SUSTAINABLE DEVELOPMENT

ENERGY CODE PANEL

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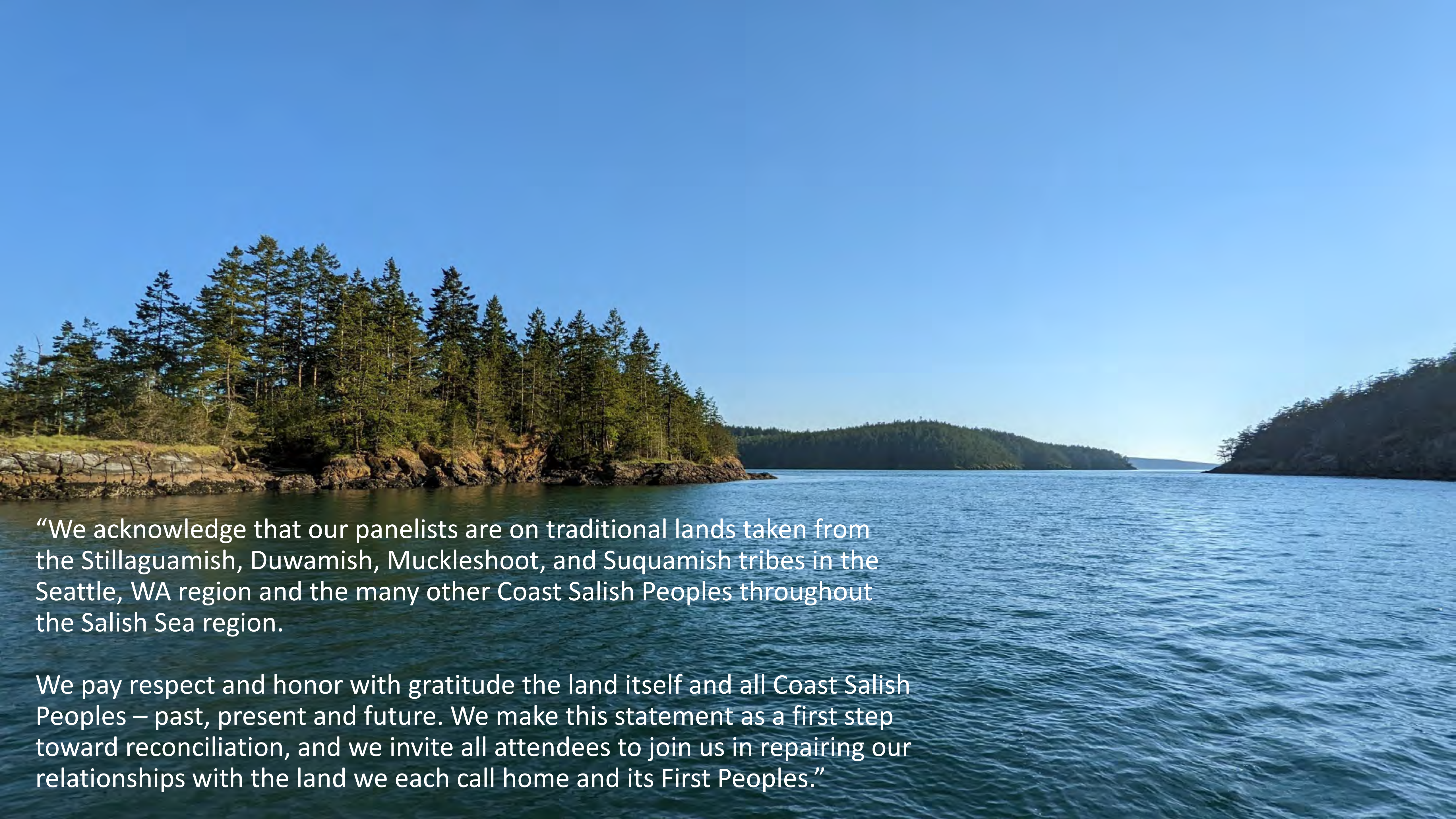
2018/2021 Commercial Energy Code Impacts

Multifamily Building Development

NAIOPWA Sustainable Development Committee

Presented: June 2, 2022

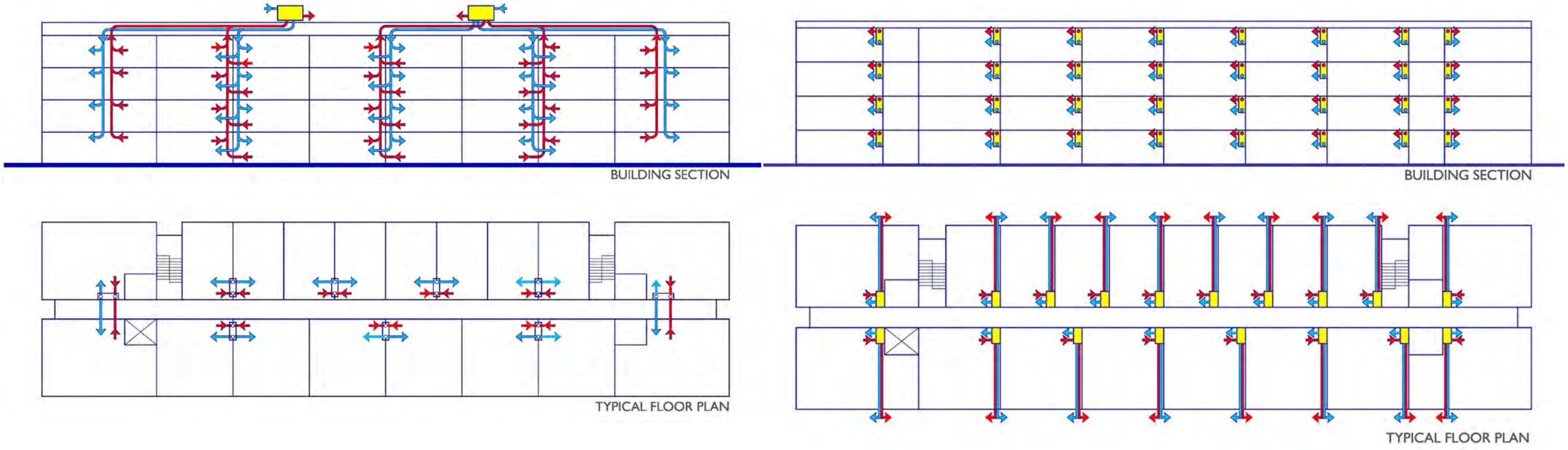


"We acknowledge that our panelists are on traditional lands taken from the Stillaguamish, Duwamish, Muckleshoot, and Suquamish tribes in the Seattle, WA region and the many other Coast Salish Peoples throughout the Salish Sea region.

We pay respect and honor with gratitude the land itself and all Coast Salish Peoples – past, present and future. We make this statement as a first step toward reconciliation, and we invite all attendees to join us in repairing our relationships with the land we each call home and its First Peoples."

2018/2021 Important Changes

- Balanced ventilation with heat recovery (BVHR) for Group R dwelling units
  - Centralized vs unitized systems?

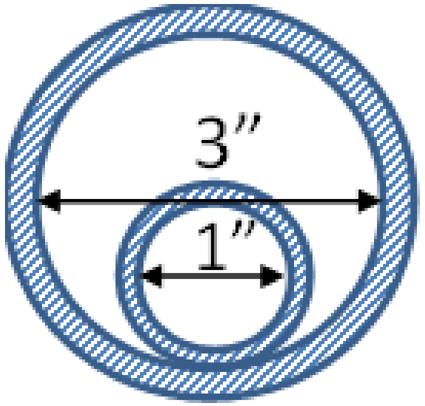


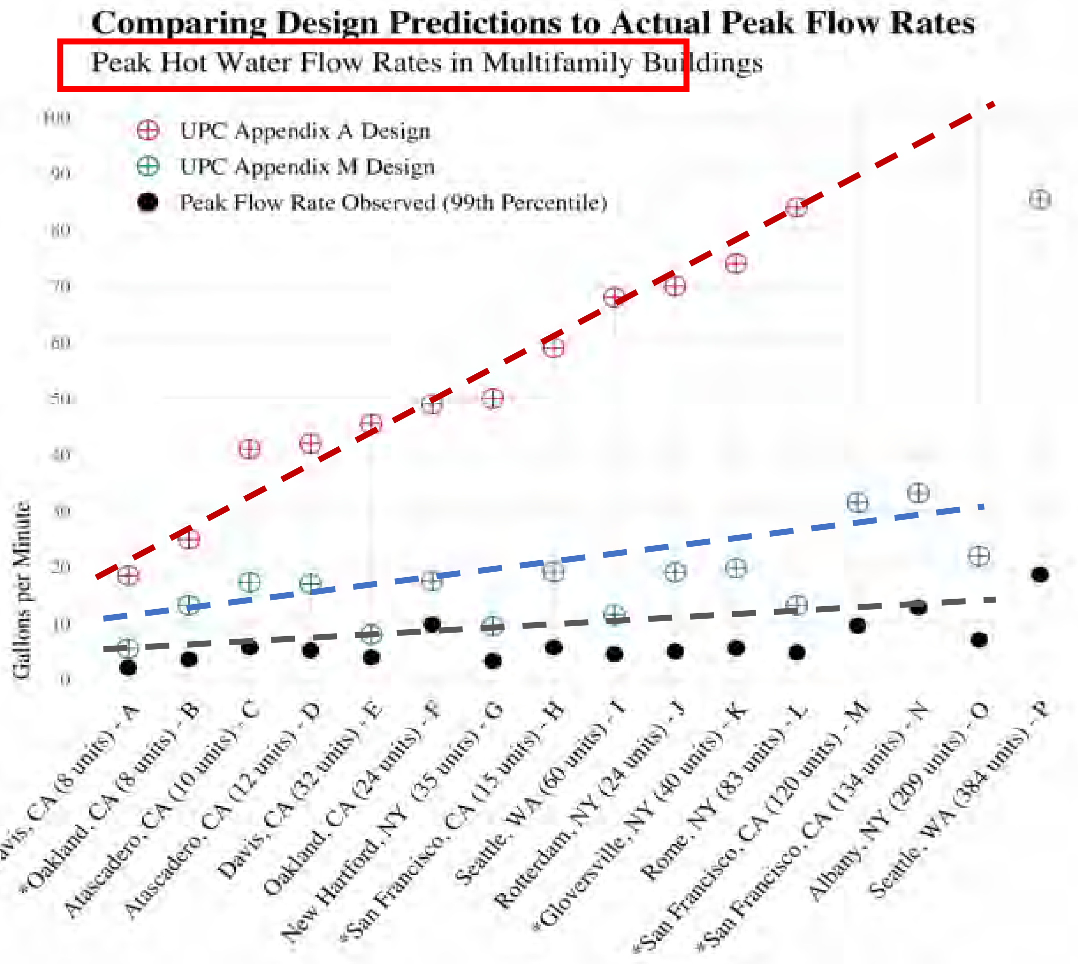
2018/2021 Important Changes

- Heat pumps for 100% of central domestic hot water heating
  - Now required in 2018 SEC; soon to be required in Shoreline, Bellingham, unincorporated King County; statewide in 2021 for at least 50% of water heating load.

2018/2021 Important Changes

- UPC Appendix M [Water Demand Calculator](#) (WDC) for sizing mains/distribution piping.
  - Now available in Seattle and KC. Cost-saving C406 option in 2021.





HDC Exemplary Buildings Program

- Started in 2019 to identify a balanced response to climate/housing/affordability crises we are facing
- Design and learn now how to cost-effectively meet future code requirements
- Develop resources for affordable housing stakeholders (generally applicable to all multifamily housing)
- Demonstration projects serve as case studies
- Sharing of knowledge among community

Exemplary Buildings Website

https://exemplarybuilding.housingconsortium.org/

HOUSING DEVELOPMENT *consortium*

Exemplary Buildings Program

A pathway to creating ultra-efficient, healthy, and durable affordable housing.

Our Vision | Our Work | Our Results: Information & Tools | Who We Are | Voices + News | Industry Resources | Connect with Us

EBP Design Guidelines

- **Balanced Ventilation with Heat Recovery** *(Guidelines document v.1.1)*
  - Balanced Ventilation w/ Heat Recovery Exhibit – Hobson Place Case Study
- **Early Integrative Design** *(Guidelines document v.1.0).*
- **Solar Integration** *(Guidelines document v.1.0.3)* and blank **solar proforma template** *(please refer to the guidelines doc for step-by-step instructions on completing the template for your project)*
- **Wall Assemblies** *(Guidelines document v.1.0)*

Exemplary Building Demonstration Projects

	Othello Square Bldg D	Hobson Place South	Sawara	North Lot	Samma
					
Developer	Homesight	DESC	SHA	SCIDpda	Imagine Housing
Location	Seattle, Rainier Valley	Seattle, North Beacon Hill	Seattle, Yesler Terrace	Seattle, North Beacon Hill	Bothell
Project Type	Family (Co-op)	Supportive	Family	Family	Senior
# Units	68	92	114	160	76
Construction	2022 start	2022 complete	2022 start	2022 start	2022 start

Exemplary Building Lessons Learned

- **Integrative design process is critical to success**
- Codes are catching up to EB concept (fast)
- Advanced wood framing is feasible in large multifamily buildings
- Pros and cons to all design strategies, goal is to discuss and understand them early, esp ventilation and water heating

Energy Recovery Ventilators (ERV)

- ERV is required for R-2 (dwelling and sleeping units)
- ERV is NOT required for R-1 (hotels)
  - Balanced ventilation is required for R-1

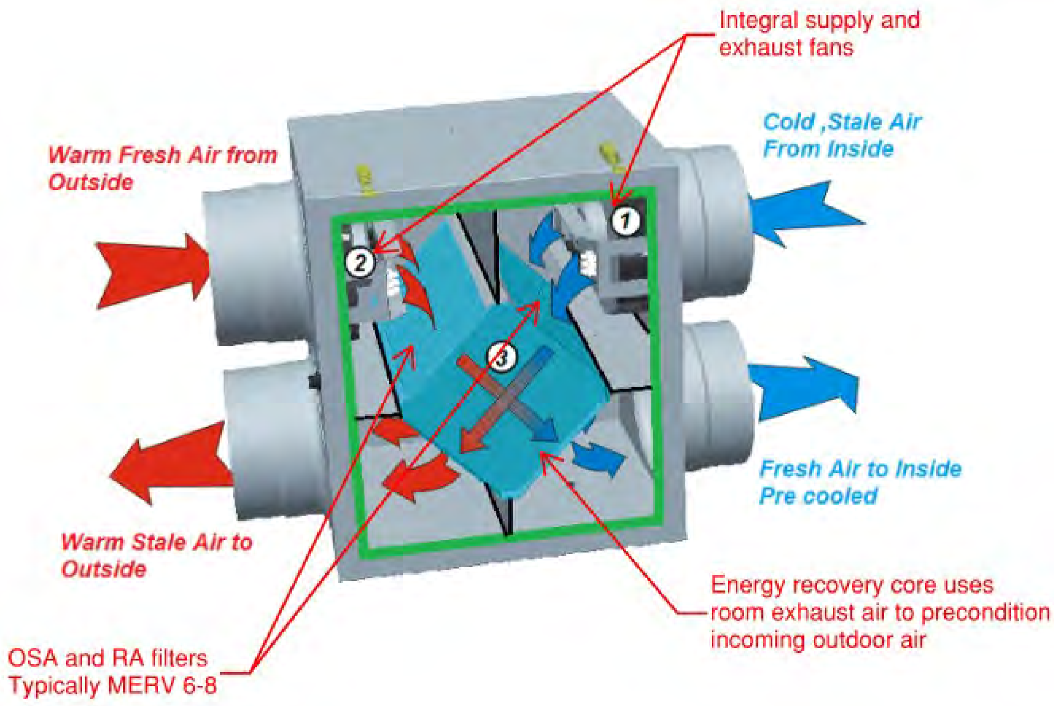


Image: https://commons.wikimedia.org/wiki/File:Air_to_Air_ERV.png

Project Benefits

- Energy Efficiency
- Filtered Ventilation Air
- Improved Building Pressurization Control
- Street Noise/Acoustics

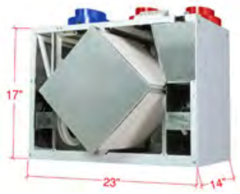
ERV's only address ventilation and bathroom exhaust.

Ranges and Dryers must be separate

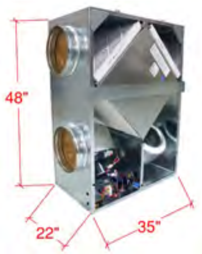
ERV Space Planning

- Considerations for design options
  - Cost differences among strategies?
  - Floor-to-floor height impacts
  - Soffit impacts
  - Corridor wall and floor framing considerations
  - Exterior penetrations for intakes/exhaust
  - Maintenance/Access

1. In Dwelling ERV
- $



2. Centralized Floor-by-floor ERV
- $$

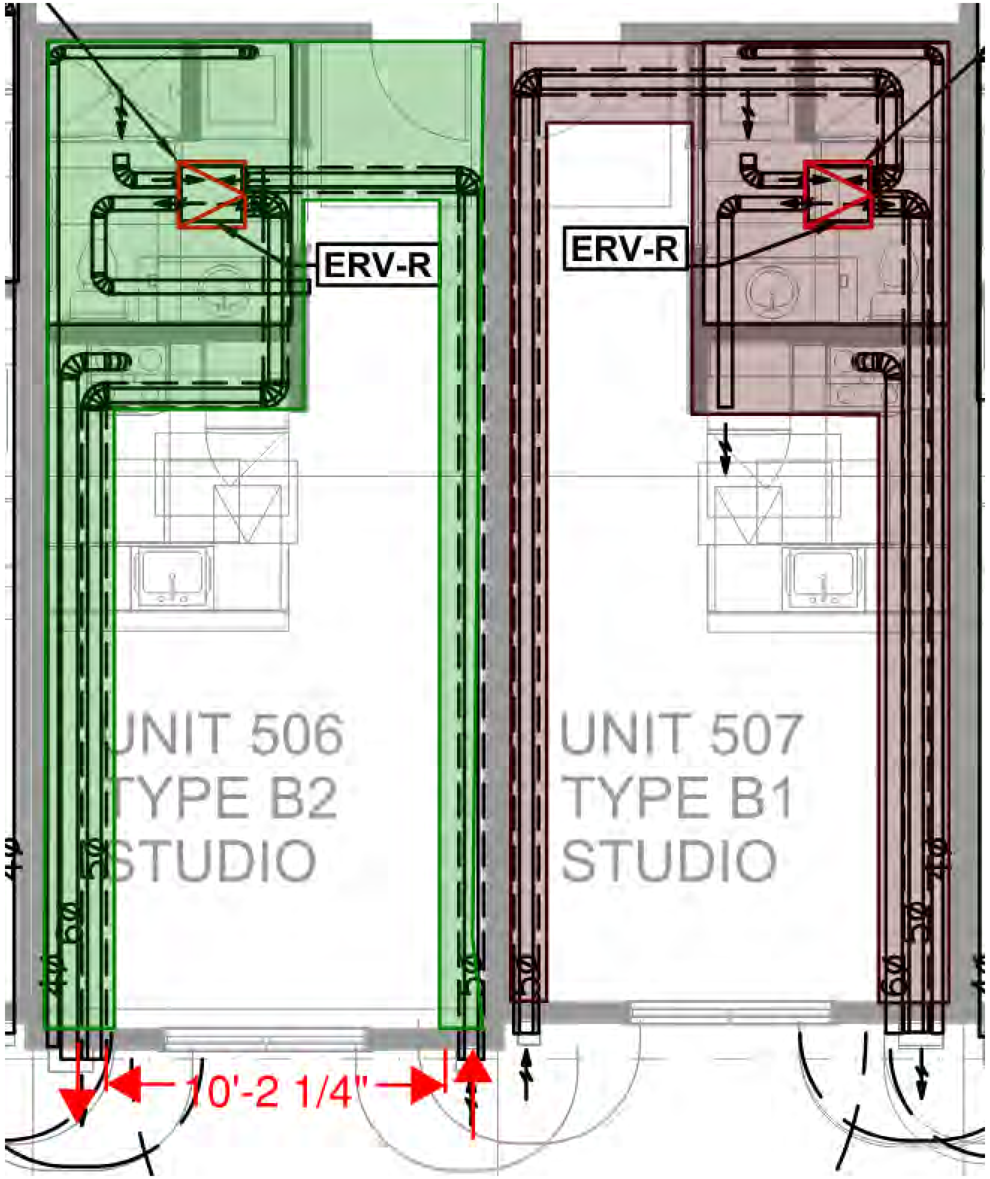


3. Centralized Rooftop ERVs
- $$$

In Dwelling ERV

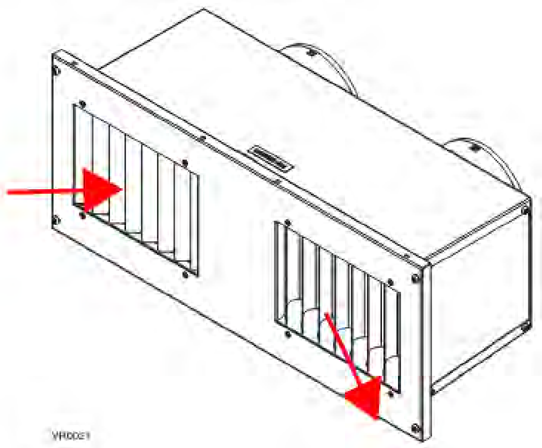
Considerations

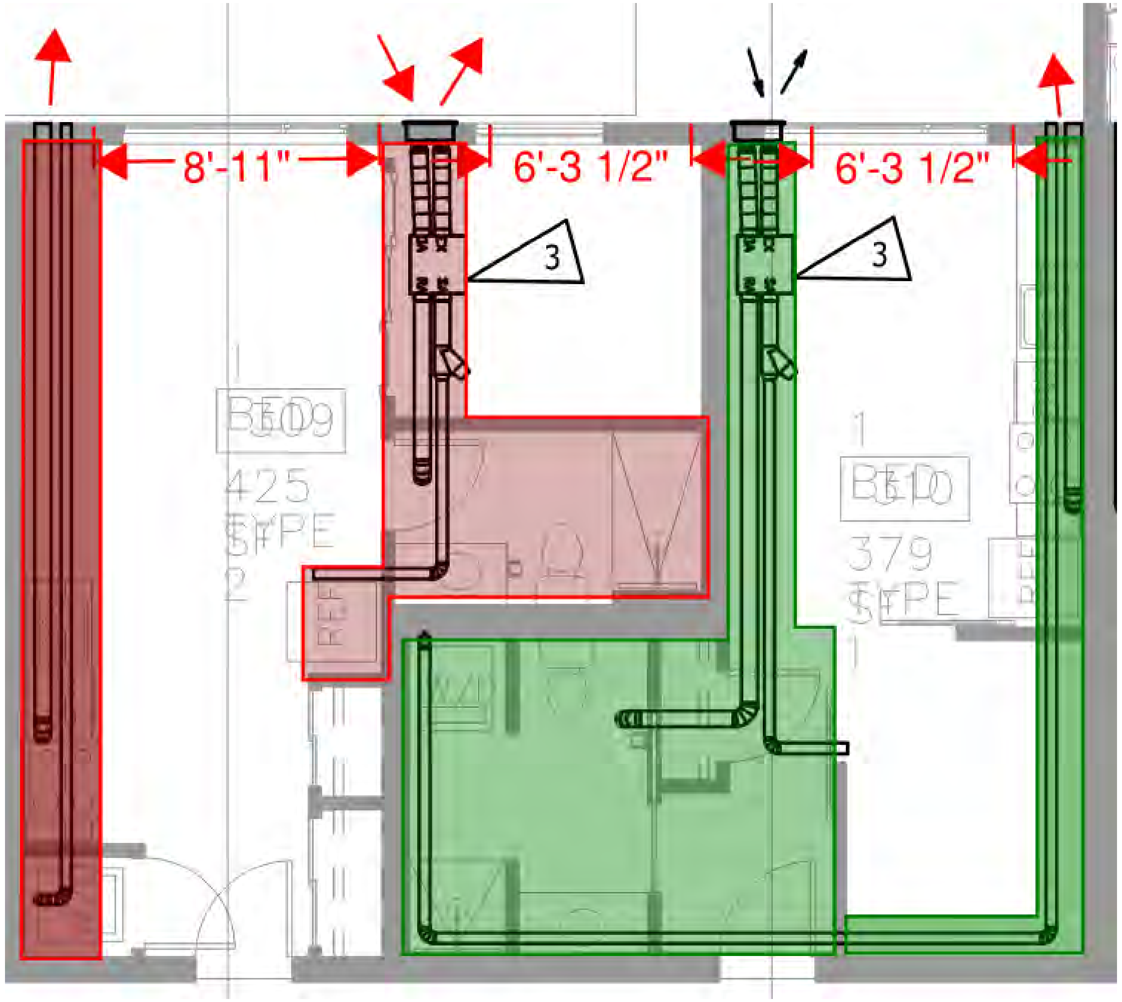
- 10' distance from intake to exhaust
  - Width of studio
  - How does configuration affect the neighbor
- More soffits – 12" Clear
- Intake and exhaust ducts must be insulated from ERV to the exterior
- More penetrations
- Access panels to maintain ERV



In Dwelling ERV – Combo Termination

New verbiage to Chapter 4 allows for a 'factory-built intake/exhaust combination termination fitting'.
Reduces distances from other unit exhausts from 10' to 5' (Seattle) or 3' (Washington).

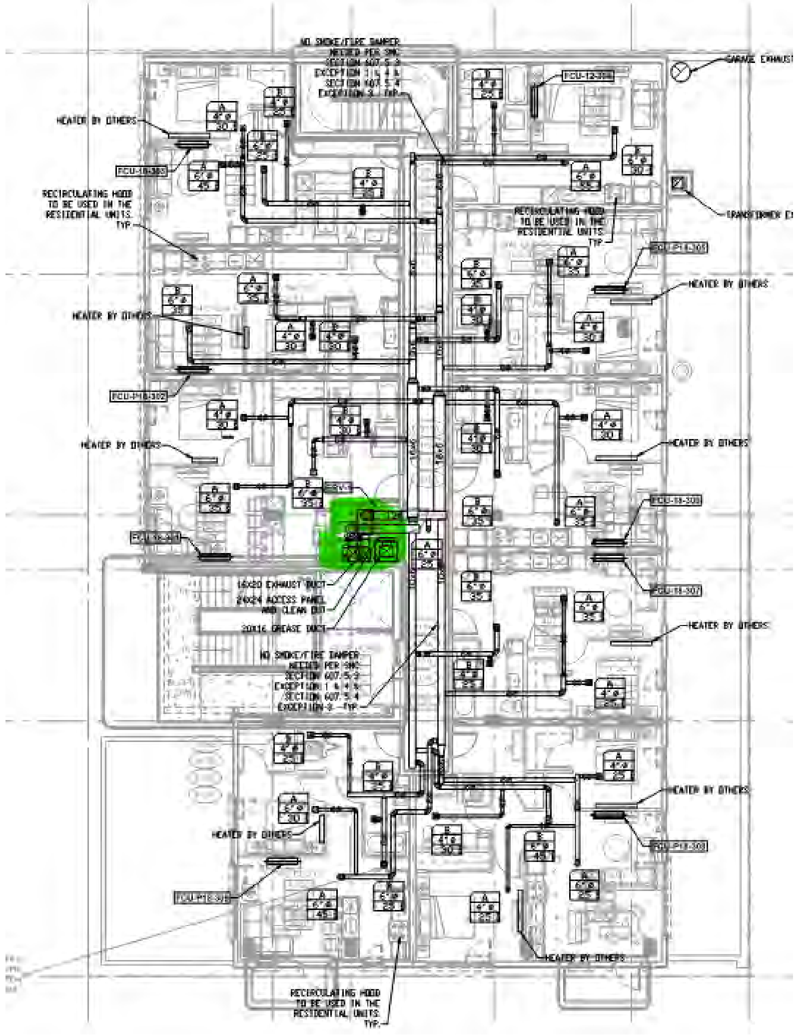




Centralized Floor-By-Floor ERV

Considerations

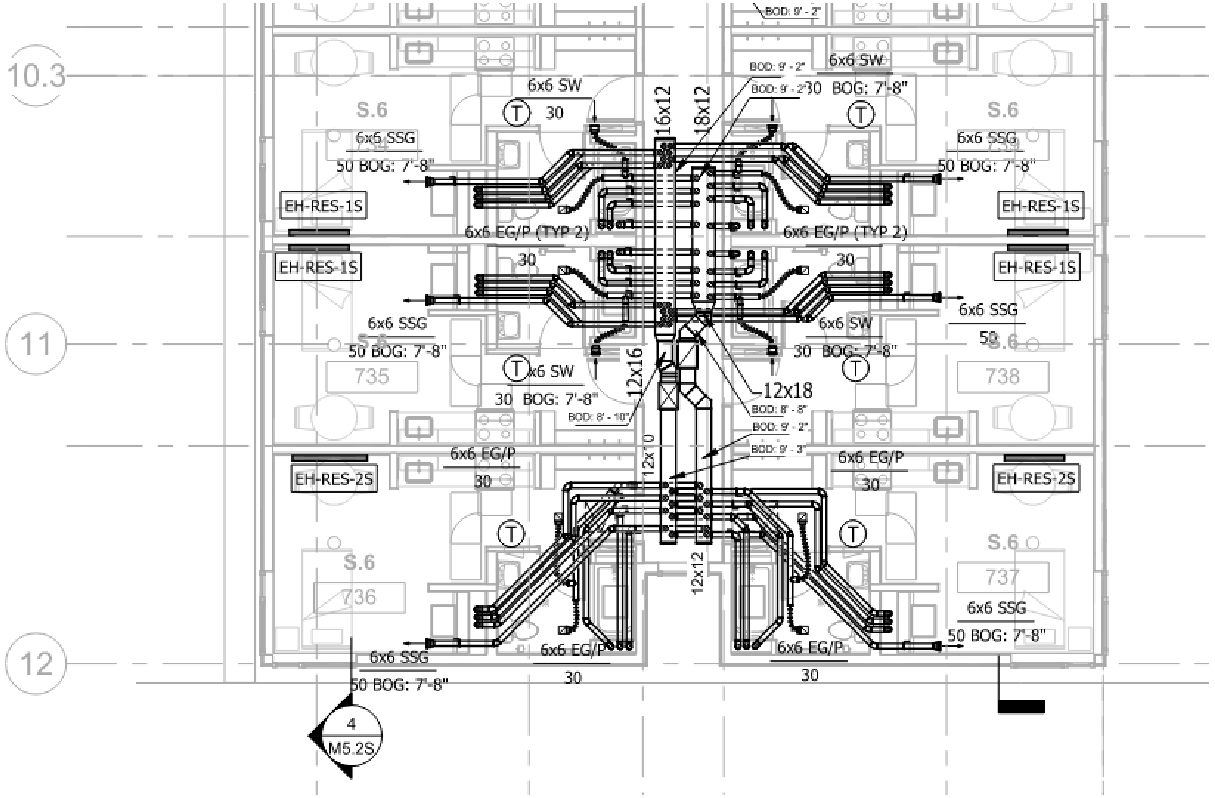
- Floor-to-floor heights probably need to be higher than normal
- Corridor ceilings will likely be low
- Corridor ceiling will be quite congested
- Requires an atypical corridor framing approach
- Soffits near the hallway vs the exterior
- Need a sizable room on each floor
- Easier filter maintenance
- No easy options for 'boost' control



Centralized Rooftop ERV

Considerations

- Easier filter maintenance
- Options for heating/cooling within the ERV
- Vertical shafts within the apartments
- Combining the horizontal distribution ductwork must get thought out
    - Top floor or roof
- Potentially complicated firestopping/building code implications



Other considerations

- Maintenance
- Ventless Ranges – can simplify the ducting layout
- Ventless Dryers – can simplify the ducting layout
- Constructability of a selected approach
  - Ceiling heights
  - Construction sequencing

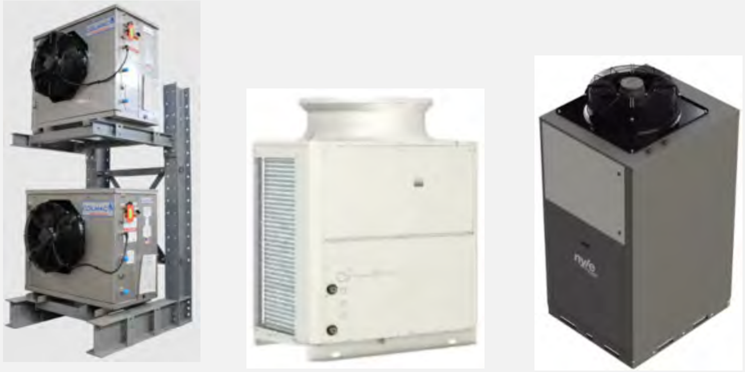
Design/Constructability Considerations for HPWH systems

- Location (Garage vs. Roof)
  - Storage tank space, weight
- Electrical service impacts
- Acoustics
- Type of refrigerant – future proofing

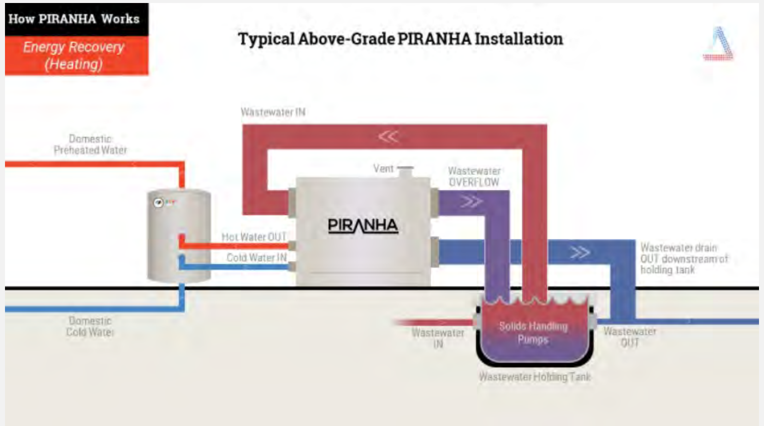
- **Resources**
- LDL 2021/2022 HPWH Webinar Series
- NEEA Advance Water Heating Specification 8.0
- Exemplary Buildings Hot Water Management Resources

Heat Pump Water Heaters

- Mandatory <u>Heat Pump</u> Domestic Water Heating
  - 2018 SEC – full plant, electric backup only
  - 2021 WSEC – min 50% capacity, electric or gas backup
- Technology options – Air, Water, Recovery, District Energy
- Impacts:
  - More space required for equipment outdoors or in parking garages
  - Storage volume
  - Weight



AIR TO WATER HEAT PUMP

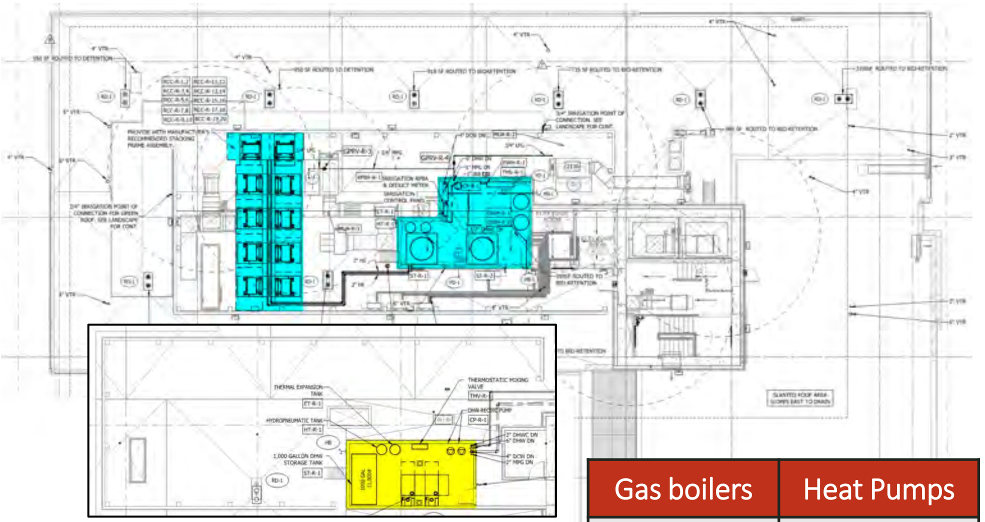


SEWER THERMAL HEAT RECOVERY

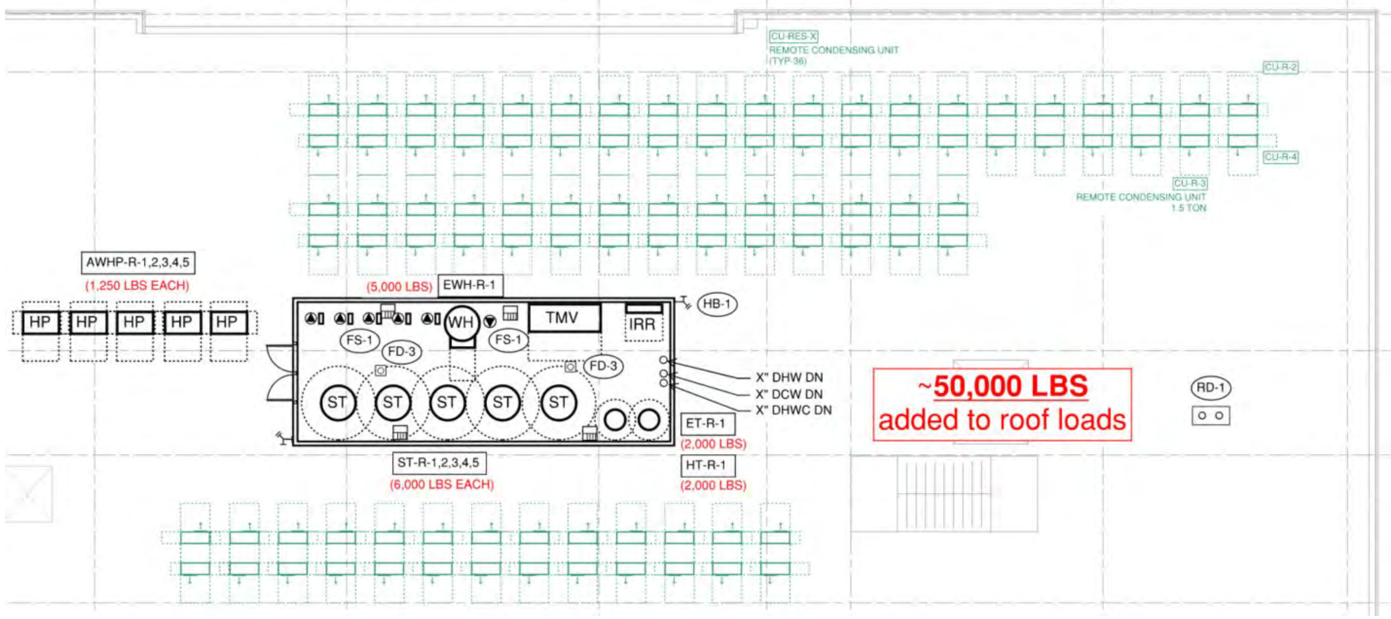
WATER TO WATER HEAT PUMP

Heat pumps on the Roof

- Space required (mechanical room and exterior)
- System Weight
- Low temperature operation – equipment selection and refrigerant options
- Acoustics



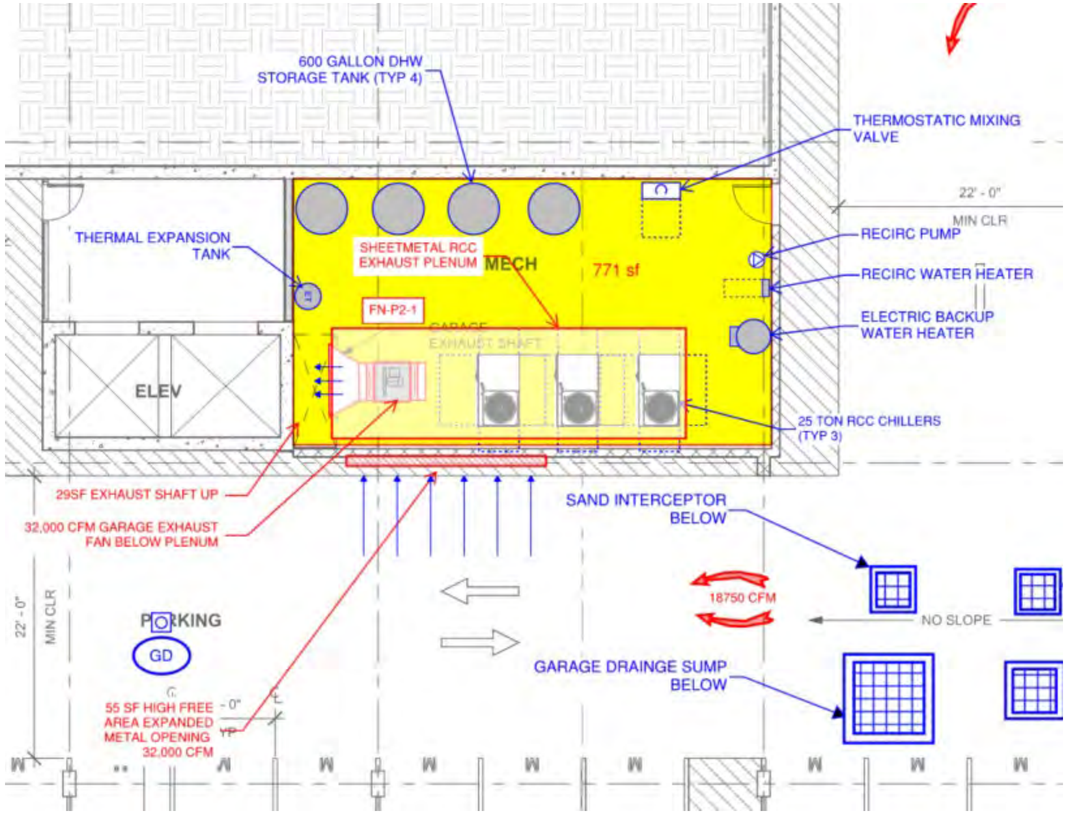
	Gas boilers	Heat Pumps
SPACE	400 SF	970 SF
POWER	15 kW	310 kW

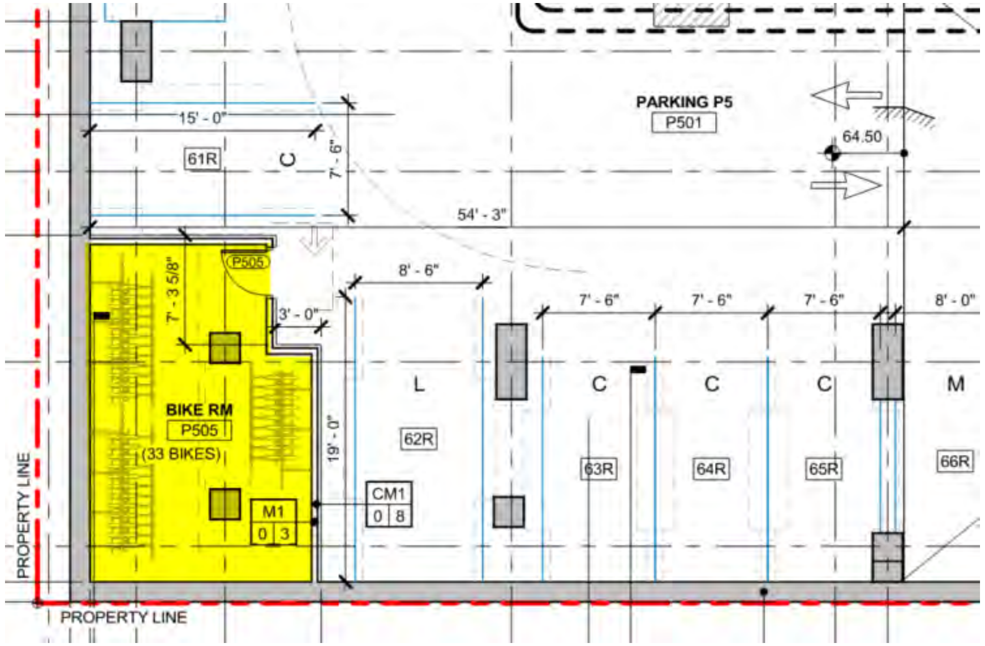


AIR TO WATER HEAT PUMP

Heat pumps in the Garage

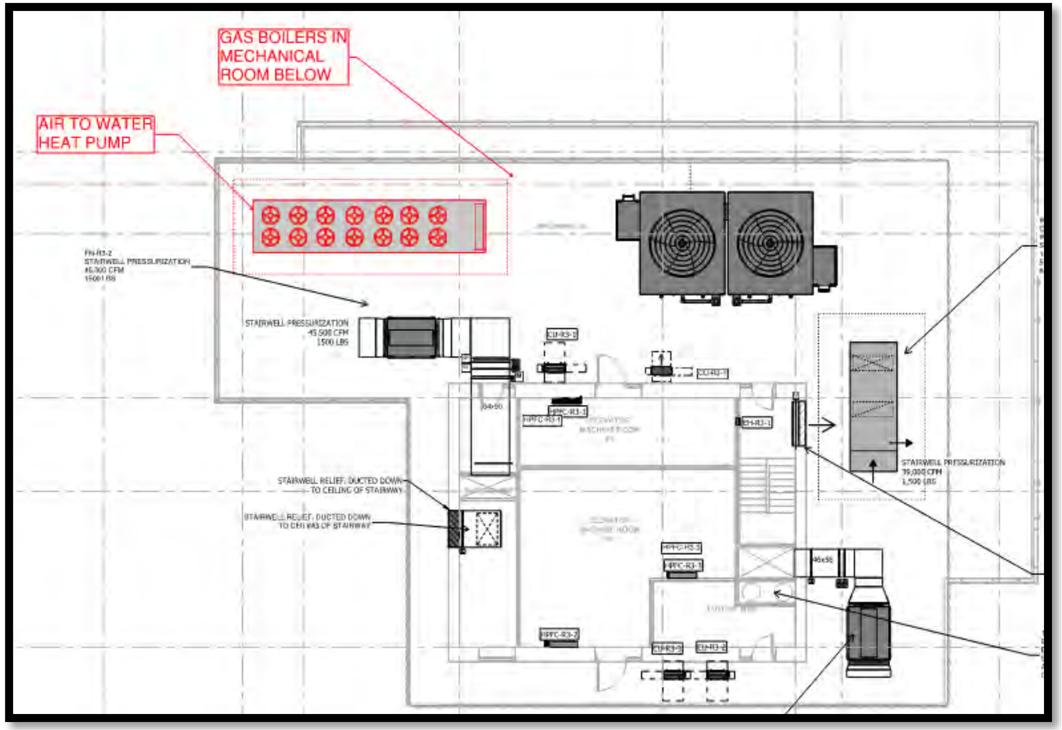
- Functions as partial garage exhaust system
- Better operating efficiency vs. roof
- Ability to use “dead” corners
- Acoustics



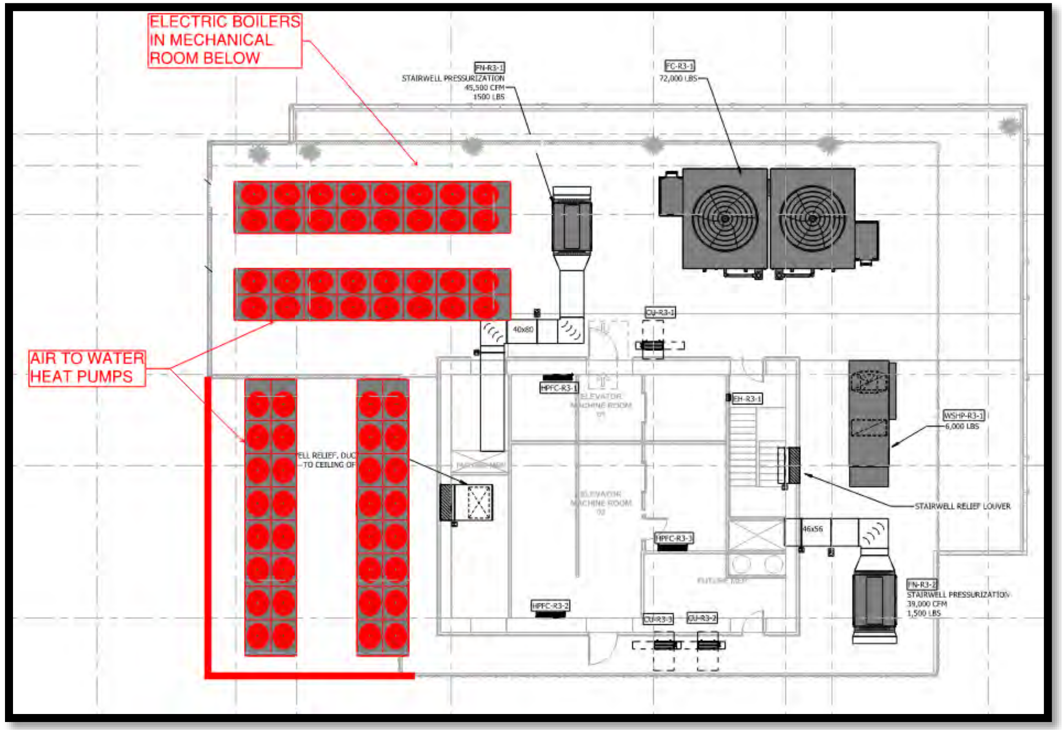


Case study: 55-story multifamily roof plan

Combined Space Heating + DHW Plant



2018 WSEC: Small AWHP and gas boilers



2018 SEC/2021 WSEC: Large AWHPs and supplemental electric boilers

Energy Code Major Changes - Multifamily

2018 WSEC

- Mandatory ERV / BVHR
- Envelope limits
- New C406 calc (6 credits, area weighted)
- Carbon metric for C407

2018 SEC

- **Mandatory heat pumps** (some exceptions for electric heat)
- **Mandatory HPWH**
- **More stringent envelope** limits
- New C406 calc (**8 credits**, area weighted)
- Carbon metric for C407, **10% lower BPF**
- **Increased PV** (0.25 W/sf)

2021 WSEC

- Mandatory heat pumps (some exceptions for electric heat)
- Mandatory HPWH **(50% cap)**
- C406 Changes
  - **Two calcs** (efficiency credits and load mgmt. credits)
  - More options
  - **Requirement and credits vary by occupancy type**
- C407 Changes
  - **Two metrics** (bldg. efficiency and site efficiency)
  - **Revised Carbon factors** (elec vs. gas)
  - **New metric may drive Off-site renewables/RECs** for highrise
- Increased PV (**0.50 W/sf**)

2021 SEC

- **TBD** – Development not yet started

2021 WSEC, C406 Prescriptive

1 Revised points scale/Carbon Basis

- 41-74 credits required (New Construction)
- 20-36 credits (Existing Building Additions)

2 New additional set of credits required for building load management

- 12-27 credits required (New Construction)

	Required Credits for Projects	Section	Occupancy Group					
			Group R-1	Group R-2	Group B	Group E	Group M	All Other
1	New building energy efficiency credit requirement	C406.2	54	41	42	48	74	49
	Building additions energy efficiency credit requirement	C406.2	27	20	21	23	36	21
	If proposal 21-GP-136 is not included in the final adoption, then replace the two rows above with the following two rows:							
+	New building energy efficiency credit requirement	C406.2	68	80	48	55	84	49
	Building additions energy efficiency credit requirement	C406.2	33	40	24	27	41	24
2	New building load management credit requirement	C406.3	12	15	27	15	13	26

2021 WSEC, C407 Energy Modeling

1 More stringent Building Performance Factors (BPFs)

- 10% reduction vs. 2018 WSEC – similar to 2018 SEC
- Apply to **Regulated** energy only
- Revised carbon factors for electricity vs. gas

2 Second additional Site metric

- Aligns to 70% reduction by 2030
- **Regulated + Unregulated**
- May drive highrise projects to purchase off-site/RECs

Table C407.3(2)
Building Performance Factors (BPF) to be used for Compliance with Section C407.3

1

Building Area Type	Building Performance Factor
Multifamily	0.52
Health care/hospital	0.49
Hotel/motel	0.57
Office	0.50
Restaurant	0.63
Retail	0.43
School	0.33
Warehouse	0.43
All others	0.49

Applies to regulated* energy only

*Plug/unregulated loads are often ~20% of building energy

+

Table C407.3(3)
Site Energy Performance Targets to be used for Compliance with Section C407.3

2

Building Area Type	Building Performance Factor
Multifamily	0.58
Health care/hospital	0.57
Hotel/motel	0.62
Office	0.56
Restaurant	0.70
Retail	0.45
School	0.44
Warehouse	0.49
All others	0.55

Applies to ALL energy

2021 WSEC, C411 – Renewable Energy

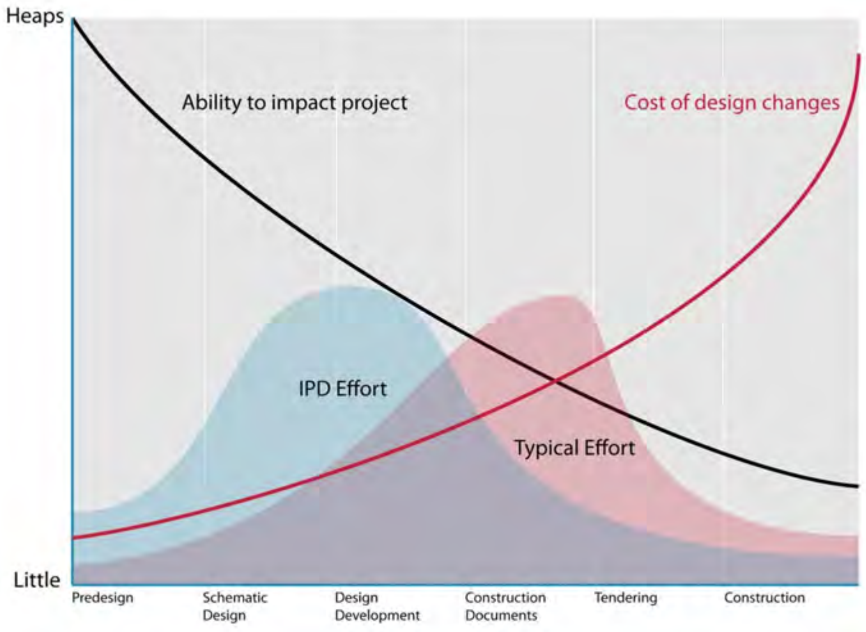
- **Mandatory Renewable** – 0.5 watts/sf (double 2018 SEC requirement)
  - On-site or off-site (including RECs)
  - Based on entire conditioned floor area of building or addition
  - Some exceptions for shading/roof coverage or partial system
- C407 vs. C406 offset
  - On-site energy factor metric for C407
- Focus on Quality of renewable
  - More flexibility, but more complex
  - See Table C411.3.1
- **Solar Readiness** requirements
  - Required for all new nonresidential buildings 20 stories or less

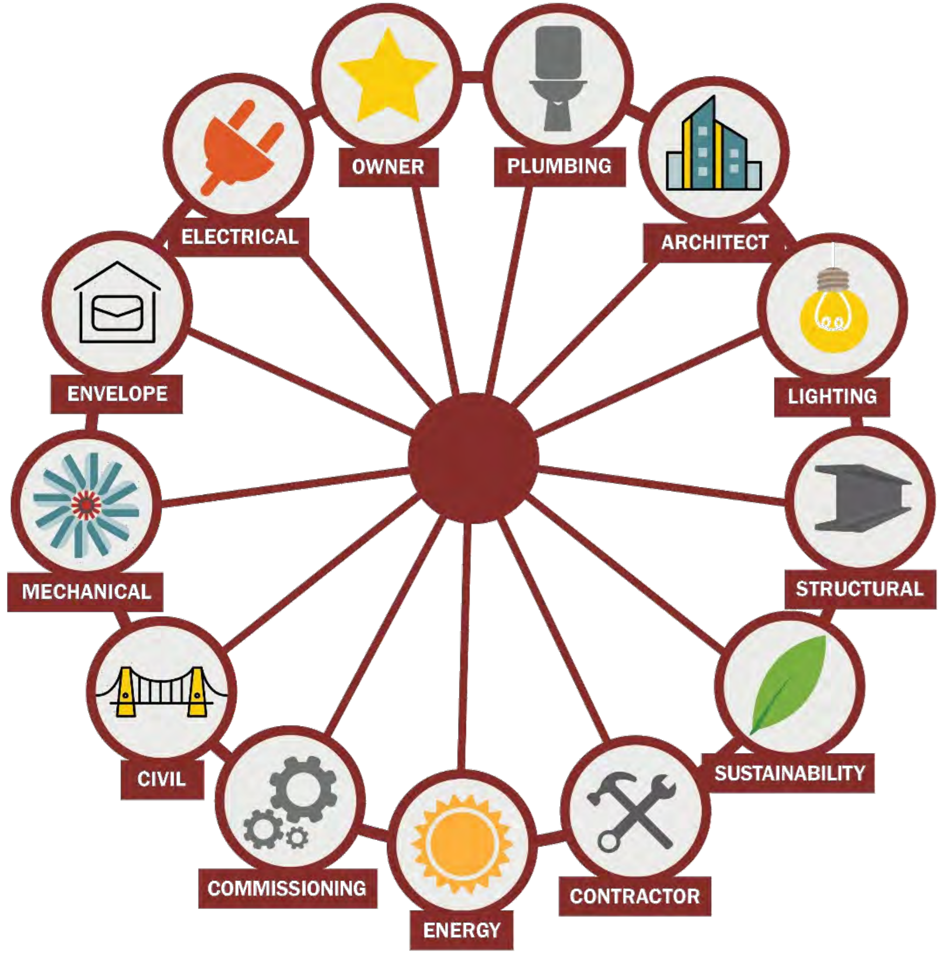
Table C411.3.1
Multipliers for Renewable Energy Procurement Methods

Location	Renewable Energy Source	Renewable Energy Factor		
		In the state of Washington	Western Interconnected	In the states of Oregon or Idaho
On-site	On-site renewable energy system	1	NA	NA
Off-site	Directly owned off-site renewable energy system that begins operation after submission of the initial permit application	0.95	0.75	0.85
Off-site	Community renewable energy facility that begins operation after submission of the initial permit application	0.95	0.75	0.85
Off-site	Directly owned off-site renewable energy system that begins operation before submission of the initial permit application	0.75	0.55	0.65
Off-site	Community renewable energy facility that begins operation before submission of the initial permit application	0.75	0.55	0.65
Off-site	Renewable Power Purchase Agreement (PPA)	0.75	0.55	0.65

2018/2021 = full team involvement

- The 2018 and 2021 codes are driving an early **Integrative Design Process**
- Have the team on board early, and need full team coordination between milestones
- Make significant design decisions earlier
- <u>Don't assume what a 2015/2018 project did still works!</u>





Things to ask on your next project

- Important – You need to have a competent Design Team to assess and account for all changes and interactions among code requirements. Don't assume what worked on past projects still works.
- ERV approach - centralized vs. distributed?
- Dwelling unit heating/cooling - Provide cooling or not?
  - Can you get away with electric resistance power limit for dwelling rooms?
  - If not, provide heat pumps for just the rooms that need it, or by façade, or by story?
- DHW - locate equipment on garage or roof?
- PV - is space available? Offset via C407?
- Envelope goals - component (spreadsheet) vs. C407 (whole building model)?
- What C406 options align best with project goals, and possible utility incentives?
- Roof/garage/BOH competing space requirements - PV, HP condensing units, HP water heating plant, central ventilation equipment. Where does it all go?
- UPC Appendix M: Is it accepted by AHJ, and what are the impacts on cost/water connection?

Q&A

THANK YOU!

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