TBDA TOM BASSETT-DILLEY ARCHITECTS

Most TBDA Phius/Zero Energy/Capable Projects*, 2011-current (*excluding ~10 in-progress, mostly retrofits)

ICF Passive House, 2012

Area: 3,598s.f. iCFA
Envelope: 8,688s.f.
Energy modeling:

Walls: 2” polyiso over 11.75” ICF w/ 2x4 interior framing w/ blown fiberglass, R-52
Slab: 4” concrete, 8” EPS, R-36
Roof: 24” blown fiberglass, R-100
Zola Thermo Alu-Clad, Uw=0.09, SHGC=0.5
HVAC: Zehnder / Mitsubishi, ductless minisplits

Number of Dwelling Units:	1		Interior Temperature:	68.0	°F
Gross Enclosed Volume V_e:	45777	ft^3	Internal Heat Gains:	0.7	BTU/hr.ft²
Number of Occupants:	9.6				

Type of Values Used: Standard

Planned Number of Occupants: 6 Verification

Energy Demands with Reference to the Treated Floor Area

Treated Floor Area: 3598 ft^2

Verification: Monthly Method

	Applied:		PH Certificate:	Fulfilled?
Specific Space Heat Demand:	4.15	kBTU/(ft²yr)	4.75 kBTU/(ft²yr)	Yes
Pressurization Test Result:	0.45	ACH_{50}	0.6 ACH_{50}	Yes
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):	34.5	kBTU/(ft²yr)	38.0 kBTU/(ft²yr)	Yes
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):	17.7	kBTU/(ft²yr)		
Specific Primary Energy Demand Energy Conservation by Solar Electricity:		kBTU/(ft²yr)		
Heating Load:	3.76	BTU/(ft²hr)		
Frequency of Overheating:		%	over 77.0 °F	
Specific Useful Cooling Energy Demand:	1.04	kBTU/(ft²yr)	4.75 kBTU/(ft²yr)	Yes
Cooling Load:	2.97	BTU/(ft²hr)		

Specific Space Heat Demand, Annual Method	4.28
Specific Space Heat Demand, Monthly Method	4.15

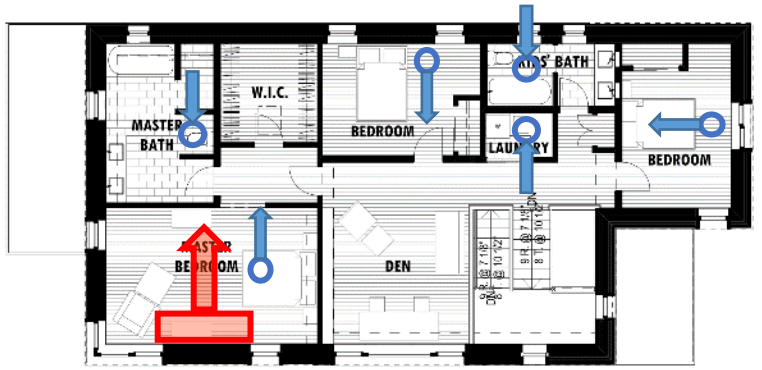
ICF Passive House:

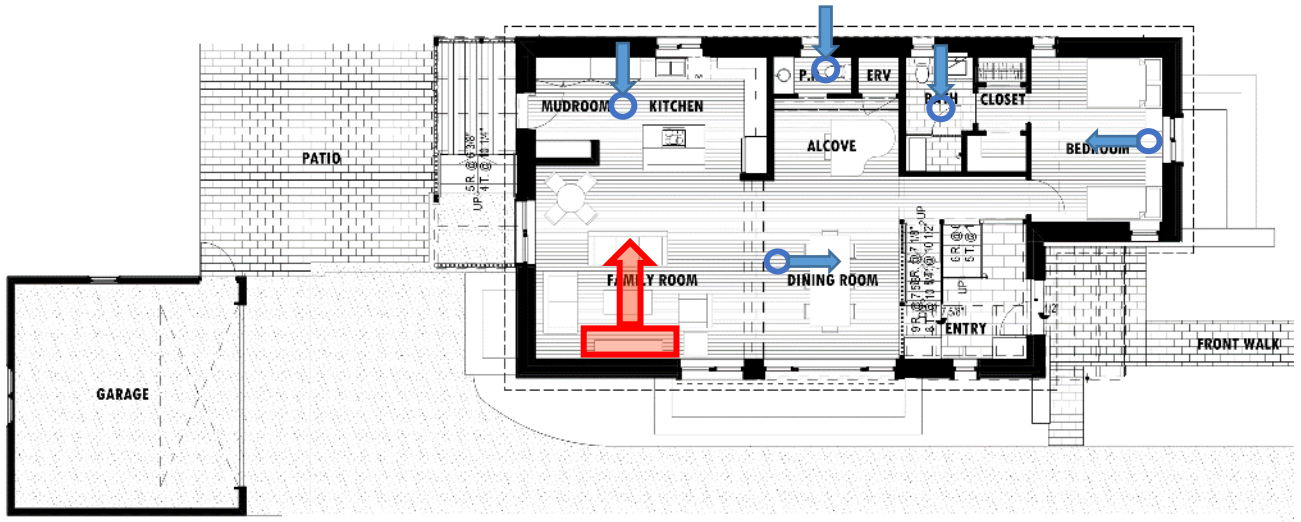
FEATURES:

- Zehnder ComfoAir 550 ERV
- (2) Mitsubishi Hyper Heat 9k BTUh units, one on 1st floor + 2nd floor

- Issues:
  - Local overheating, particularly east and west;
  - temperature stratification (basement)

- Fixes:
  - Swap Zehnder for CERV
  - Add shading to windows





ERV exhaust

ERV supply

Ductless minisplit indoor unit

Case Study: Community Center retrofit

- One of only three certified Net Zero buildings in IL
- Retrofit and Addition
- Phius Source Zero certified
- Supported by ICECF NZE Grant

Carroll Center
New Wall Section

Roof Assembly (R-48.4):

- Airtight Membrane Roof over 8” Polyiso.on Metal Deck + joists

Wall Assembly (R-27.3):

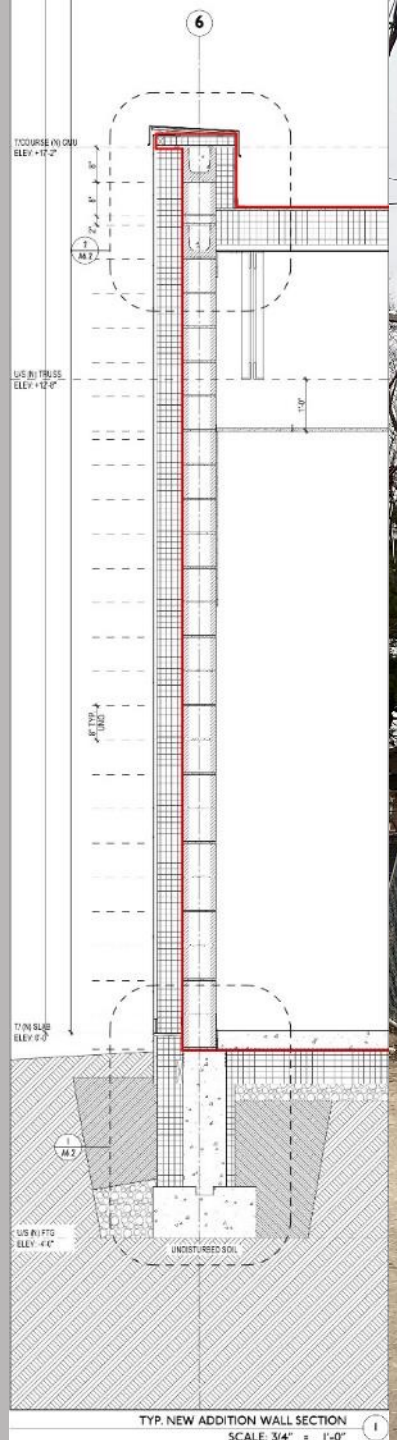
- Fiber Cement Board rainscreen over 6” Mineral Wool Insulation on 8” Concrete Masonry Unit with Fluid-applied Air Barrier

Slab Assembly (R-35.6):

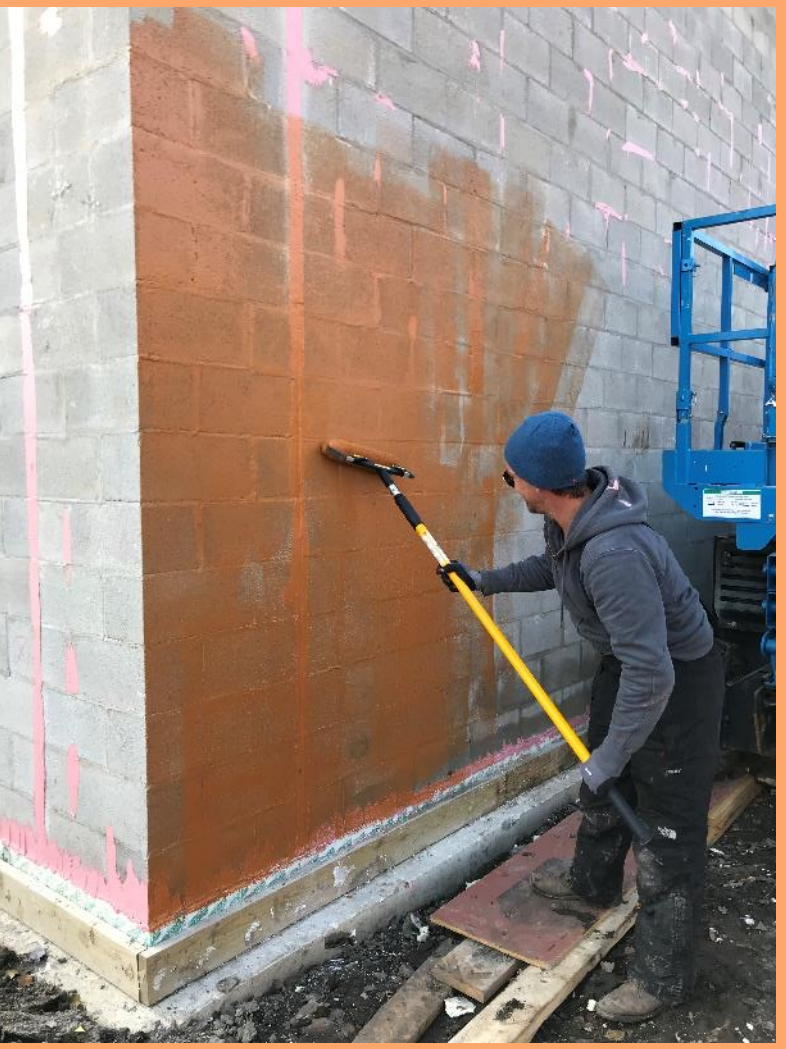
- 4” Concrete Slab/Vapor Barrier over 8” Type-IX EPS Insulation on gravel

Foundation Assembly (R-36.3):

- 6” Type-IX EPS Insulation



Construction Photos: air barrier/new



Carroll Center Retrofit Wall Section

Roof Assembly (R-45.5):

- (E) 2x4 Rafters with (N) 2x8 Rafters Sistered for 1” Deflection. Cavity Filled with 8-1/4” HFO Closed Cell Spray Foam

Wall Assembly (R-28.6):

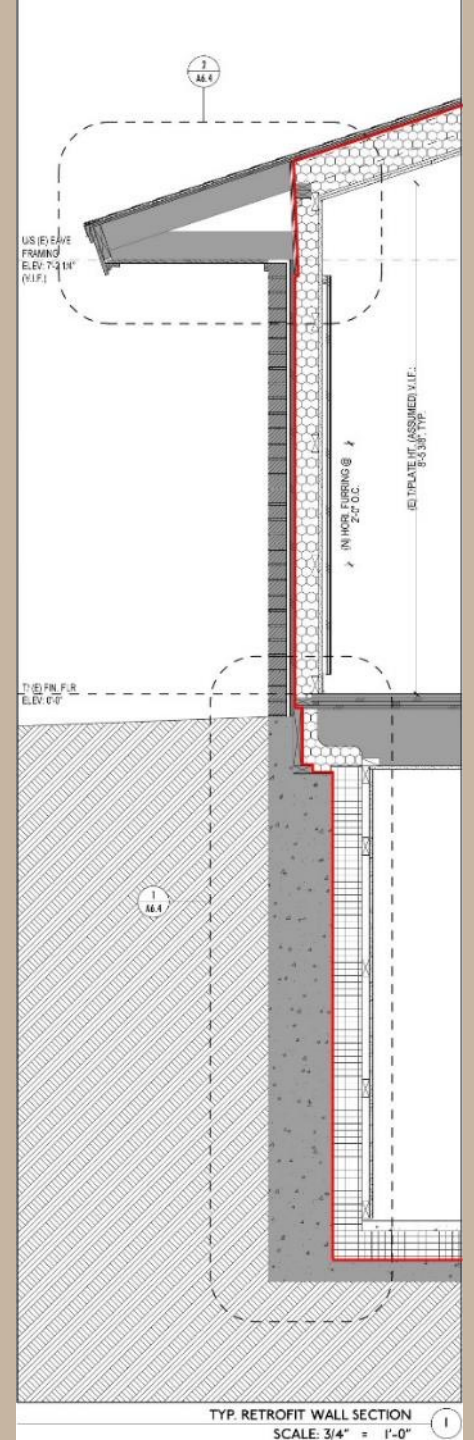
- (E) Brick over (E) 2x4 Studs with (N) 2x2 Cross Furring with 5” Closed Cell Spray Foam and 5/8” Gypsum Board

Slab Assembly (R-27.7):

- (N) 2” Concrete Slab on 6” EPS Insulation on (E) Concrete Slab

Foundation Assembly (R-28.0):

- (E) Concrete Foundation w/ 6” EPS Insulation, 2x Furring and 5/8” Gypsum Board



Construction Photos: air barrier/exist.

Carroll Center Mechanicals

Heating & Cooling:

(4) Climatemaster TE Ground Loop Heat Pumps

- EER: 26.7
- COP: 4.4

Ventilation:

RenewAire HE-2XINV

- Efficiency: 76%
- 1000 CFM Ventilation

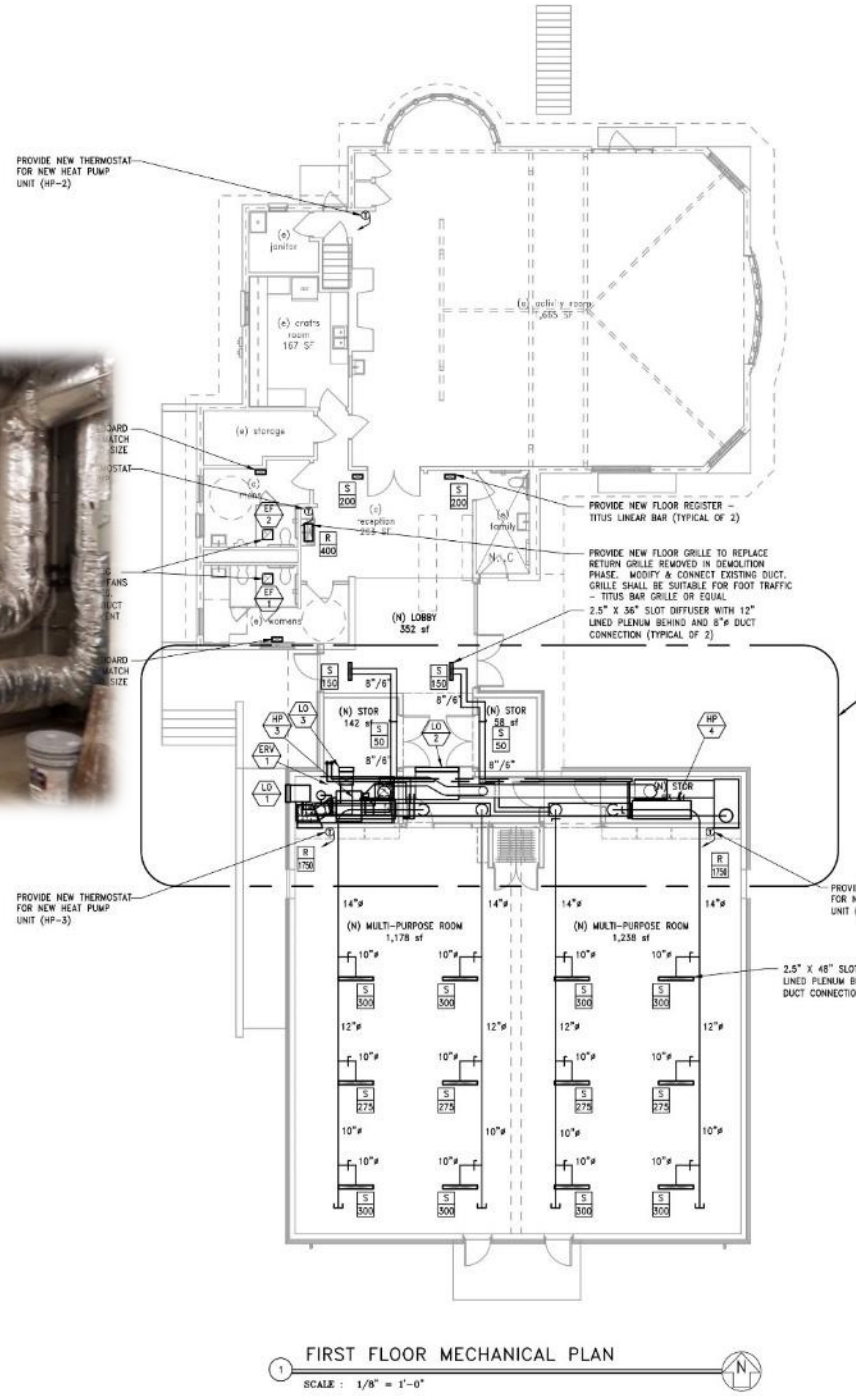
DHW:

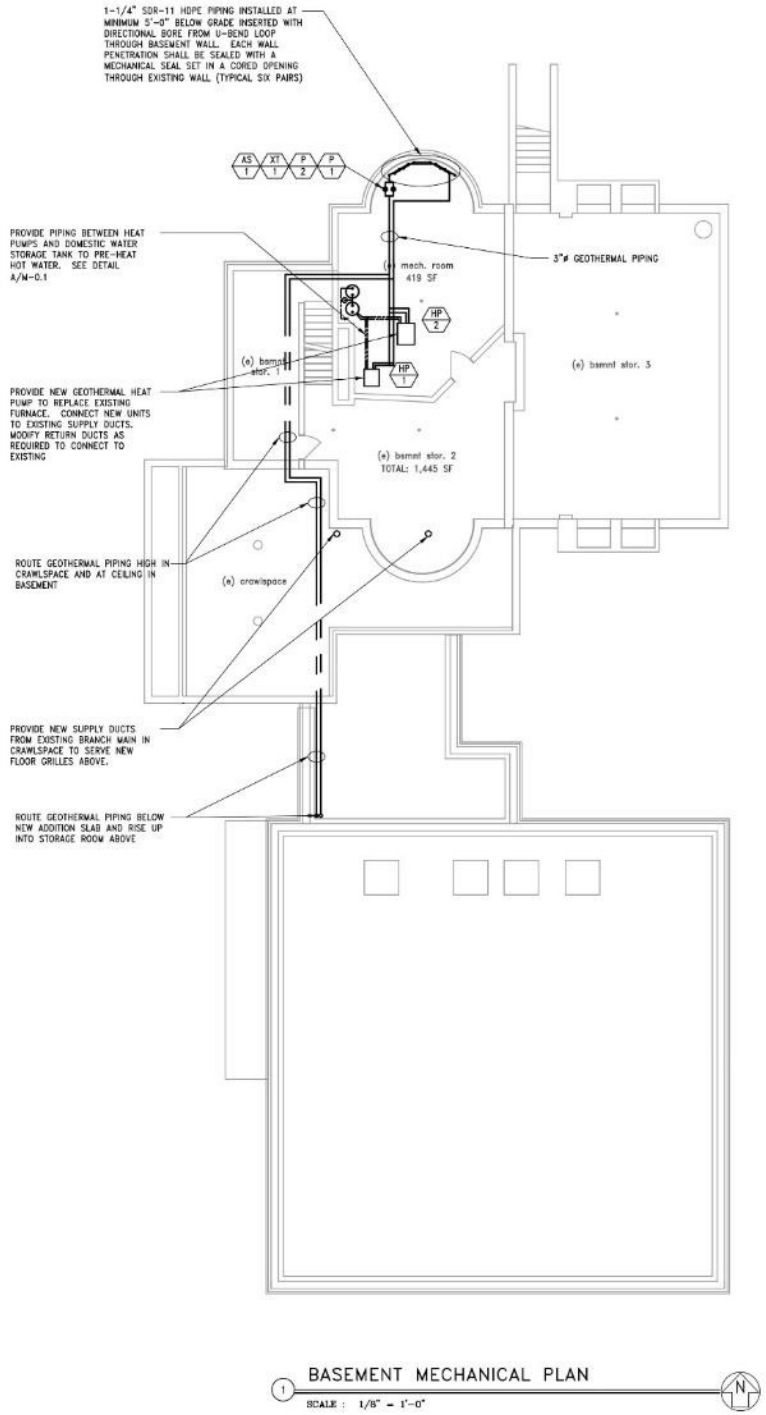
40 Gallon Electric Water Heater

- Efficiency: 92%

Solar:

27kW Rated Array (35,633 kWh/yr per PVWatts)





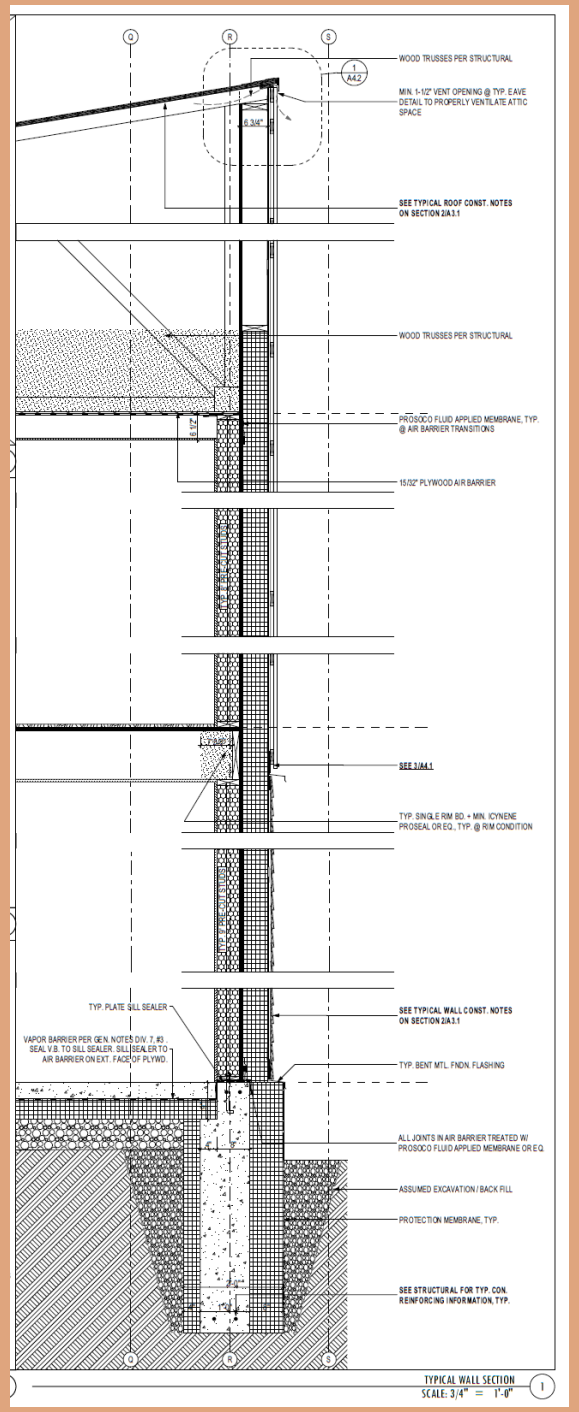
Case Study: Community Center retrofit

- 79 panel PV array provides more than 50% overproduction for the facility

“Acorn Glade” 2016

Area: 1,785s.f. iCFA
Envelope: 5,074s.f.
Energy modeling: PHIUS+2018 Source Zero

Slab R-20: 5” EPS
Walls R-46: 2x6/fiberglass + 5” EPS
Roof R-81: cellulose
Windows: Zola Thermo uPVC Tripane



Acorn Glade: HVAC as designed

FEATURES:

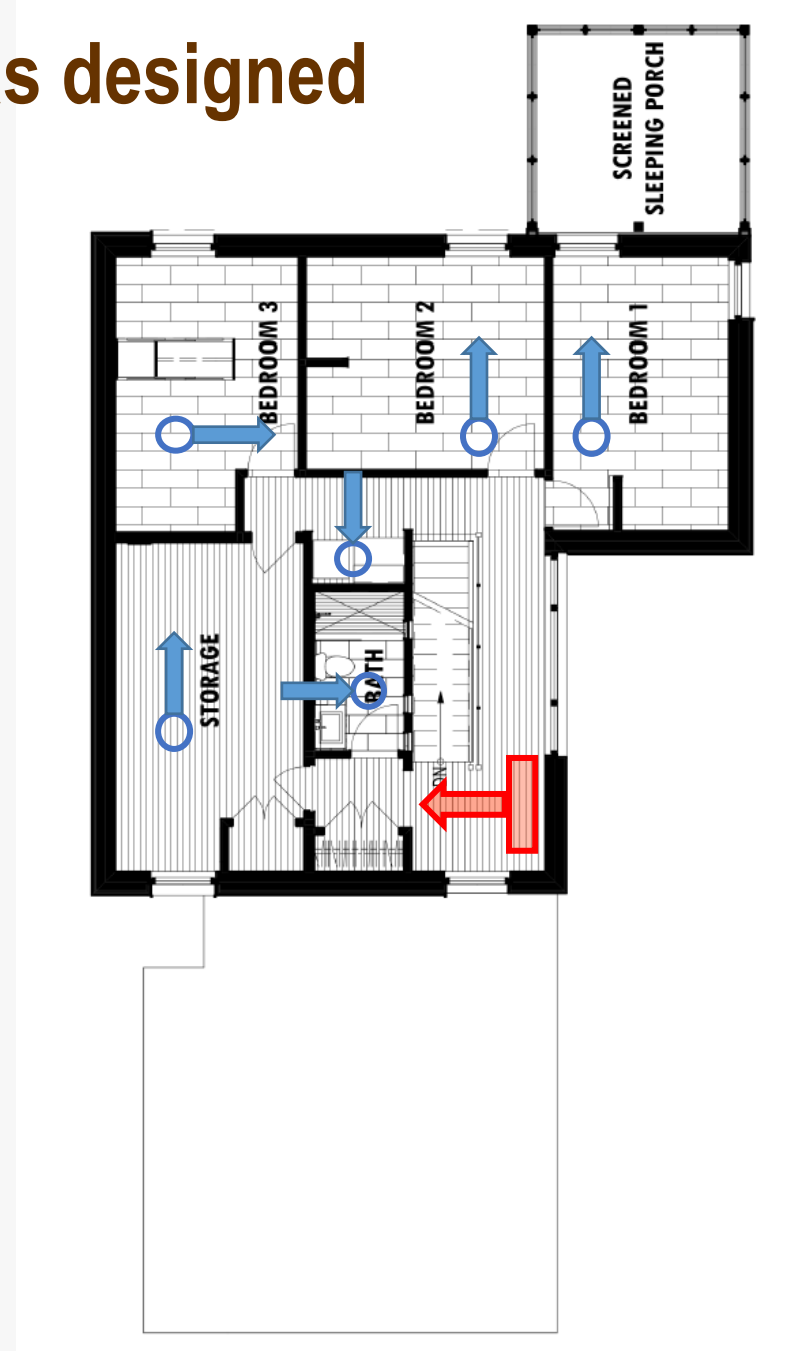
- CERV ERV
- Mitsubishi Hyper Heat 12k BTUh unit, one on second floor

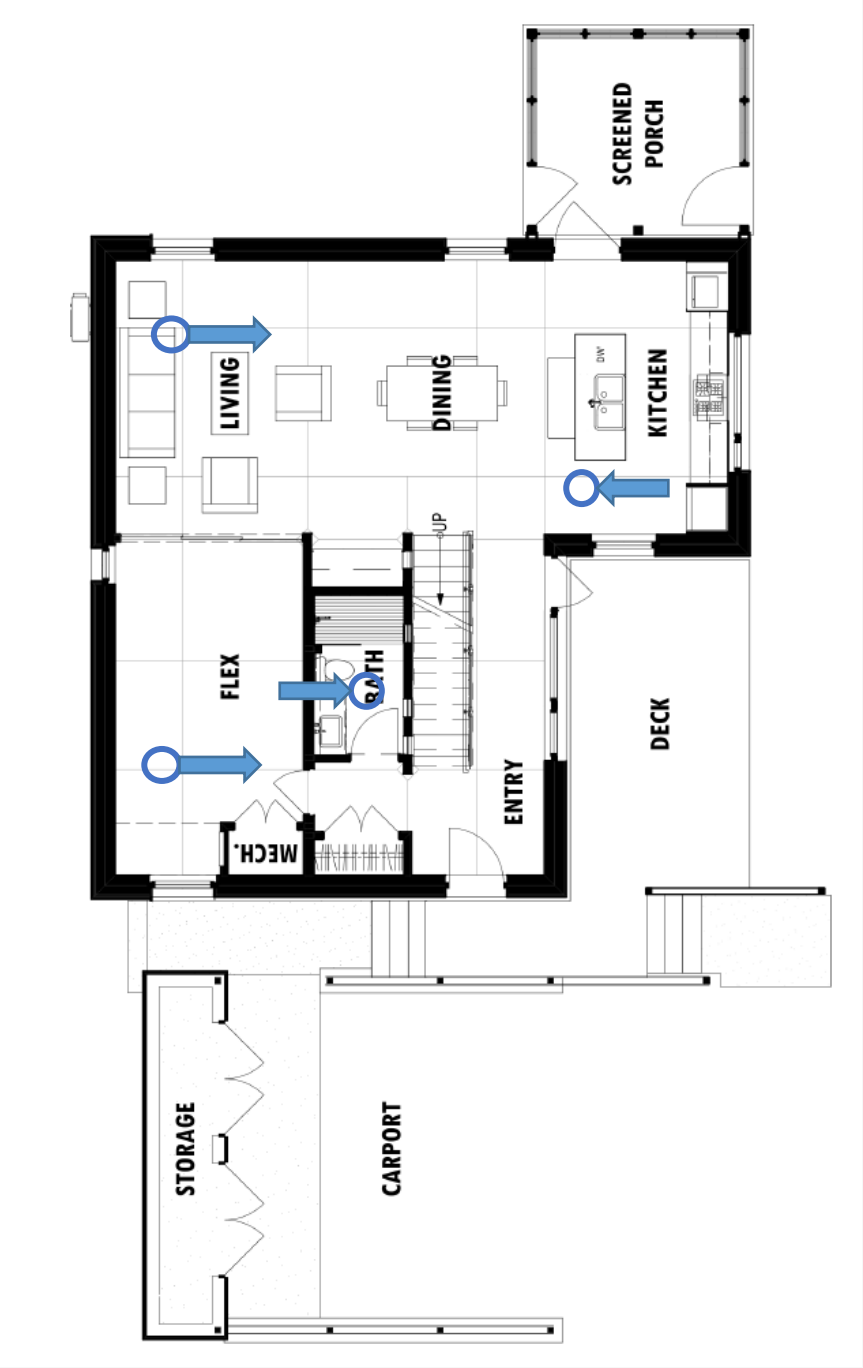
- Issues:
  - differential temperatures between floors;
  - temperature stratification
  - HPWH causing local cooling

ERV exhaust

ERV supply

Ductless minisplit indoor unit





Acorn Glade: HVAC retrofit

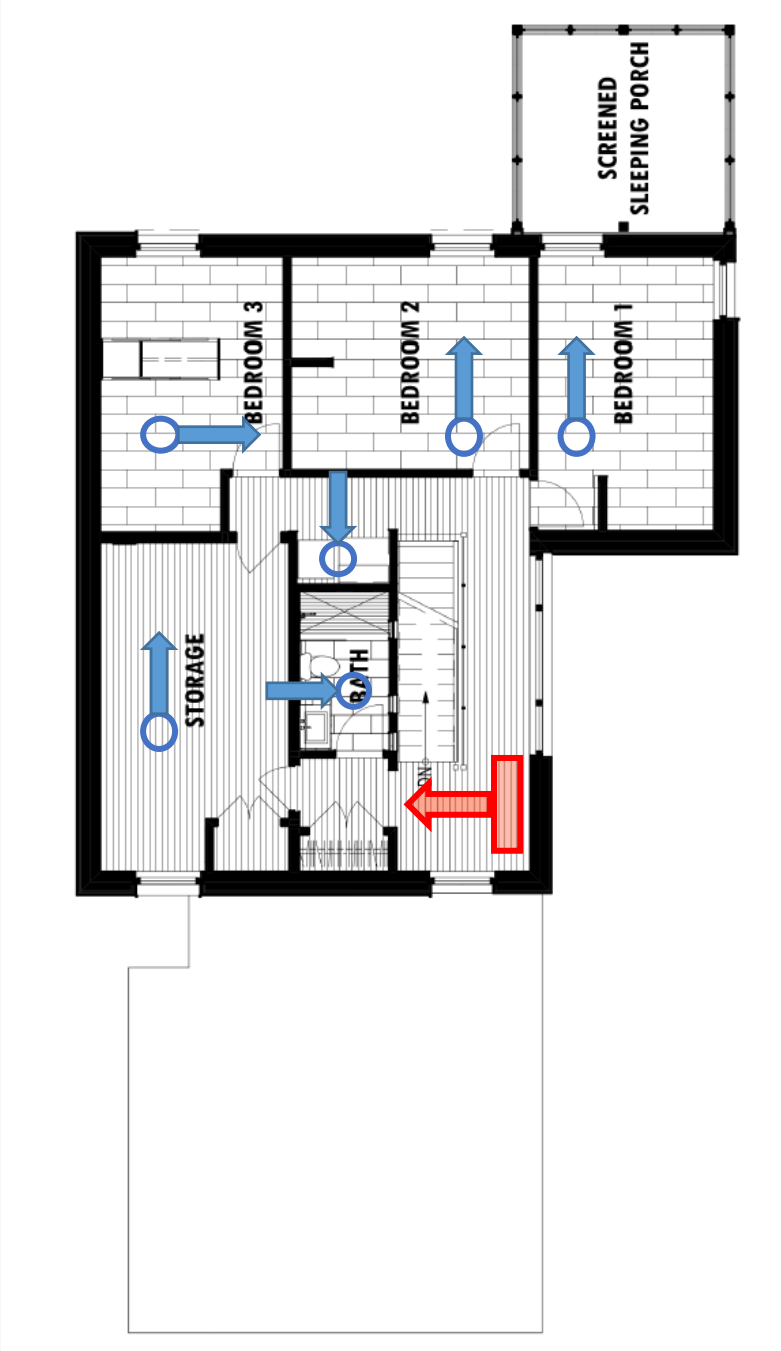
FIXES:

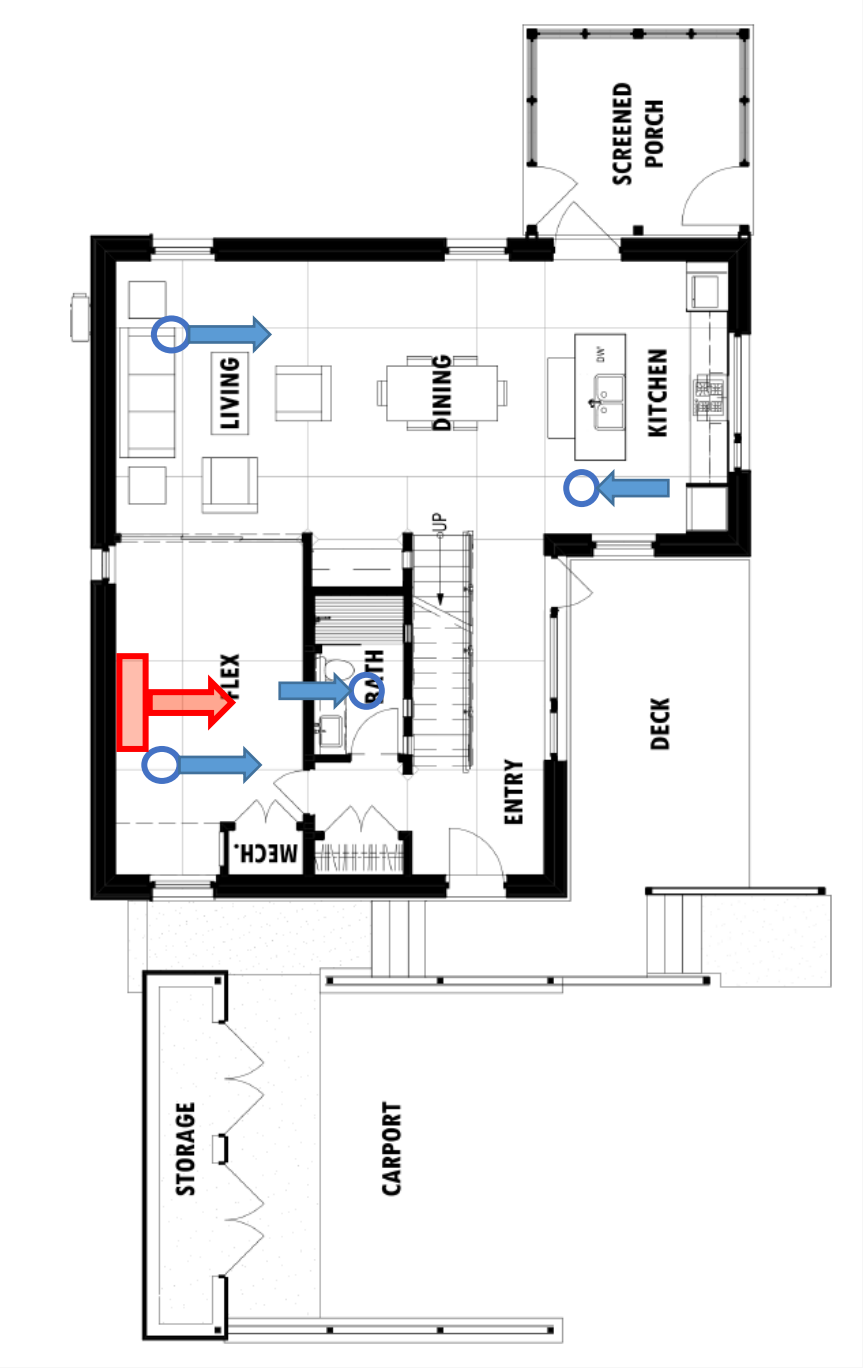
- CERV ERV is fine
- Add one Mitsubishi Hyper Heat at first floor: problem solved.

ERV exhaust

ERV supply

Ductless minisplit indoor unit





“Acorn Glade” 2016

Construction photos

“Acorn Glade” 2016

Construction photos

“Acorn Glade” 2016

Construction photos

“Acorn Glade” 2016

Construction photos

“Acorn Glade” 2016

PHIUS+2018 Source Zero

“Acorn Glade” 2016

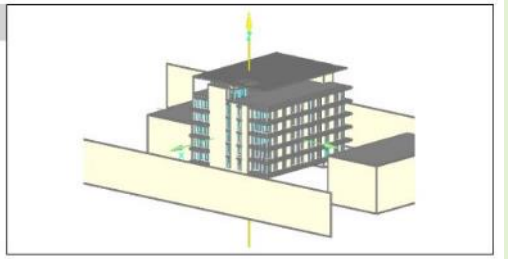
PHIUS+2018 Source Zero

PHIUS Source Zero Multifamily project

Tom Bassett-Dilley AIA, CPHC

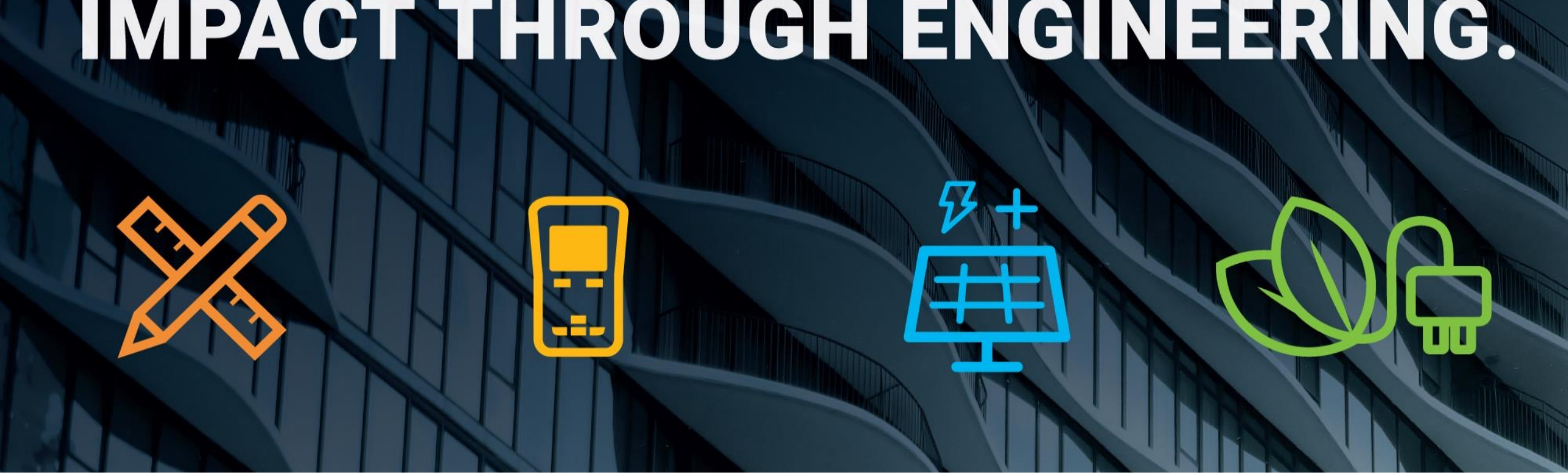
Joe Clair, (Data Based+/dbHMS, MEP Engineers)

BUILDING INFORMATION	
Category:	Residential
Status:	In planning
Building type:	New construction
Year of construction:	
Units:	44
Number of occupants:	87 (Design)
Occupant density:	440 ft²/Person



DATA | BASED+
db | HMS

IMPACT THROUGH ENGINEERING.



db|HMS

DESIGN

- MEP/FP
- Lighting Design
- Information Technology Design
- BIM

COMMISSIONING

- MEP Systems Commissioning
- Building Enclosure Commissioning
- LEED Fundamental & Enhanced Commissioning
- Measurement & Verification
- Retro Commissioning

DATA|BASED+ db|HMS

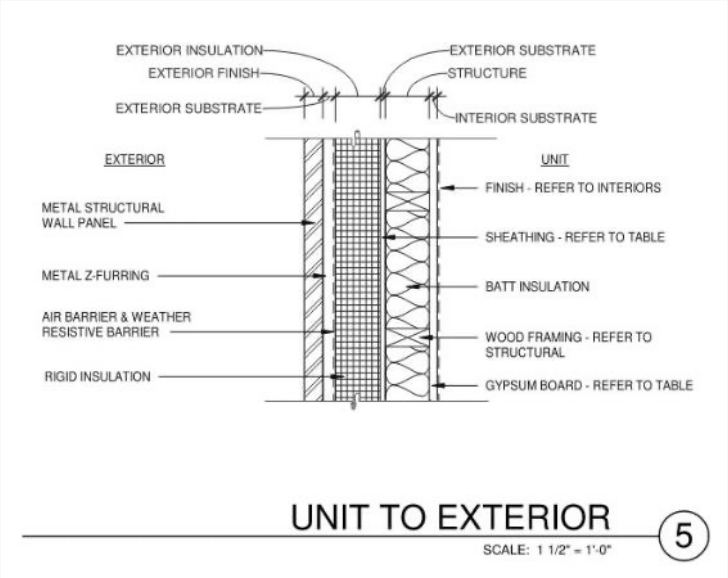
- Whole Building Energy Analysis
- Integrated Façade Analysis
- Clean Technology Evaluation & Design
- District Sustainability & Infrastructure Planning
- Carbon Footprint Assessment
- Smart Buildings
- Sustainable Framework & Strategy Development
- Green Building Certification - LEED, HERS, LBC, EGC, ENERGY STAR GREEN GLOBES
- Green Permits/Incentive Consulting
- Energy Performance Benchmarking
- LEED® Proven Provider™

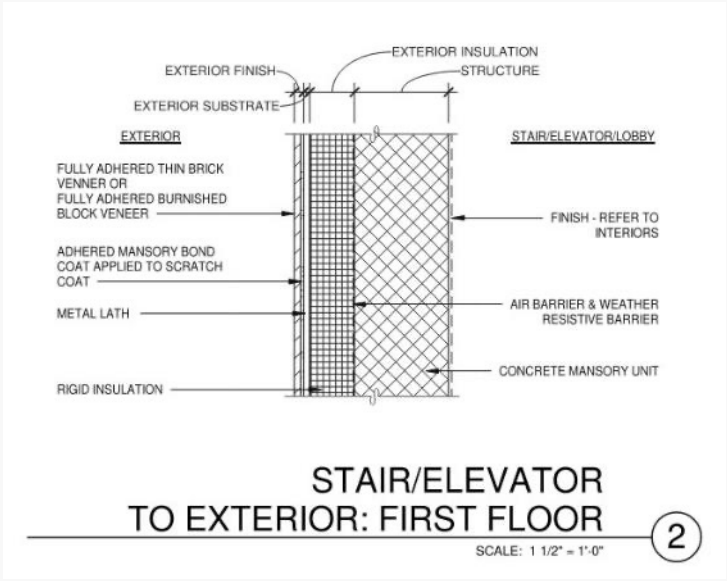
The project

- On Austin, Blvd., looking at Columbus Park, gateway
- 2 blocks from Blue Line and Ike
- First development on the east side of the Village in 50 years
- 80% market rate, 20% affordable units
- Qualified for ICECF funding by pursuing Phius and Net Zero
- Public reaction: “Sustainability efforts outweigh parking concerns”

Proposed new development at 7 Van Buren St. on Austin Boulevard. | Provided by Oak Park Residence Corporation

Envelope

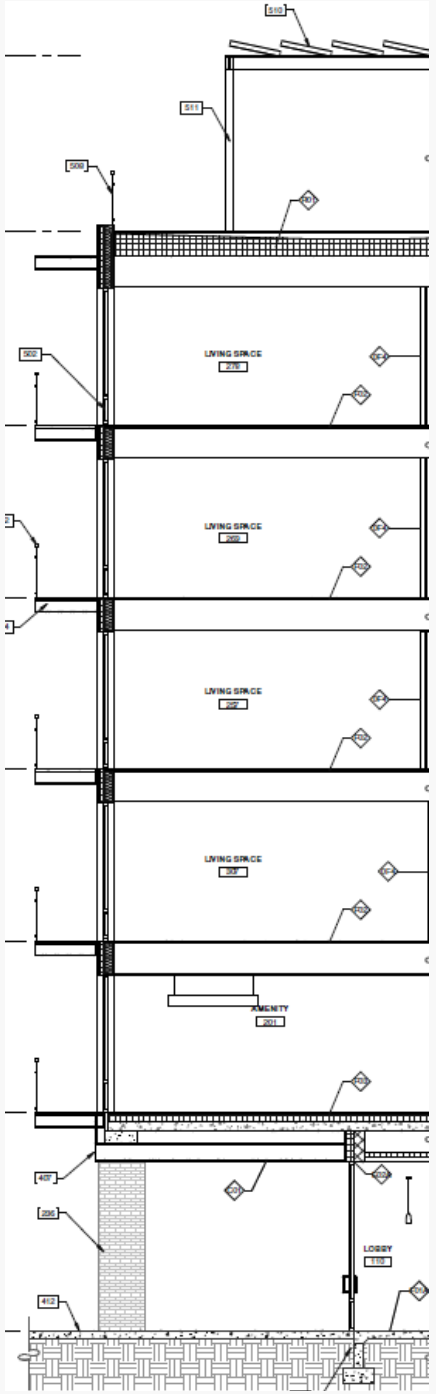




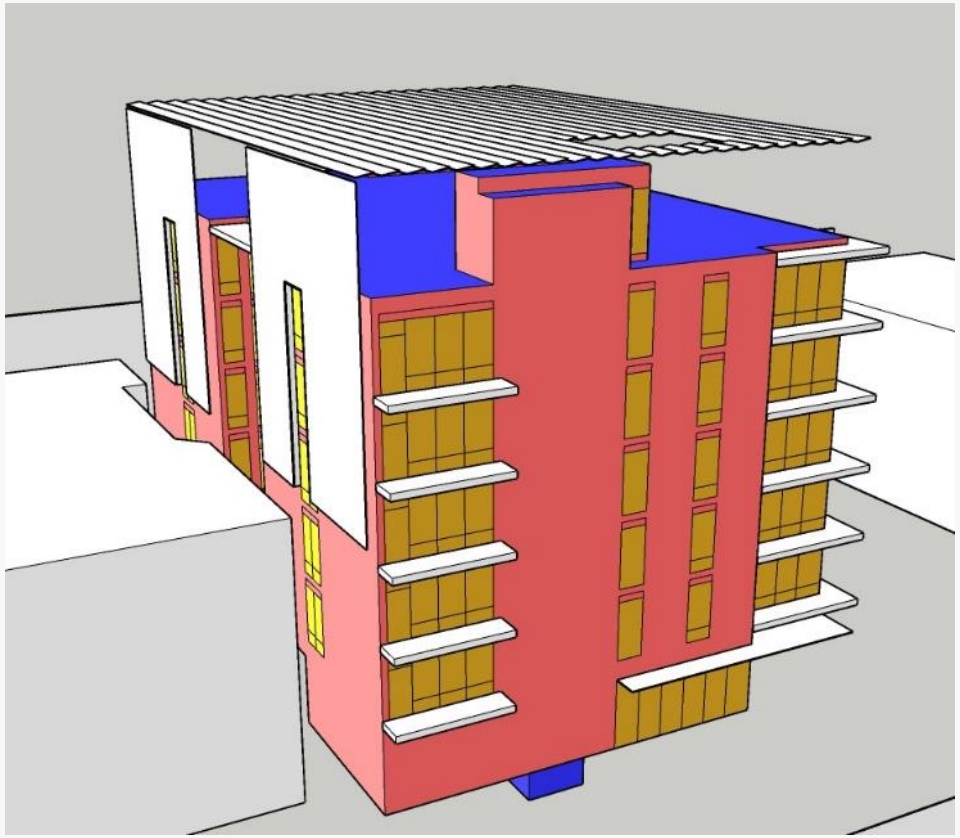
Assemblies:

- R-37 Walls
- R-75 Roof*
- R-26 Slab
- Windows U=0.18, all SHGC= 0.2**

*note R values driven by Site Energy, not Space Conditioning
**we'll get to that in a minute…



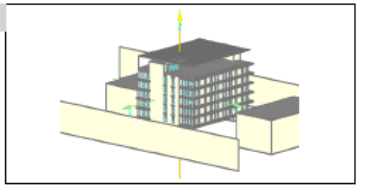
WUFI-Passive modeling results



Modeled without PV to give us a production target

About 200Mwh for Source Zero. We multiply by an 8% safety factor

BUILDING INFORMATION



Category:	Residential
Status:	In planning
Building type:	New construction
Year of construction:	
Units:	44
Number of occupants:	87 (Design)
Occupant density:	440 ft²/Person

Boundary conditions

Climate:	CHICAGO MIDWAY AP IL
Internal heat gains:	1.3 Btu/hr ft²
Interior temperature:	68 °F
Overheat temperature:	77 °F

Building geometry

Enclosed volume:	482,755.6 ft³
Net-volume:	442,480.7 ft³
Total area envelope:	42,569.6 ft²
Area/Volume Ratio:	0.1 1/ft
Floor area:	38,277 ft²
Envelope area/iCFA:	1.112

PASSIVEHOUSE REQUIREMENTS

Certificate criteria: **PHIUS+ 2018**

Heating demand

specific:	3.34 kBtu/ft²yr
target:	5.7 kBtu/ft²yr
total:	127,807.91 kBtu/yr

Cooling demand

sensible:	4.37 kBtu/ft²yr
latent:	0.6 kBtu/ft²yr
specific:	4.97 kBtu/ft²yr
target:	6.6 kBtu/ft²yr
total:	190,084.26 kBtu/yr

Heating load

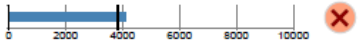
specific:	4.76 Btu/hr ft²
target:	5.8 Btu/hr ft²
total:	182,278.76 Btu/hr

Cooling load

specific:	2.36 Btu/hr ft²
target:	2.6 Btu/hr ft²
total:	90,387.37 Btu/hr

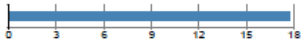
Source energy

total:	358,815.33 kWh/yr
specific:	4,124 kWh/Person yr
target:	3,840 kWh/Person yr
total:	1,224,207.88 kBtu/yr
specific:	31.99 kBtu/ft²yr



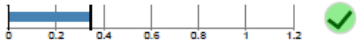
Site energy

total:	680,115.49 kBtu/yr
specific:	17.77 kBtu/ft²yr
total:	199,341.85 kWh/yr
specific:	5.21 kWh/ft²



Air tightness

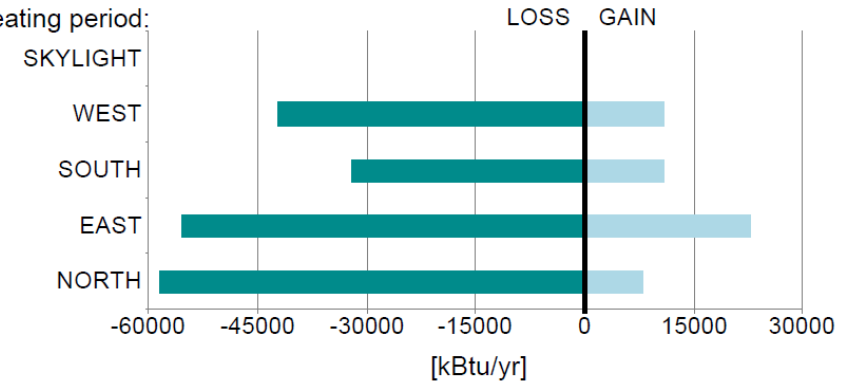
ACH50:	0.35 1/hr
CFM50 per envelope area:	0.06 cfm/ft²
target:	0.35 1/hr
target CFM50:	0.06 cfm/ft²



Envelope: windows

Windows

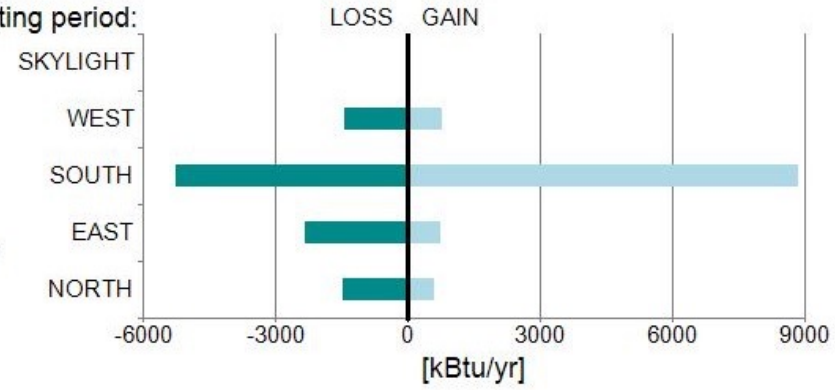
Average SHGC:	**0.21**	
Average solar reduction factor heating:	**0.36**	
Average solar reduction factor cooling:	**0.33**	
Average U-value:	**0.183**	Btu/hr ft² °F
Total glazing area:	**5,746.4**	ft²
Total window area:	**7,332.7**	ft²



This current multifamily project

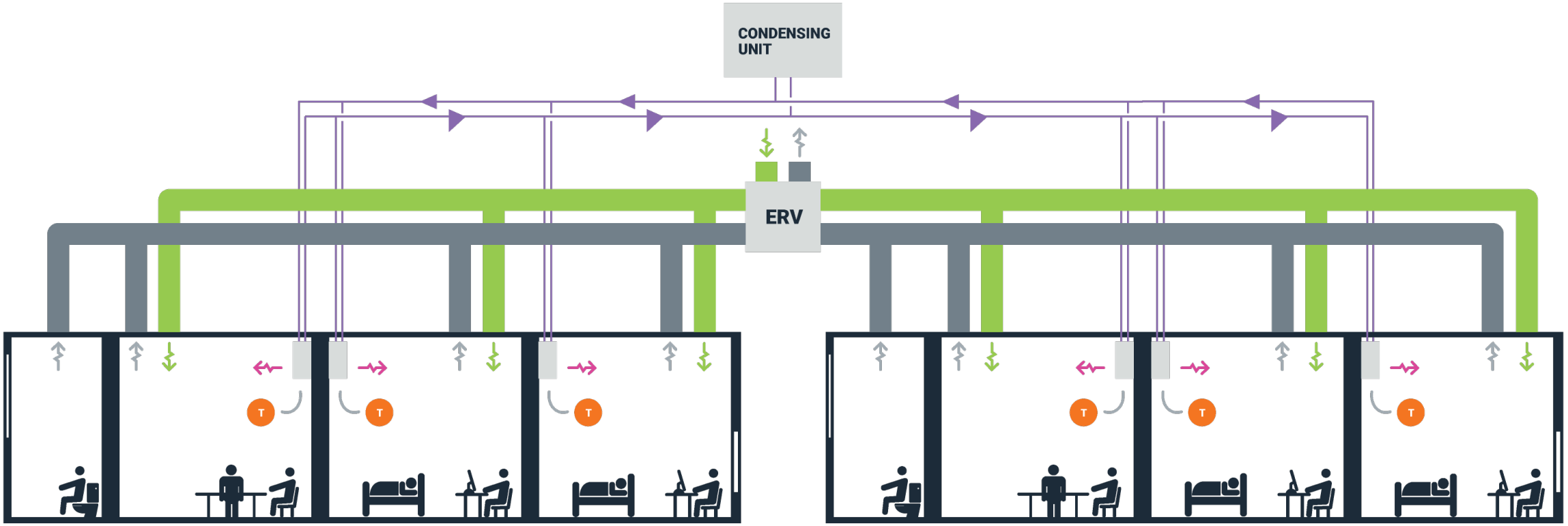
Windows

Average SHGC:	**0.49**	
Average solar reduction factor heating:	**0.37**	
Average solar reduction factor cooling:	**0.34**	
Average U-value:	**0.167**	Btu/hr ft² °F
Total glazing area:	**334.6**	ft²
Total window area:	**495.8**	ft²

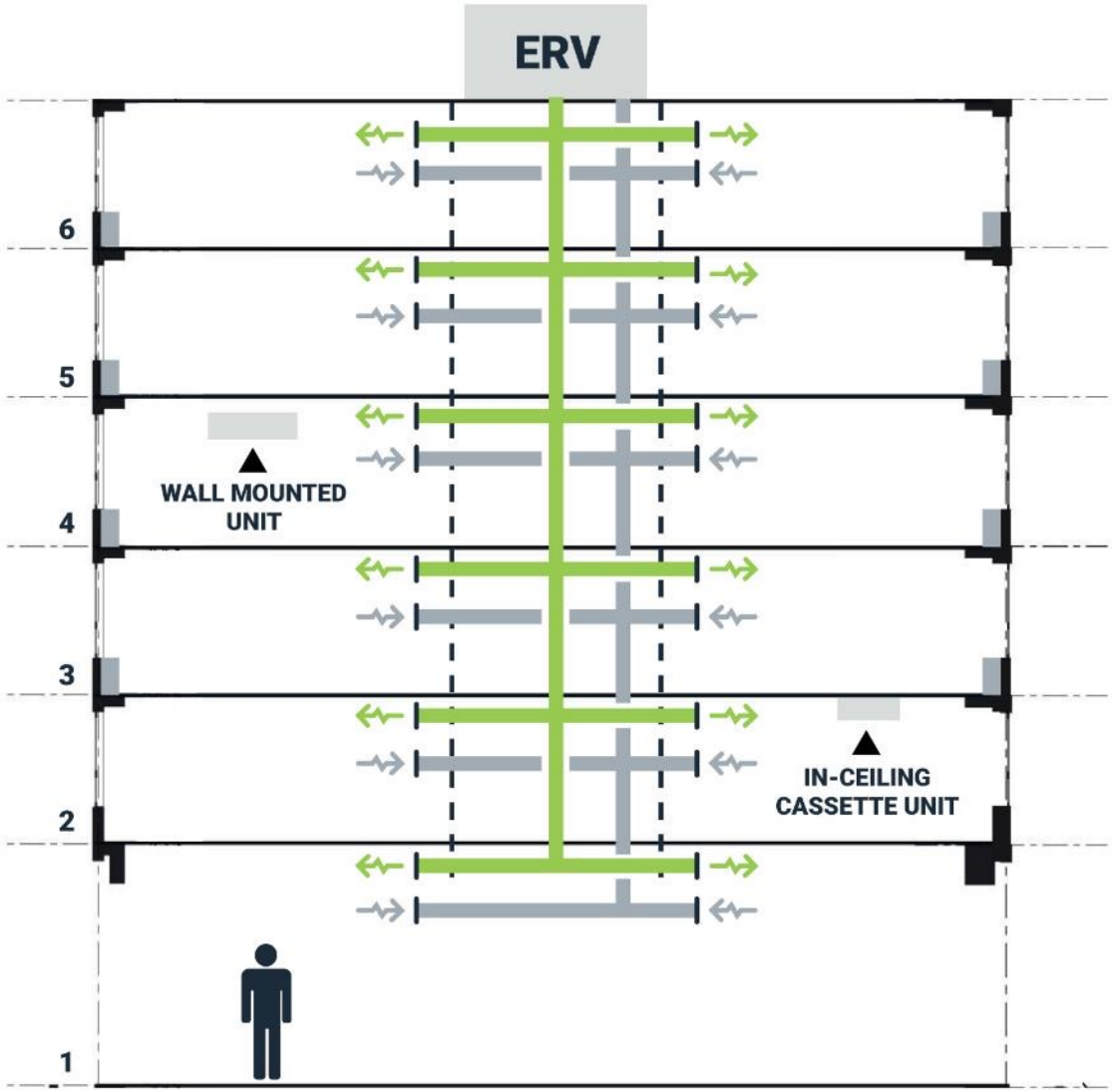


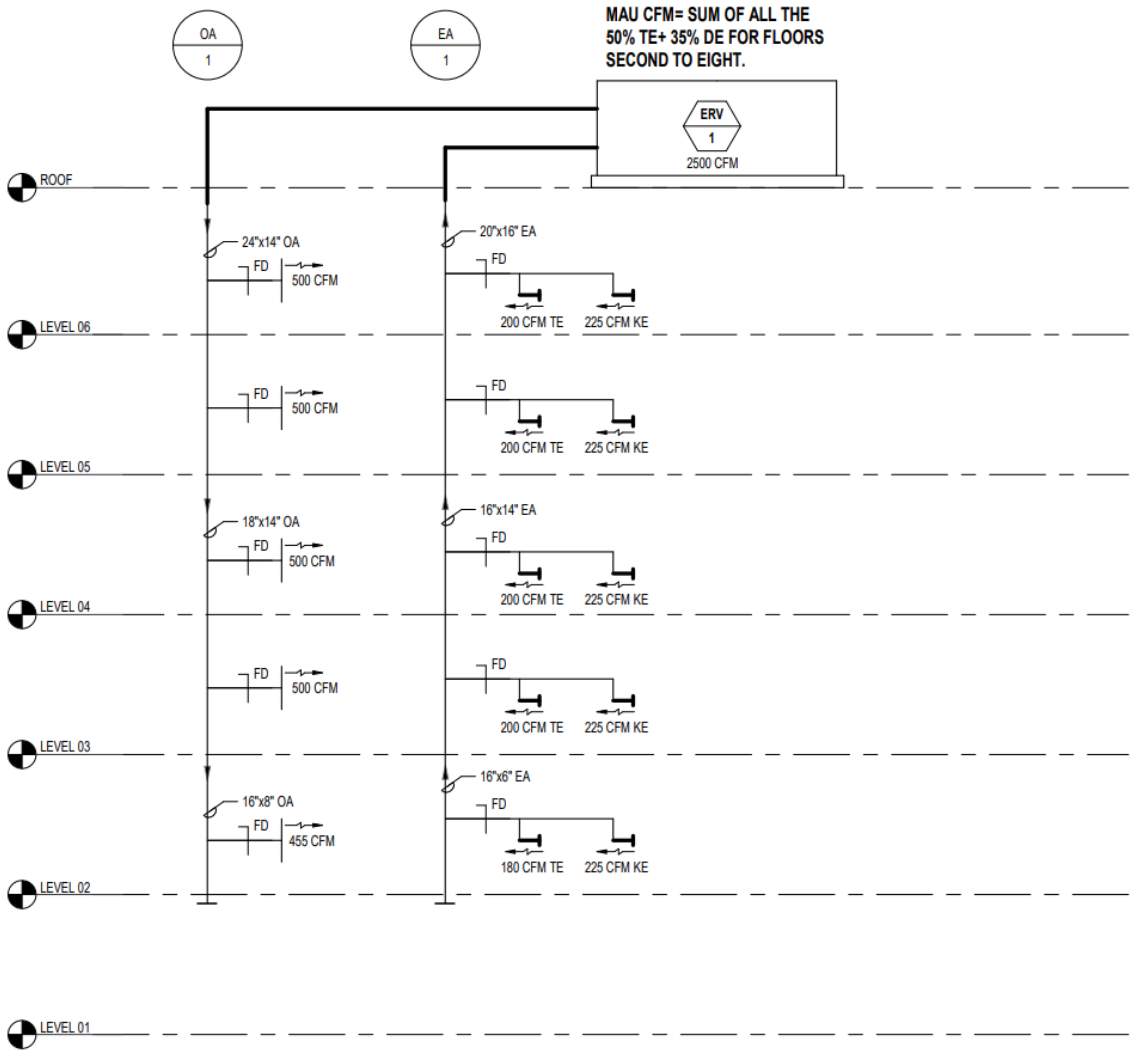
One of our recently certified single family homes

HVAC: AS DESIGNED

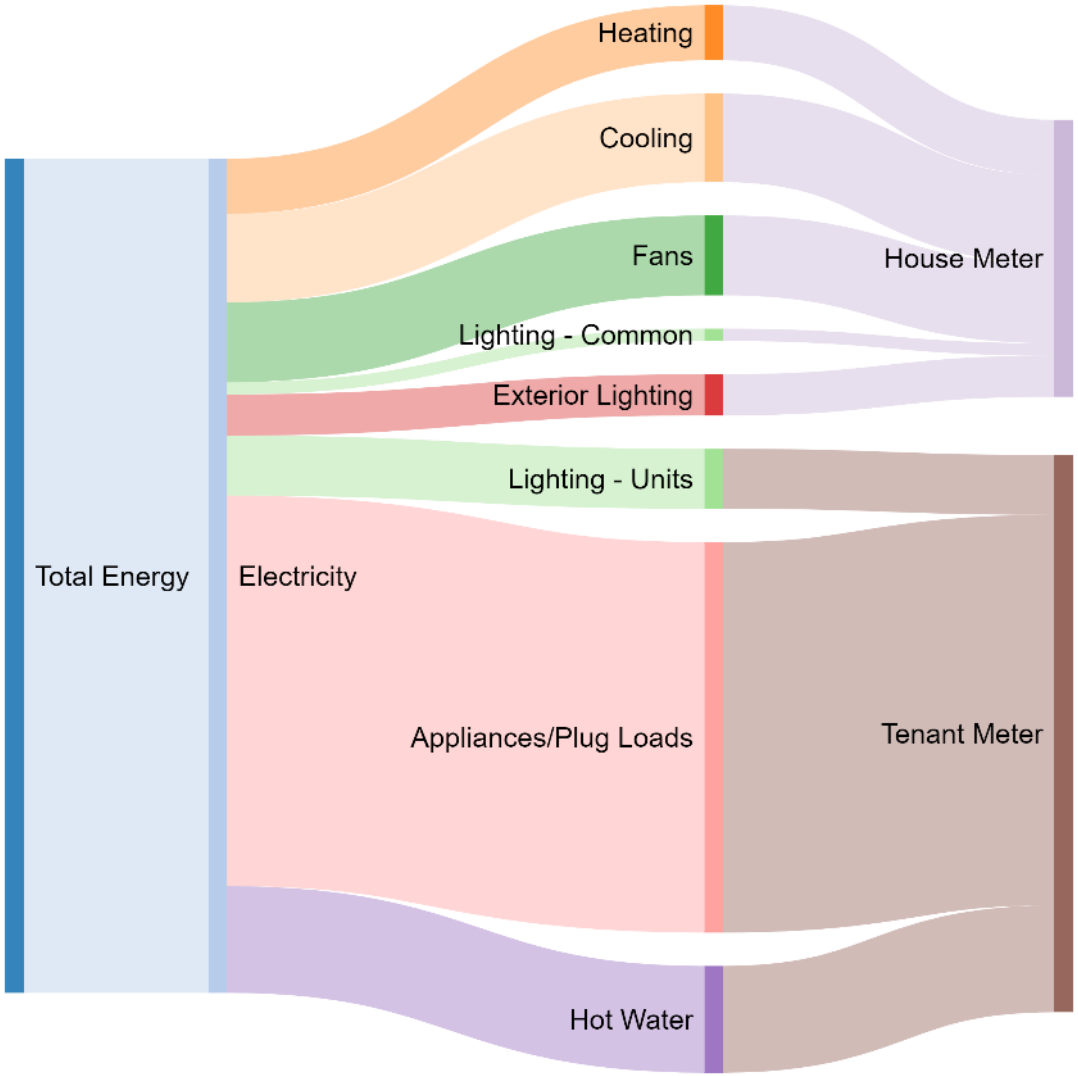


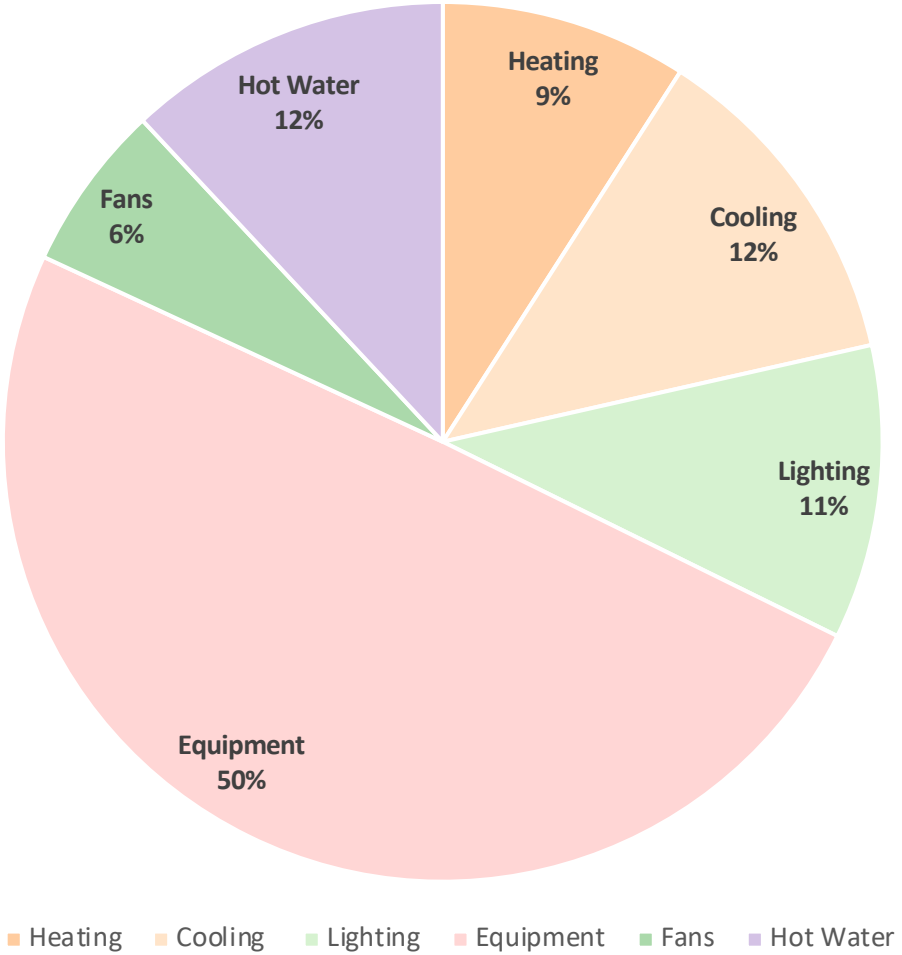
HVAC: AS DESIGNED





PREDICTED ENERGY BY END-USE (SD vs. CD)





Thanks!
Questions?

Tom Bassett-Dilley AIA, CPHC

Tom Bassett-Dilley Architects, Ltd. (TBDA, CPHC on the project but not design architect)

Scott Farbman, CPHC (dbHMS, MEP Engineers)

BUILDING INFORMATION	
Category:	Residential
Status:	In planning
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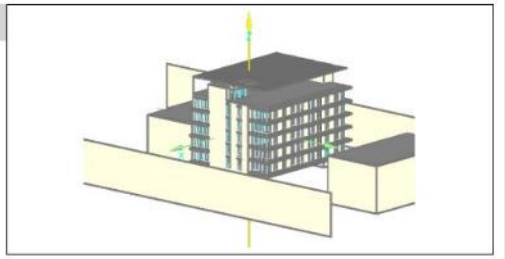

TBDA TOM BASSETT-DILLEY ARCHITECTS

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