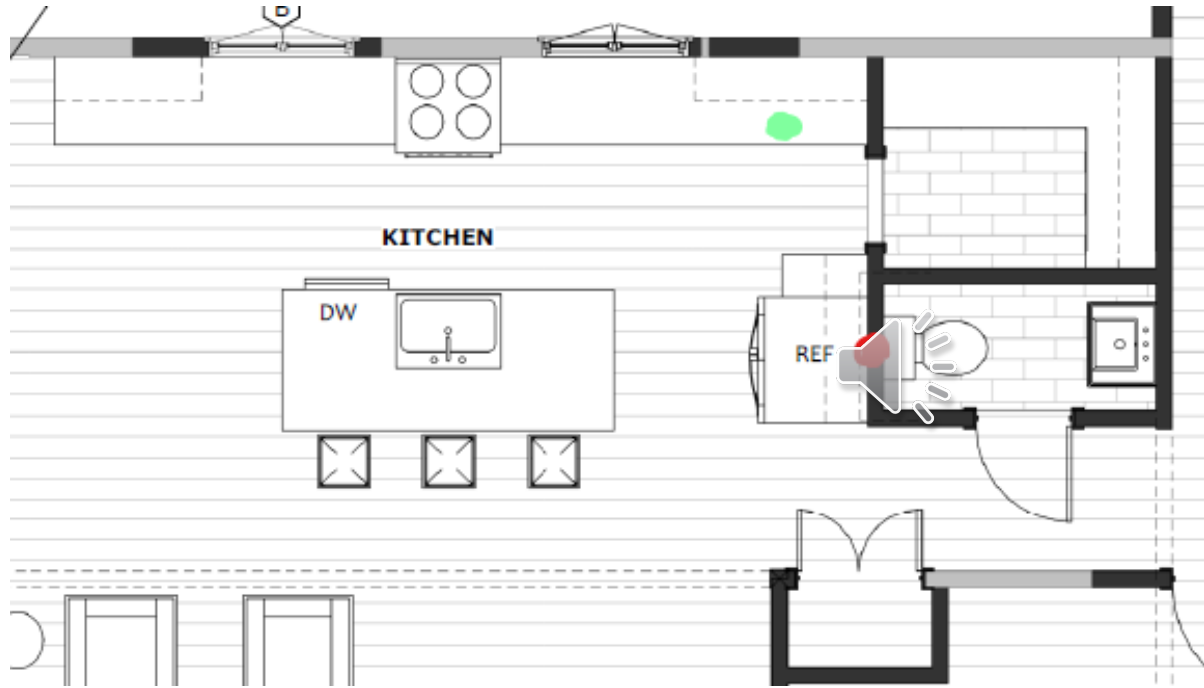
- Zehnder ventilation system
- System designed and commissioned by manufacturer
- Installed by builder





## 4 HIGHLAND AVE.

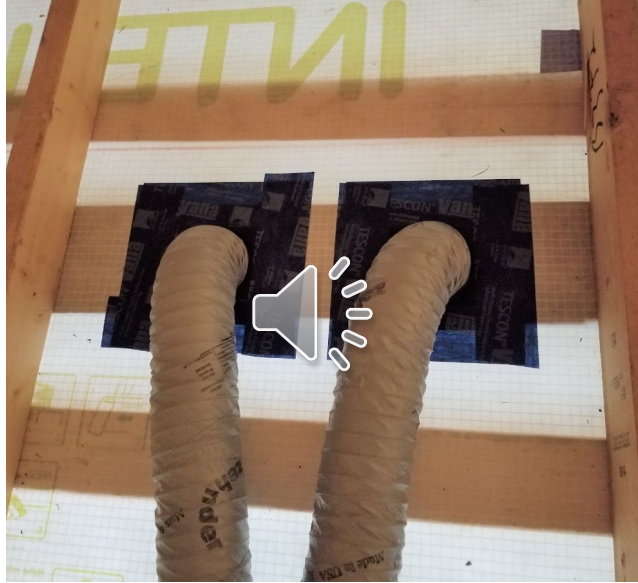
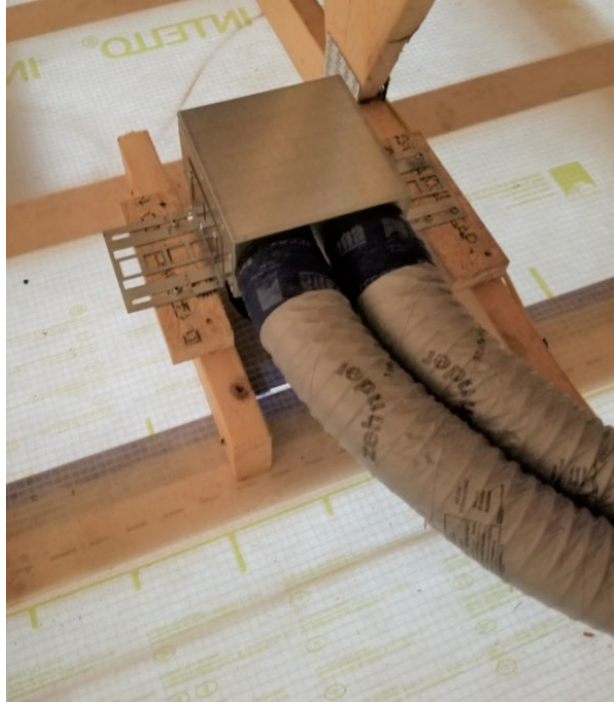
- Supplying to bedrooms
- Exhausting from kitchen and bathrooms



## 4 HIGHLAND AVE.

- Design issue resulted in moving ducts into attic





## 4 HIGHLAND AVE.

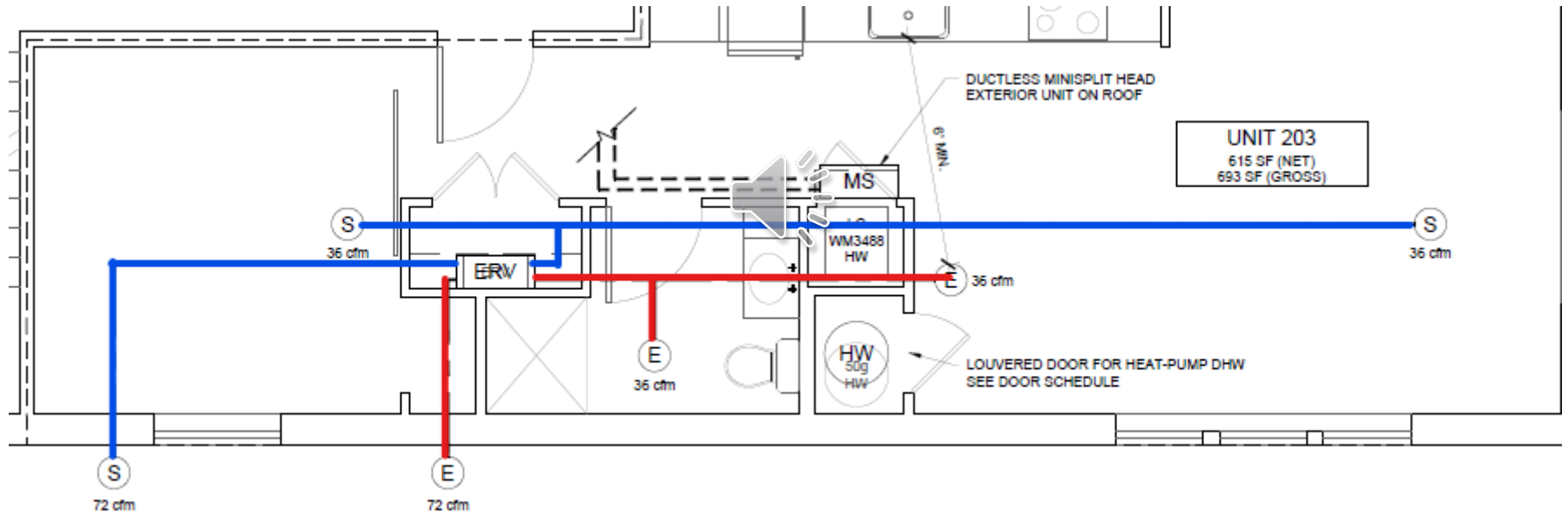
- Needed to move ventilation ducts into attic under cellulose
- Needed verification that D.O.E. would allow ventilation ducts in unconditioned space

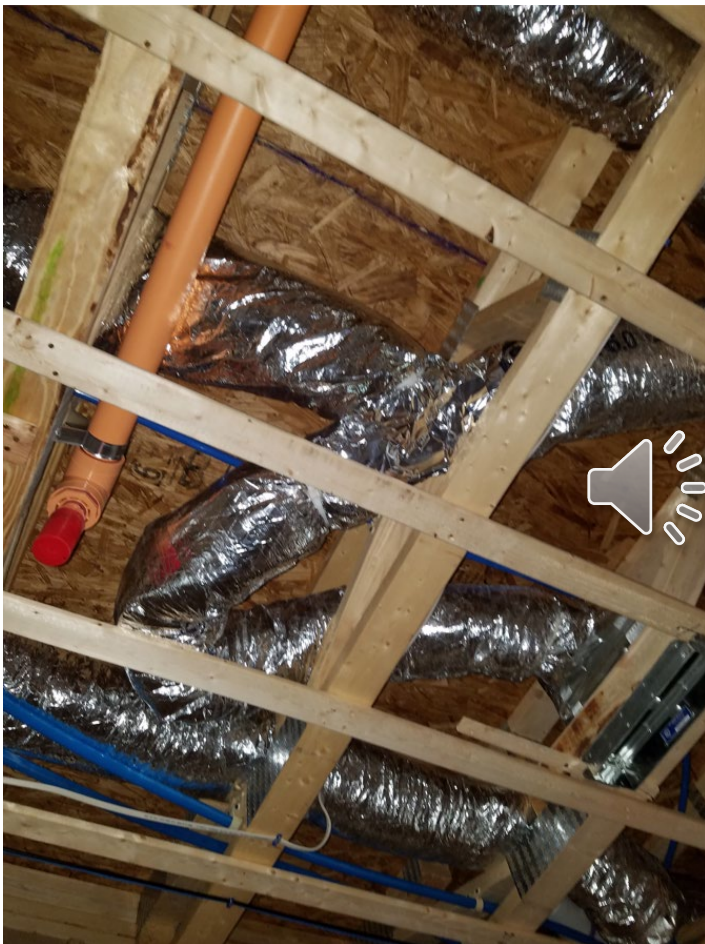


## WESTMINSTER STREET

- 7 unit multi-family with commercial space
- Passive envelope only includes 6 units and shared stairwell

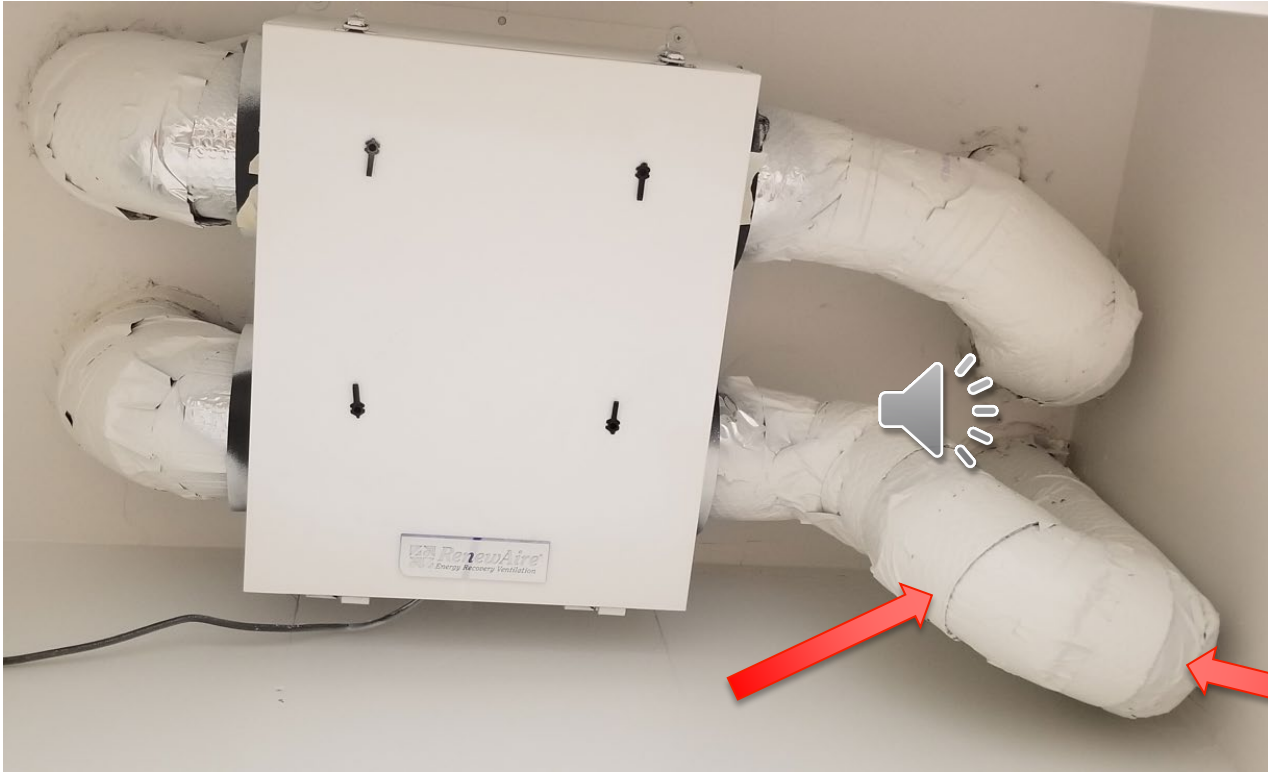
## Example ERV layout from mechanical plans





## WESTMINSTER STREET

- Q: Did the HVAC sub deviate from the plans?



## WESTMINSTER STREET

- Without specified design plan, subs “ad-libbed”
- Two 4” 90 degree fittings are equivalent to 60 additional feet of straight ductwork.



## WESTMINSTER STREET

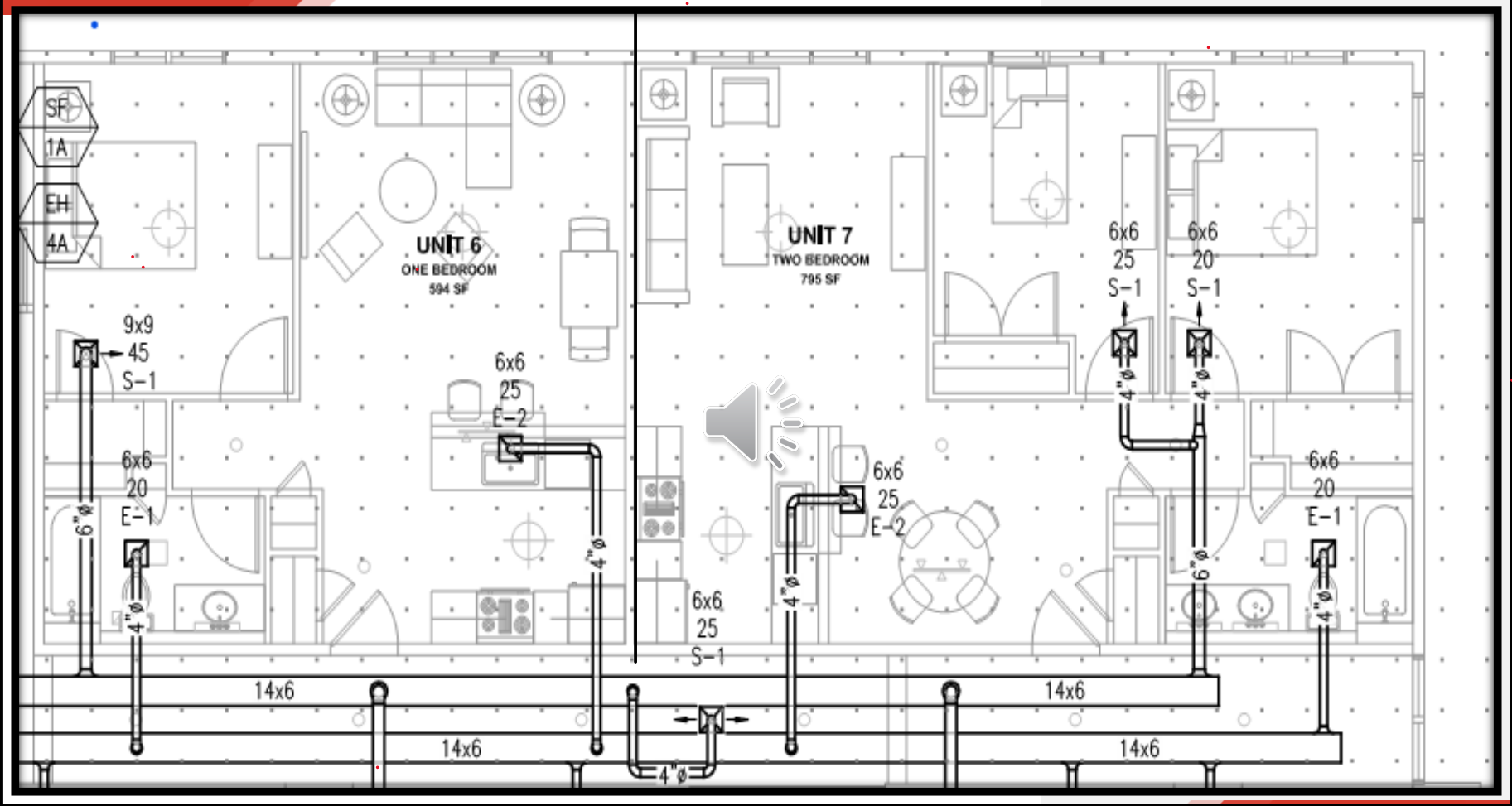
- ERVs for individual units  
= lots of penetrations





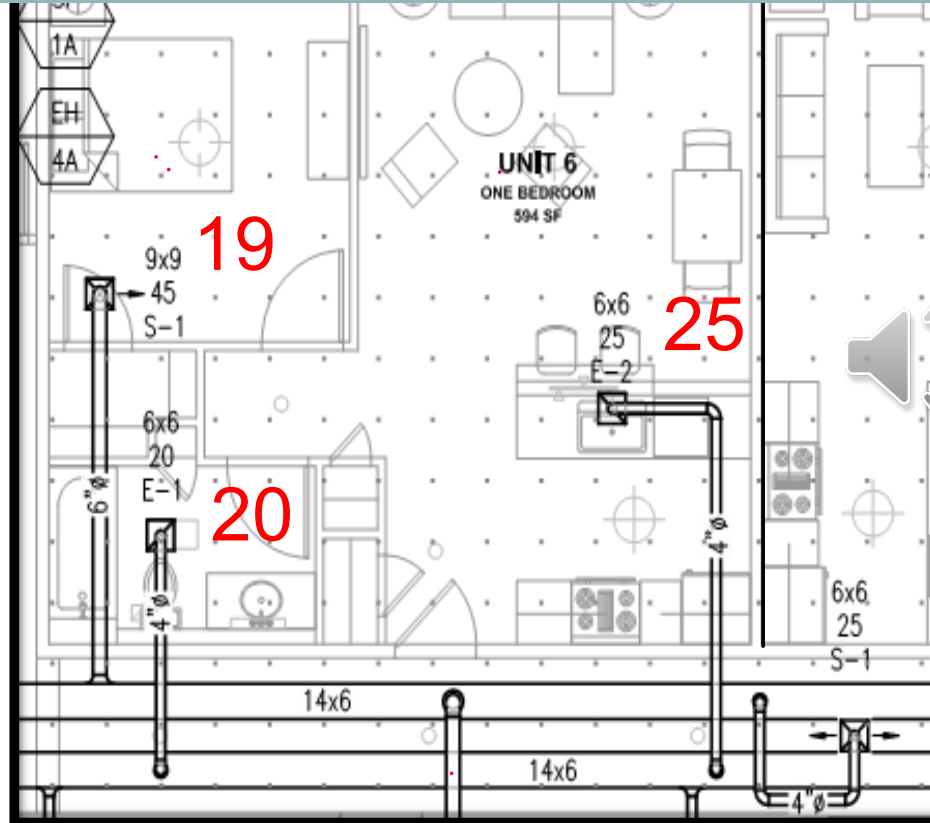
## BROOKSIDE TERRACE

- Four 24 Unit Passive houses
- Single Central ERV serving the entire building
- Semi-central Heat Pumps





# Built as designed!

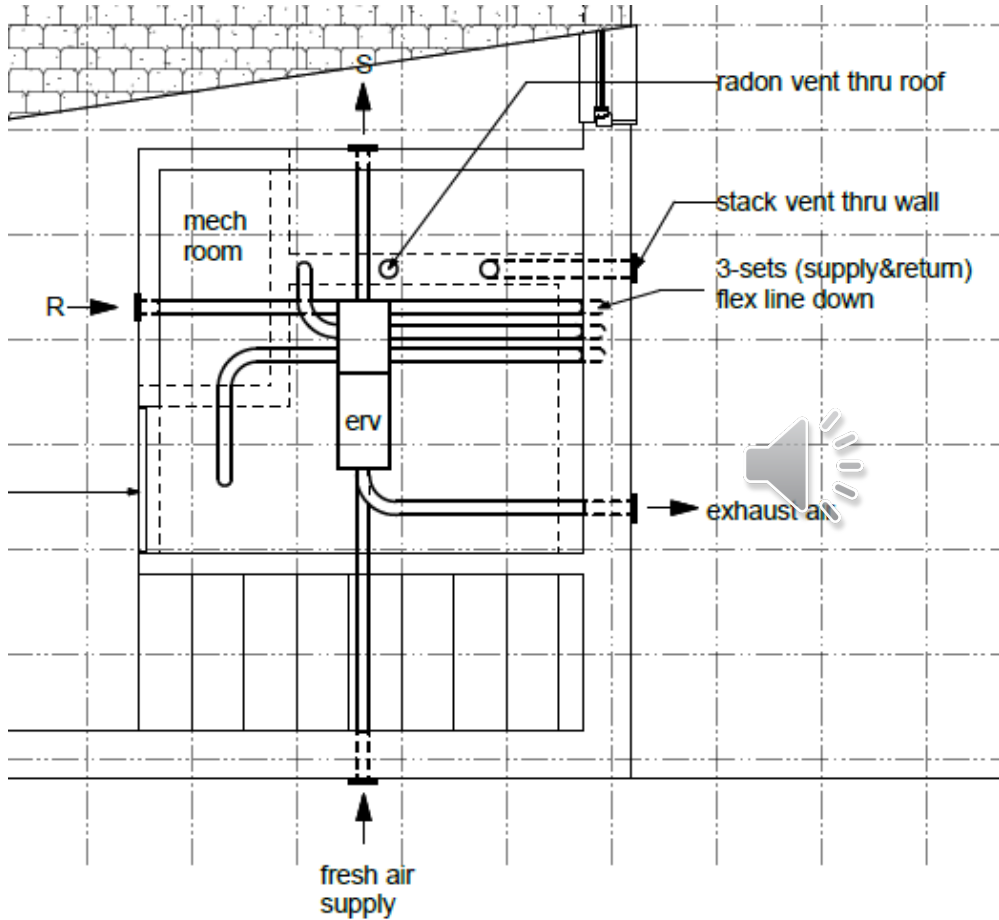






## SHERIDAN SMALL HOMES

- Cluster of five small single-family homes
- Replicable design for infill development specifically for non-conforming lots.
- Designed by RISD architectural students



## SHERIDAN SMALL HOMES

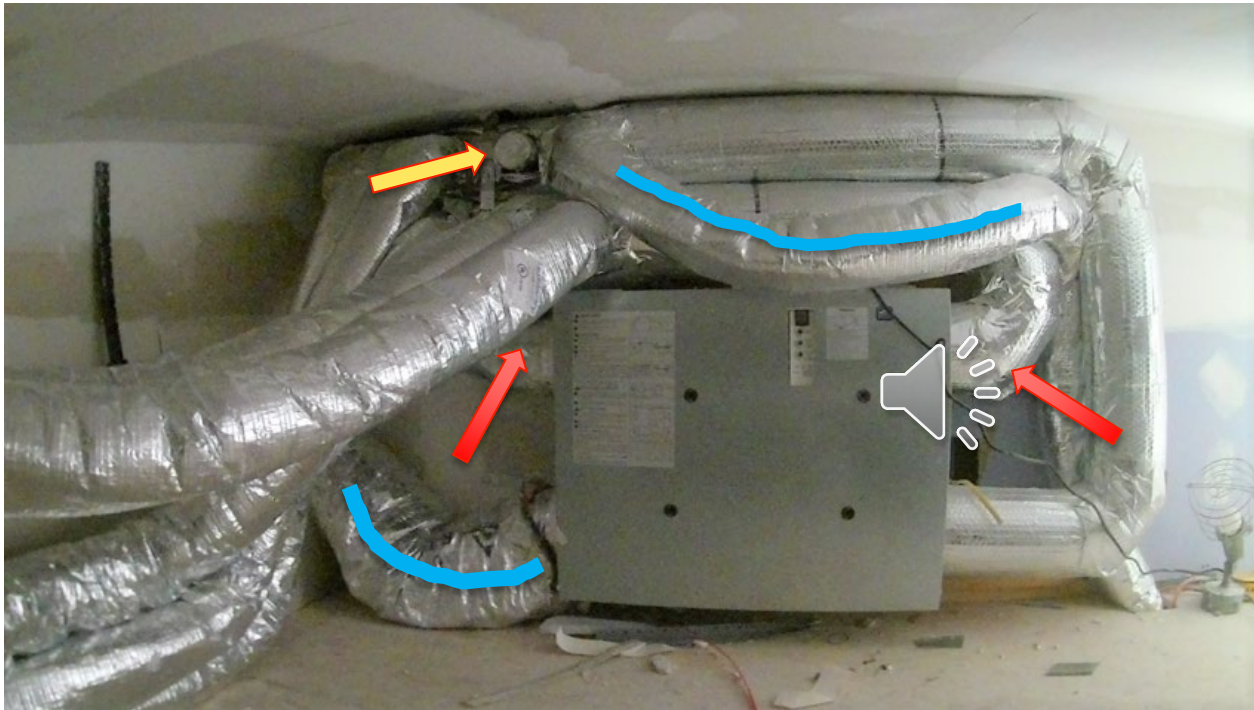
- Original ERV design





## SHERIDAN SMALL HOMES

- HVAC sub site built duct runs.



## SHERIDAN SMALL HOMES

- Original install
- Ductwork “Site Built”
- Contractor unaware of Energy Star flow requirements

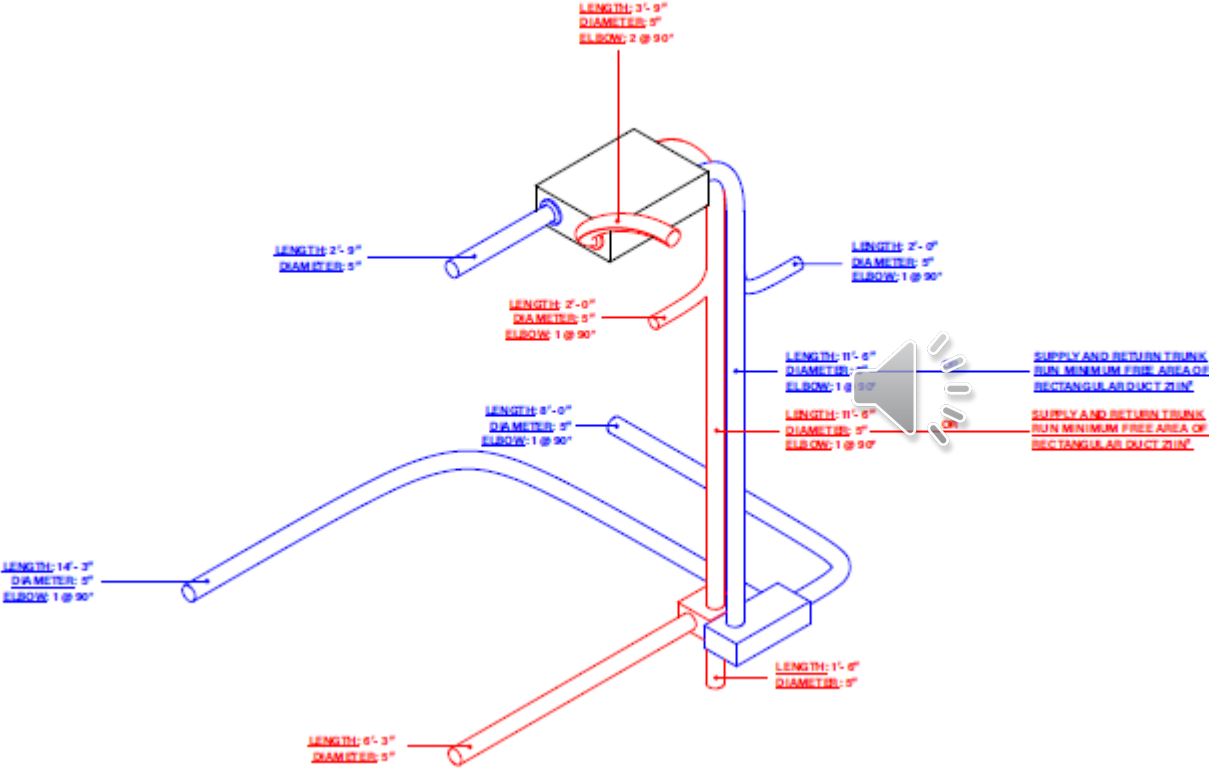
## SHERIDAN SMALL HOMES

- Subsequent install.



# SHERIDAN SMALL HOMES

- Final design.



# CONCLUSIONS

- Pre-construction planning and communication
  - Goal transparency
  - Setting subs up for success
  - Subs know what they are bidding on
- Value of correct and detailed design
  - ACCA Manual D
  - Accounting for framing, etc.
  - Subs won't go off script
- Test Early and Test Often
- Some additional thoughts

## THANK YOU!

### Questions??

[jon.erickson@cleareresult.com](mailto:jon.erickson@cleareresult.com)  
[jeremy.dagold@cleareresult.com](mailto:jeremy.dagold@cleareresult.com)

