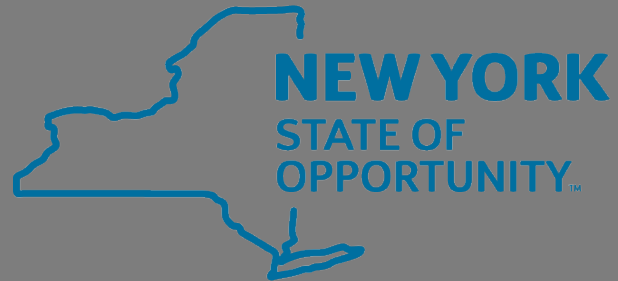


# welcome.



**NYSERDA**



# ENGINE 16

223 EAST 25TH STREET  
MANHATTAN, NY



MICHAEL INGUI, RA  
Certified Passive House Designer

AMY FAILLA, RA  
Certified Passive House Designer

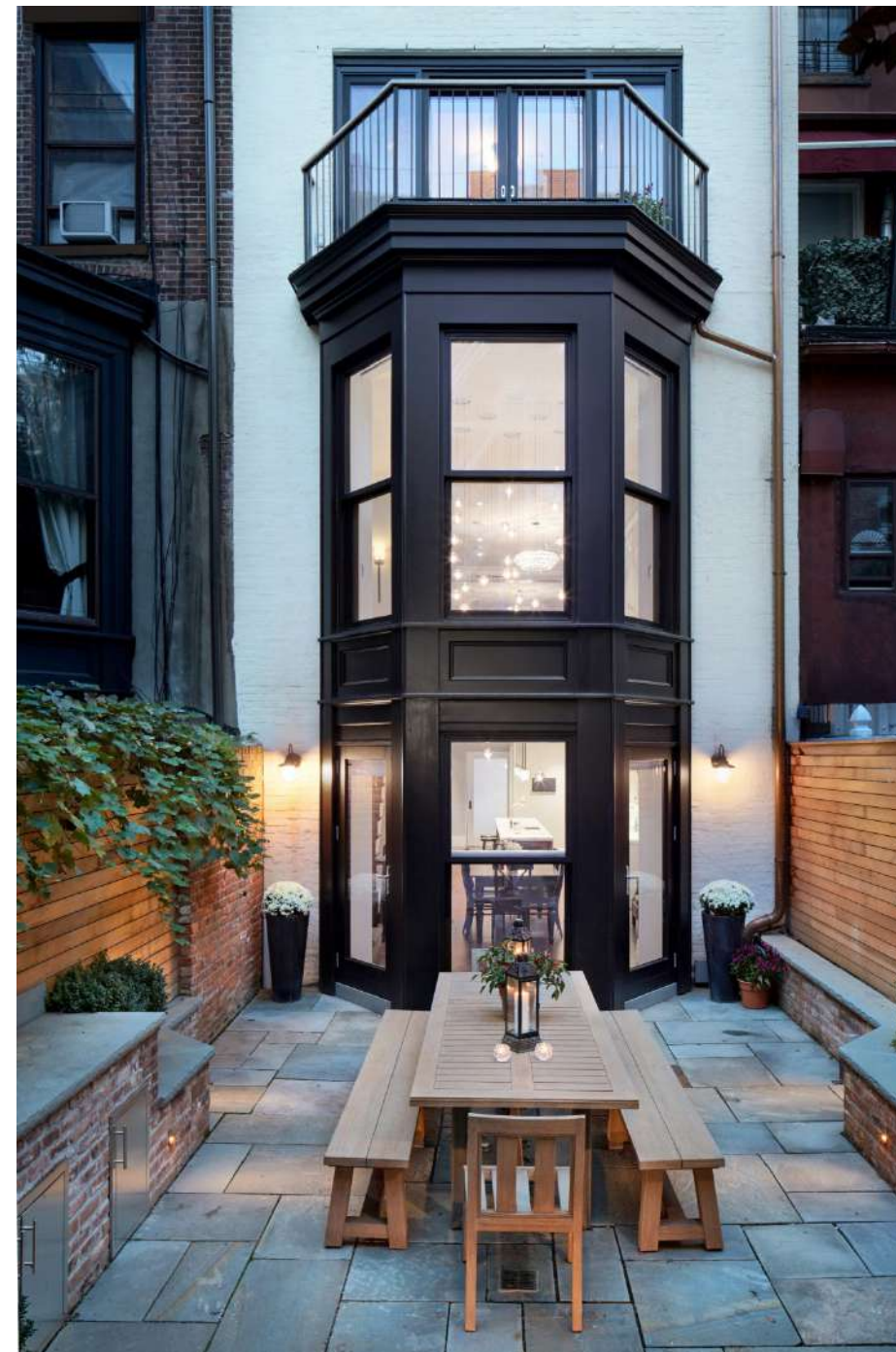
- . 8 PASSIVE PROJECTS COMPLETED
  - . 7 UNDER CONSTRUCTION
  - . 11 DIFFERENT CONTRACTORS
  - . 7 BAXT INGUI ARCHITECTS TEAMS
  - . 3 PASSIVE HOUSE CONSULTANTS
- (1) SYSTEMATIC APPROACH*



UPPER WEST SIDE,  
MANHATTAN NYC



BROOKLYN HEIGHTS,  
BROOKLYN NYC



BROOKLYN HEIGHTS,  
BROOKLYN NYC

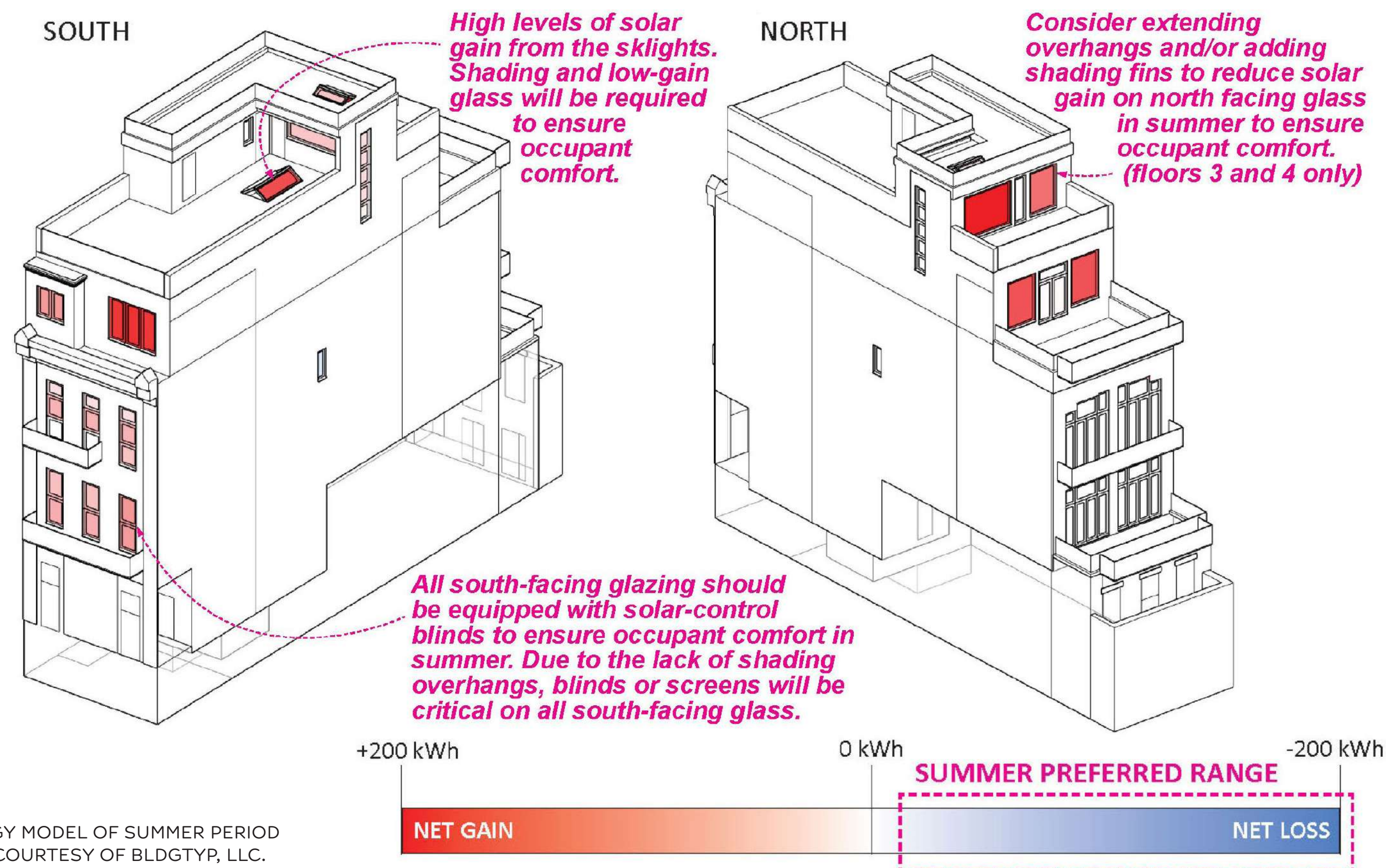


BROOKLYN HEIGHTS,  
BROOKLYN NYC

# A SYSTEMATIC APPROACH

## BAXT INGUI'S SYSTEMATIC APPROACH INCLUDES THESE CRITICAL STEPS:

1. Educating the client on passive house in an effective way.
2. Involving the passive house consultant before or during schematic design.
3. Start the certification process with your certification body early and harness their feedback as early as possible.
4. Select and involve a contractor as early as possible, and get them and their team certified/trained.
5. Hold weekly meetings.
6. Use the blower door as a tool.
7. Openly share knowledge & receive feedback with the community.



# ENGINE 16



1.



2.

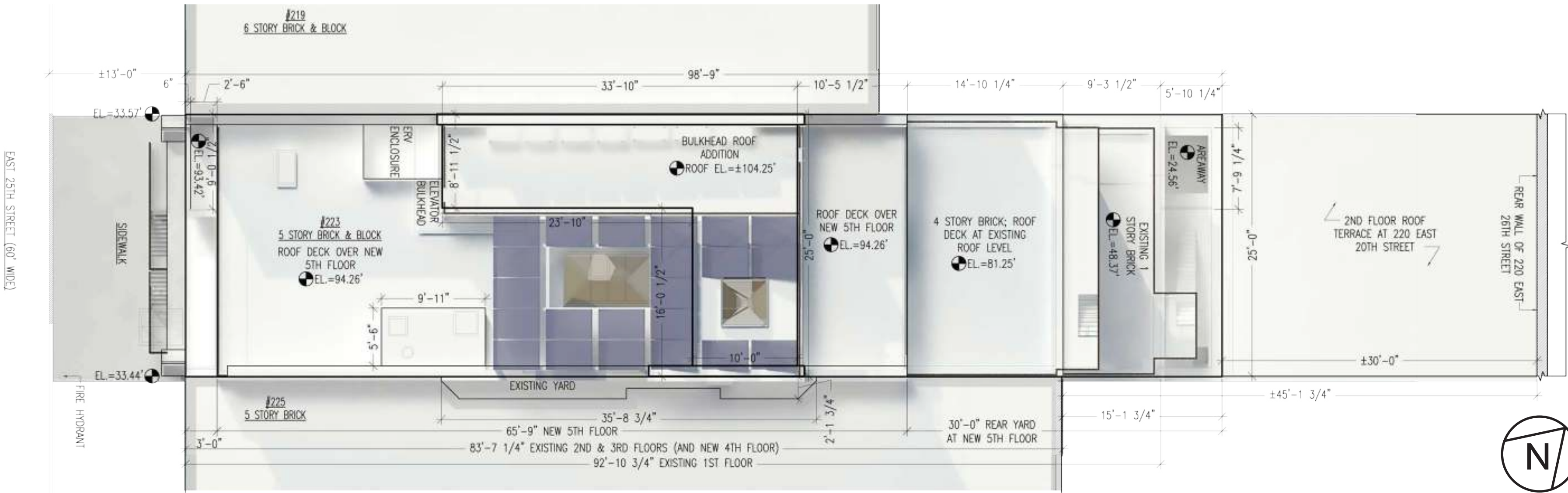


3.

1. PHOTO: CIRCA 1950.  
2. PHOTO: CIRCA 1925.  
3. RENDERING OF PROPOSED FRONT FACADE.  
CREDIT: PERSPECTIVE ARTS

# SITE PLAN / CONTEXT

1.



2.



## NOTES

1. PLOT PLAN (PROPOSED)
2. SITE PLAN/ CONTEXT

## LEGEND

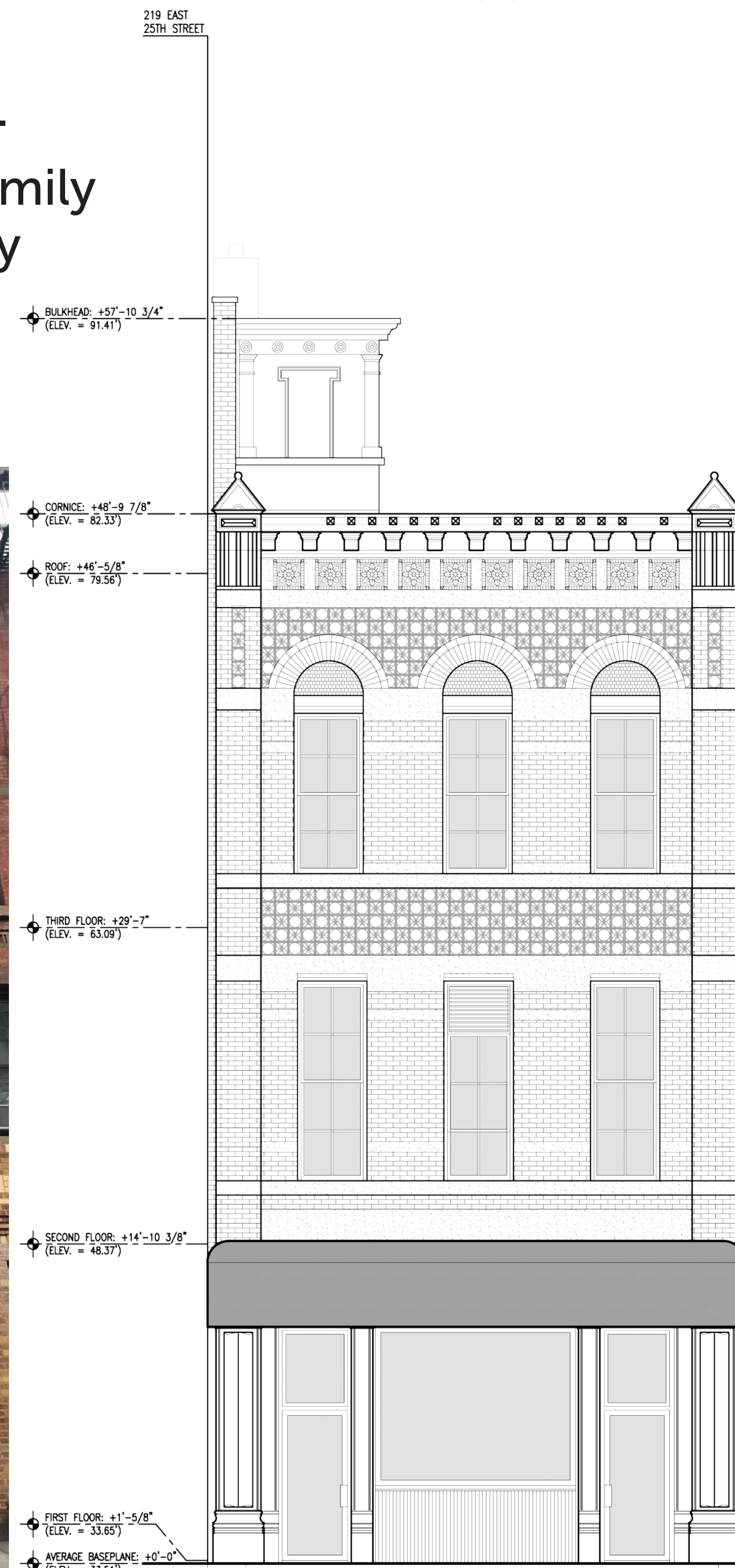
- 223 E. 25TH
- SUBWAY STOP
- BUS STOP
- CITIBIKE STOP
- RESTAURANT/BAR/ ENTERTAINMENT (WITHIN HIGHLIGHTED AREA)
- PARK
- PUBLIC FACILITIES + INSTITUTIONS (INCLUDING NYU, BARUCH COLLEGE, SVA)

# FRONT FACADE ELEVATIONS

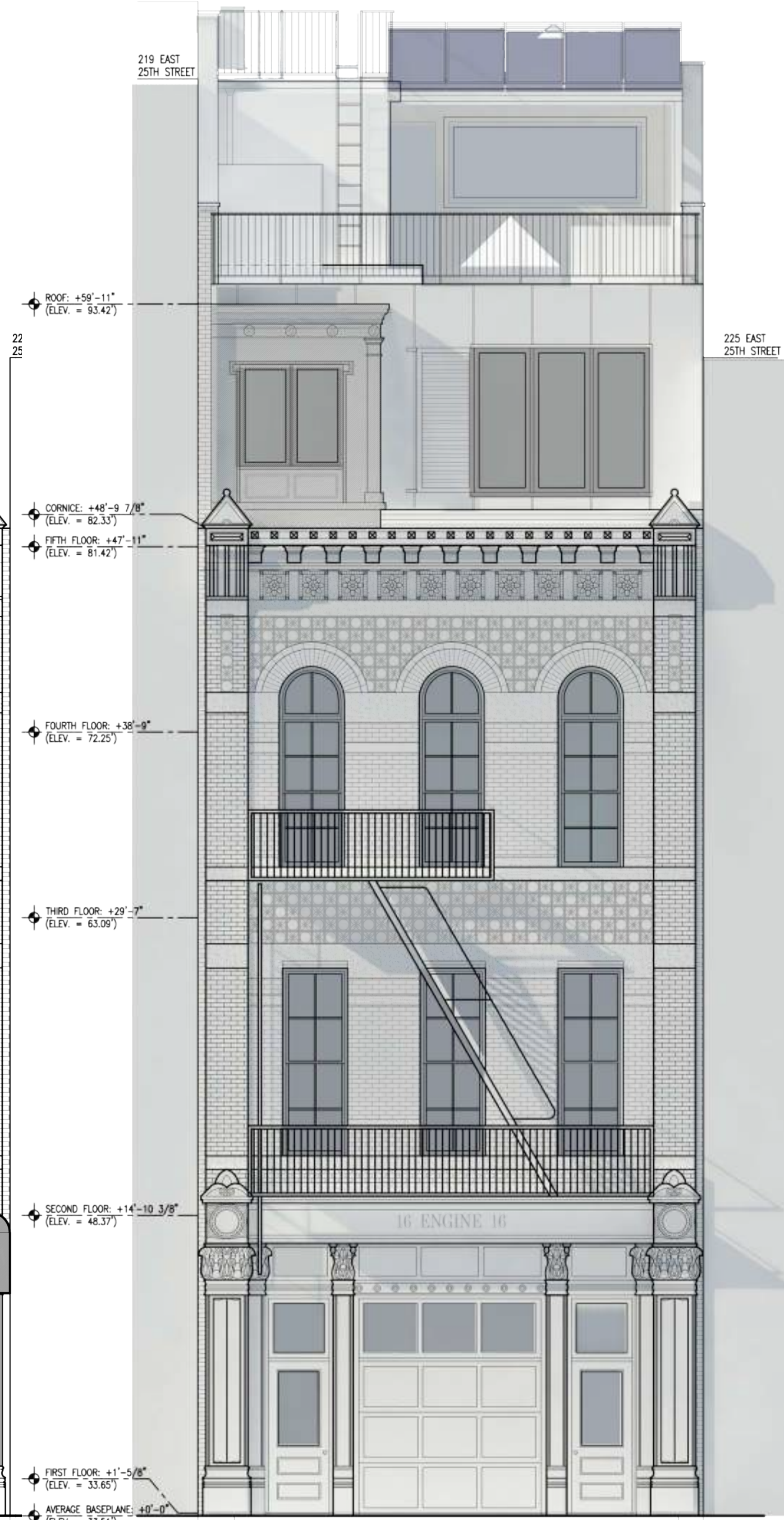
- Decommissioned firehouse building, converted into a church in 1974.
- Ground floor was used for religious facilities while upper floors fell into disrepair.
- New owners purchased in 2018.
- Adaptive reuse project as a 4-family residence with a community facility on the ground floor.



1.



2.



3.

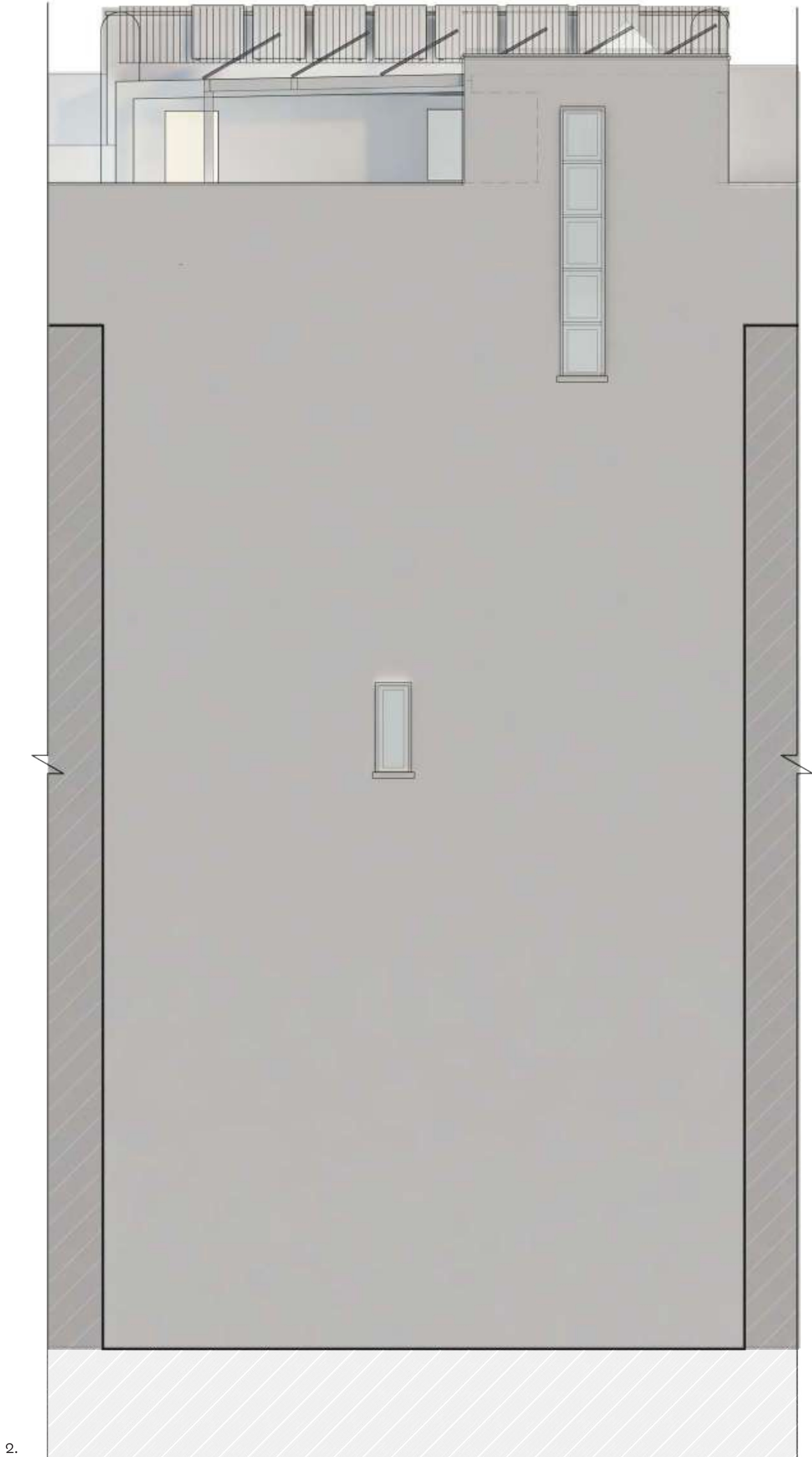
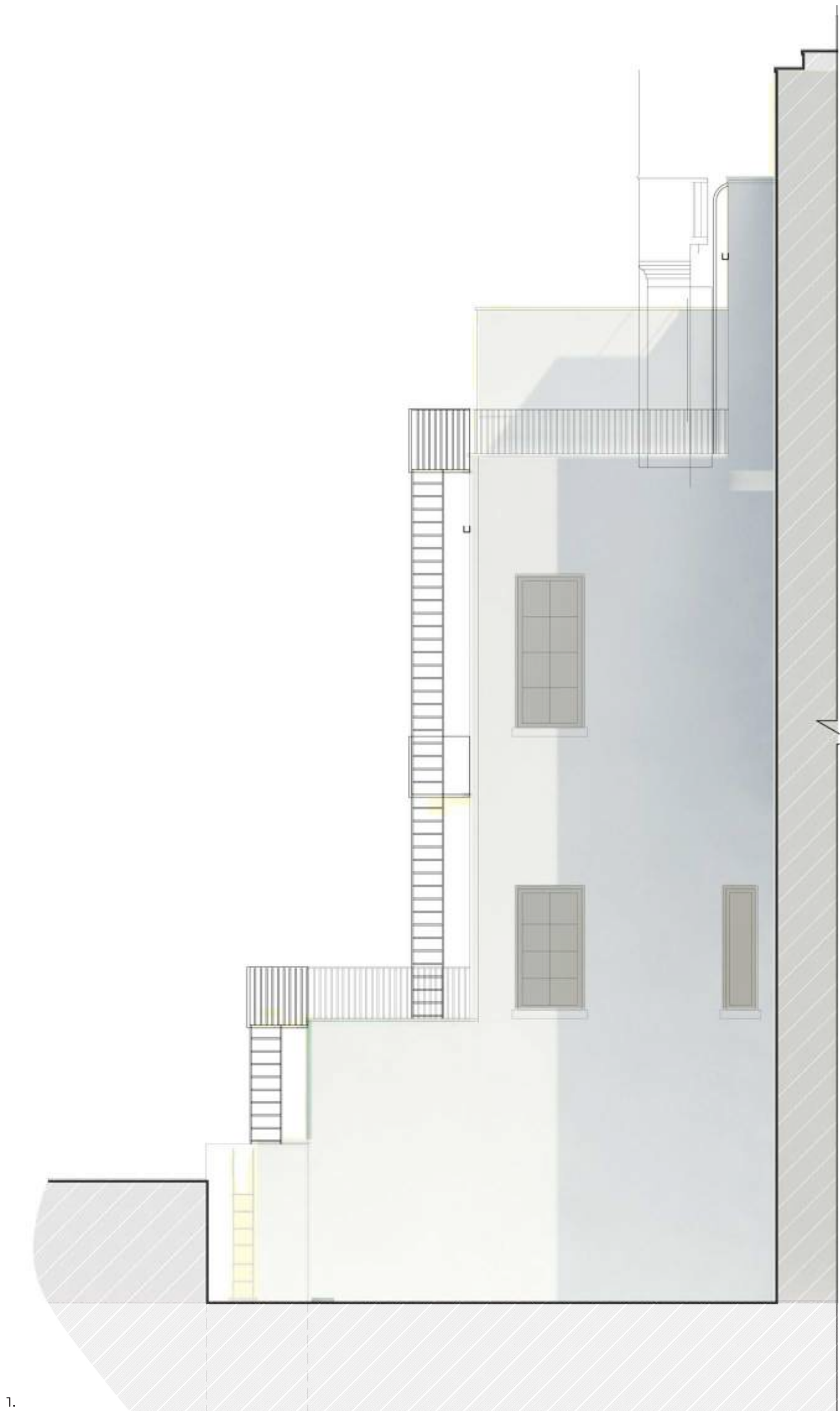
1. EXISTING FRONT FACADE PHOTO (SOUTH FACING)
2. EXISTING FRONT FACADE (SOUTH FACING)
3. PROPOSED FRONT FACADE (SOUTH FACING)

# REAR FACADE ELEVATIONS



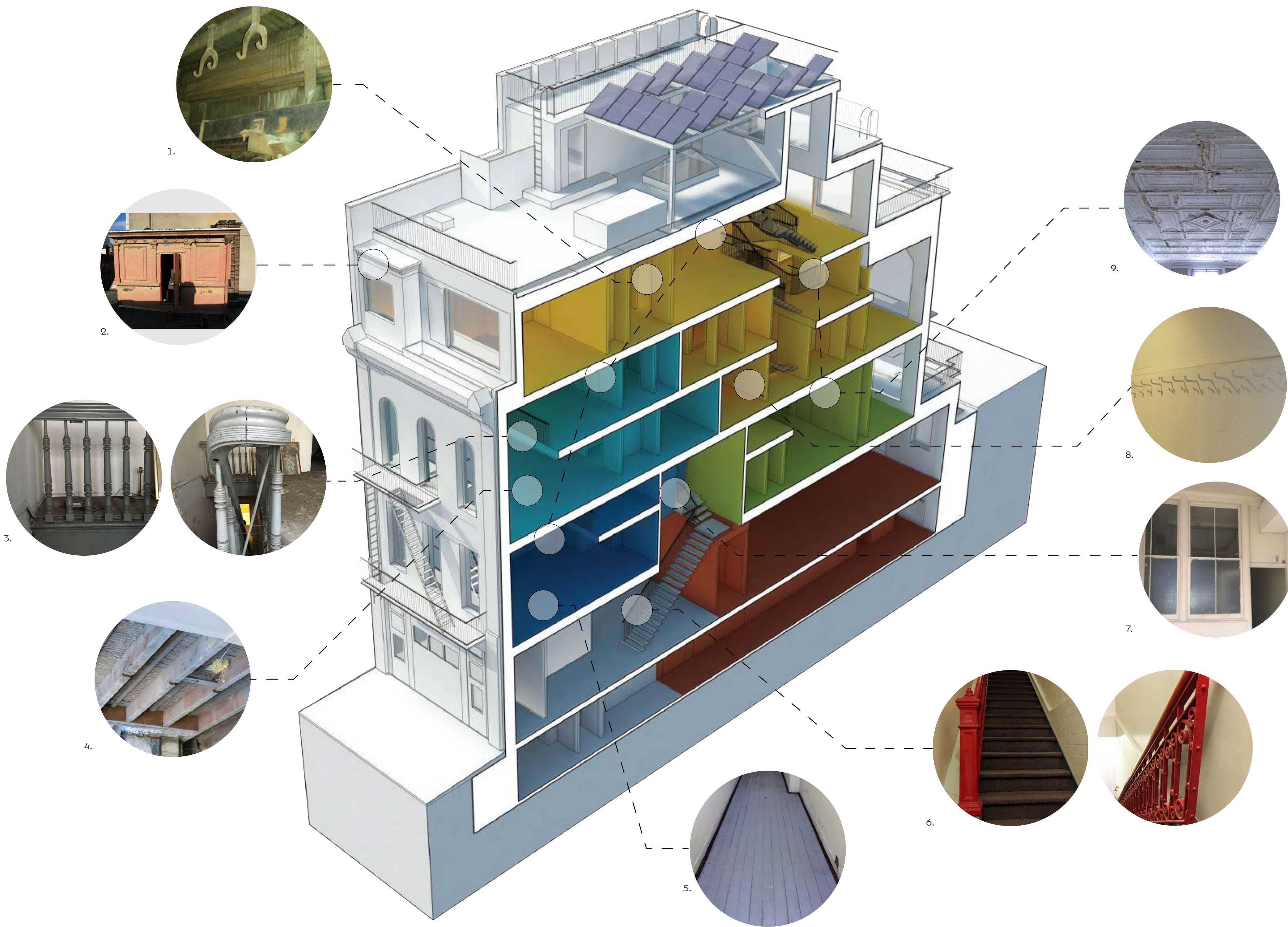
1. EXISTING REAR FACADE PHOTOS (NORTH FACING)
2. EXISTING REAR FACADE (NORTH FACING)
3. PROPOSED REAR FACADE (NORTH FACING)

# SIDE FACADE ELEVATIONS



1. WEST REAR FACADE  
2. EAST FACADE AT  
AIR SHAFT

# HISTORIC + RESTORED ELEMENTS



- 1. HISTORIC FIREHOUSE HOSE HOOKS
- 2. FRONT ADDITION EMULATES HISTORIC CAST IRON FIREHOUSE SHED
- 3. HISTORIC WOOD RAILING
- 4. REPURPOSED WOOD FLOOR JOISTS
- 5. RESTORED WOOD FLOORING
- 6. HISTORIC STEEL RAILING
- 7. HISTORIC WINDOWS
- 8. HISTORIC FIREHOUSE HOOKS
- 9. RESTORED TIN CEILING

# EXISTING CONDITIONS - FACADE DETAILS



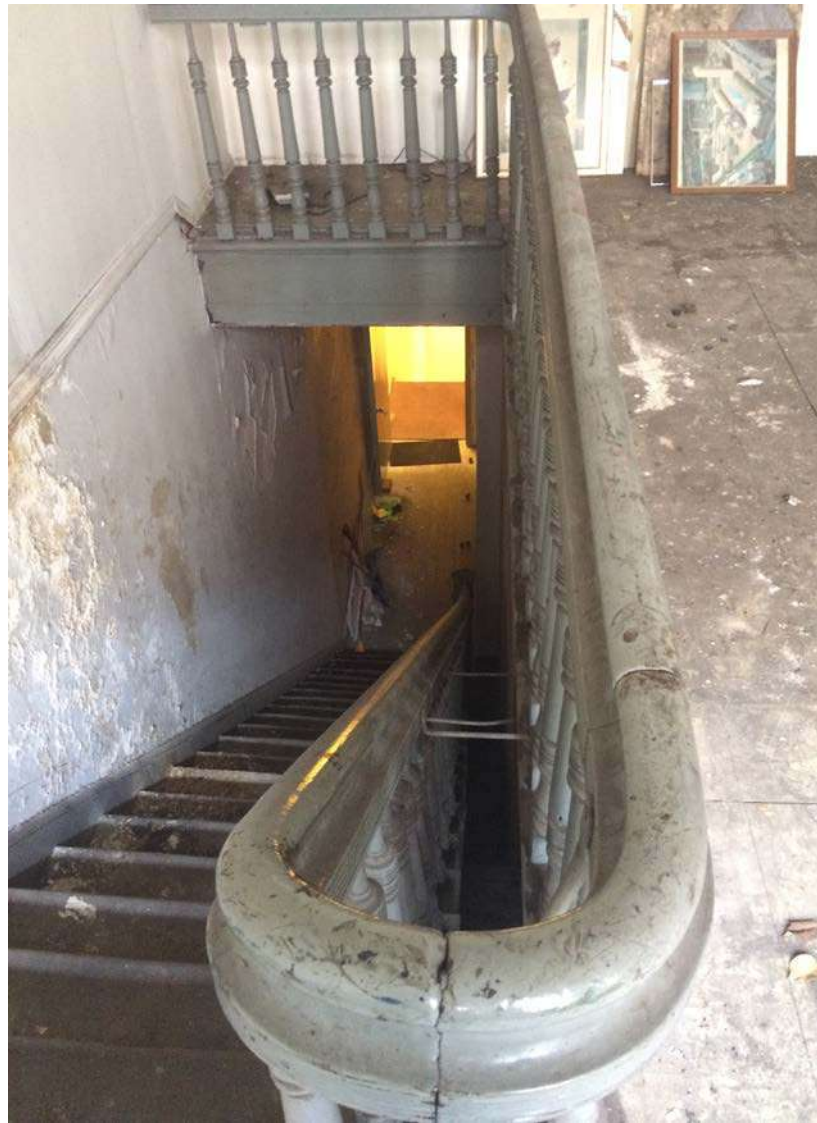
# EXISTING CONDITIONS - 1ST FLOOR CHURCH



# EXISTING CONDITIONS - 2ND FLOOR



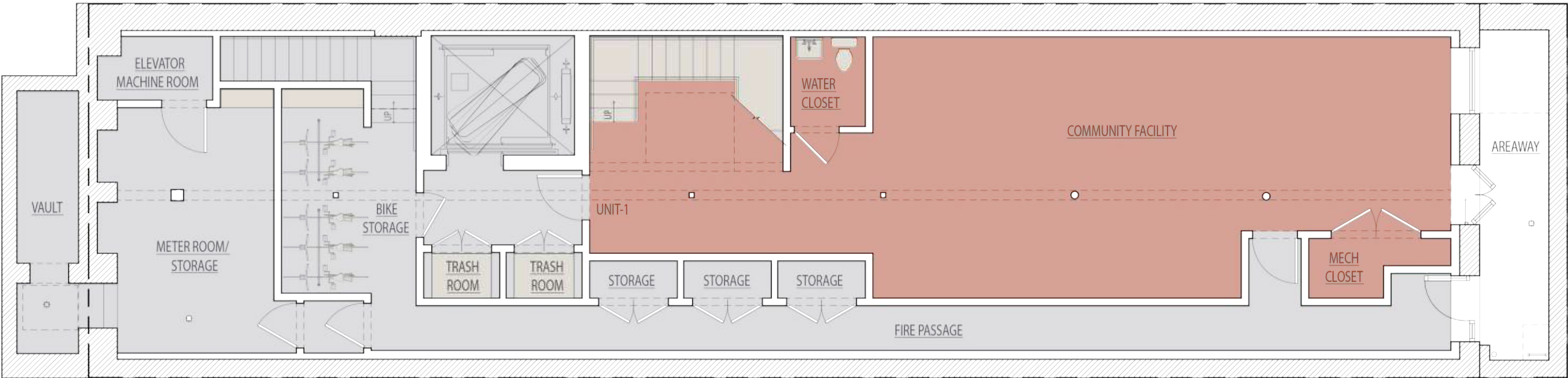
# EXISTING CONDITIONS - 3RD FLOOR



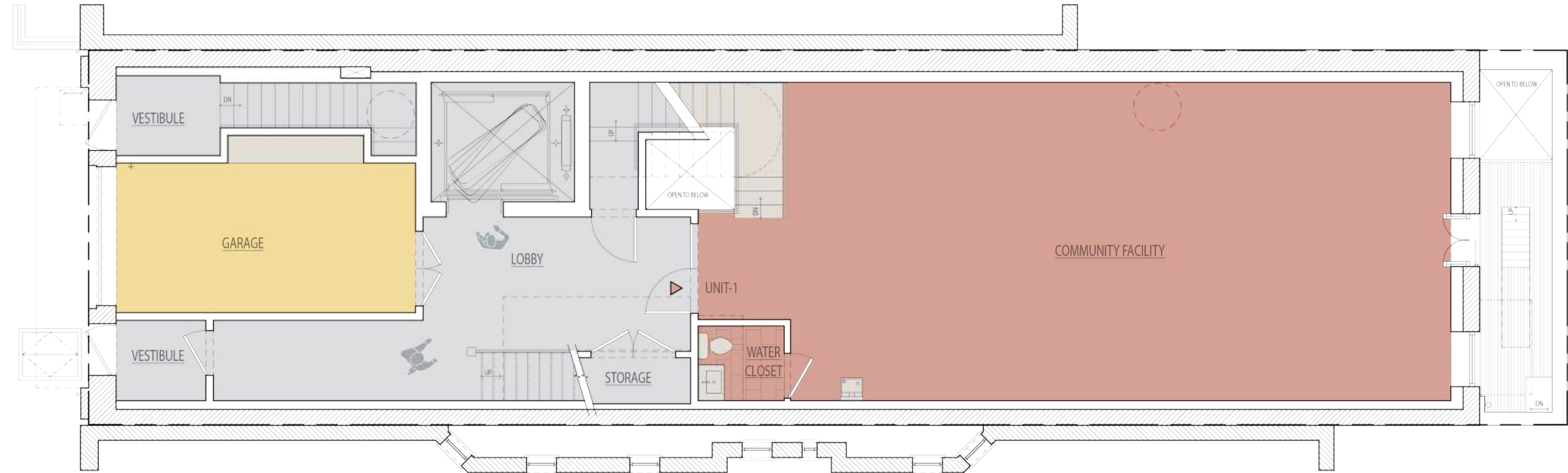
# EXISTING CONDITIONS - FIRE POLE OPENING



# CELLAR + 1ST FLOOR PLANS: COMMUNITY SPACE



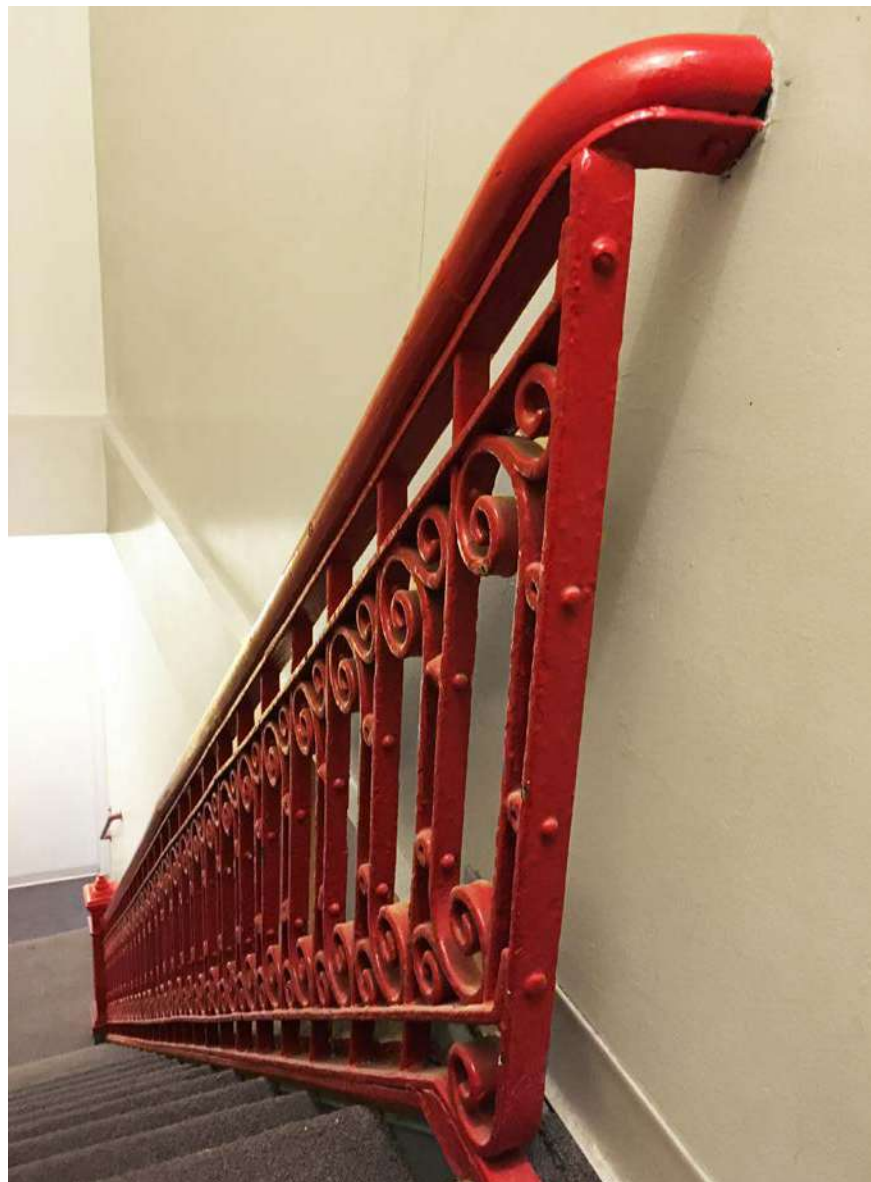
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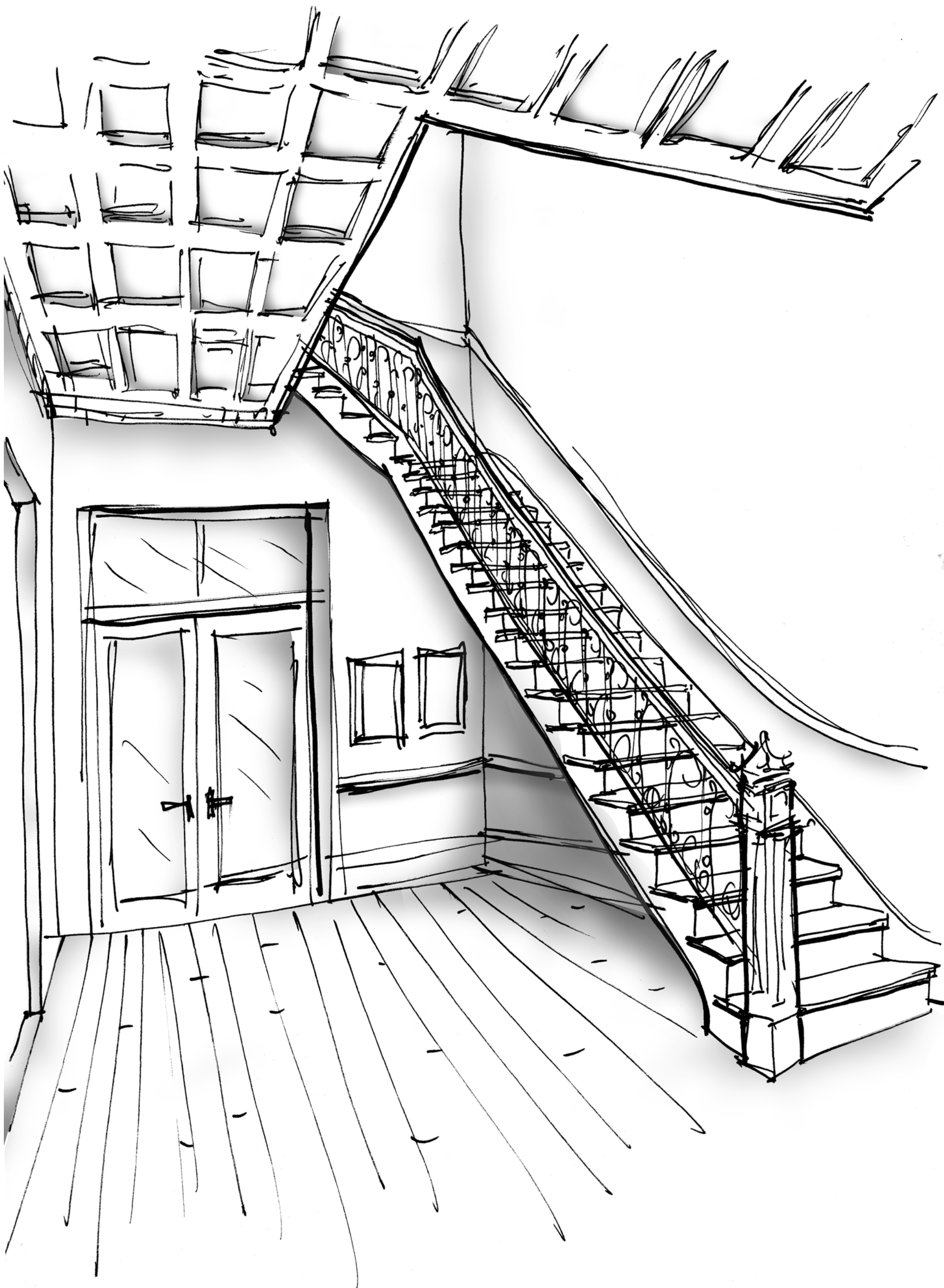
2.

- 1. CELLAR PLAN
- 2. 1ST FLOOR PLAN
- 3. CELLAR COMMUNITY CENTER AREA = 1113SF
- 4. 1ST FL. COMMUNITY CENTER AREA = 1400SF

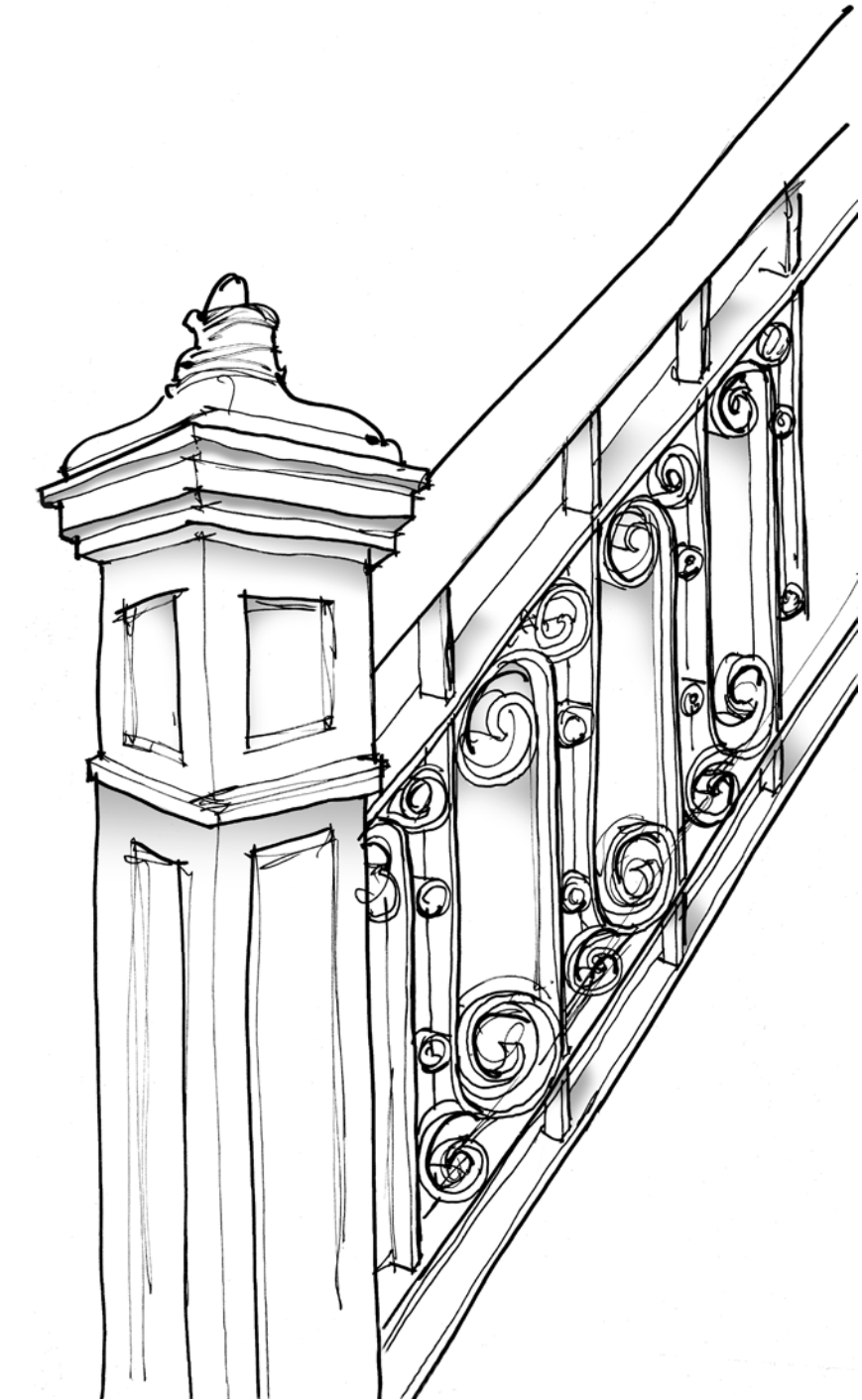




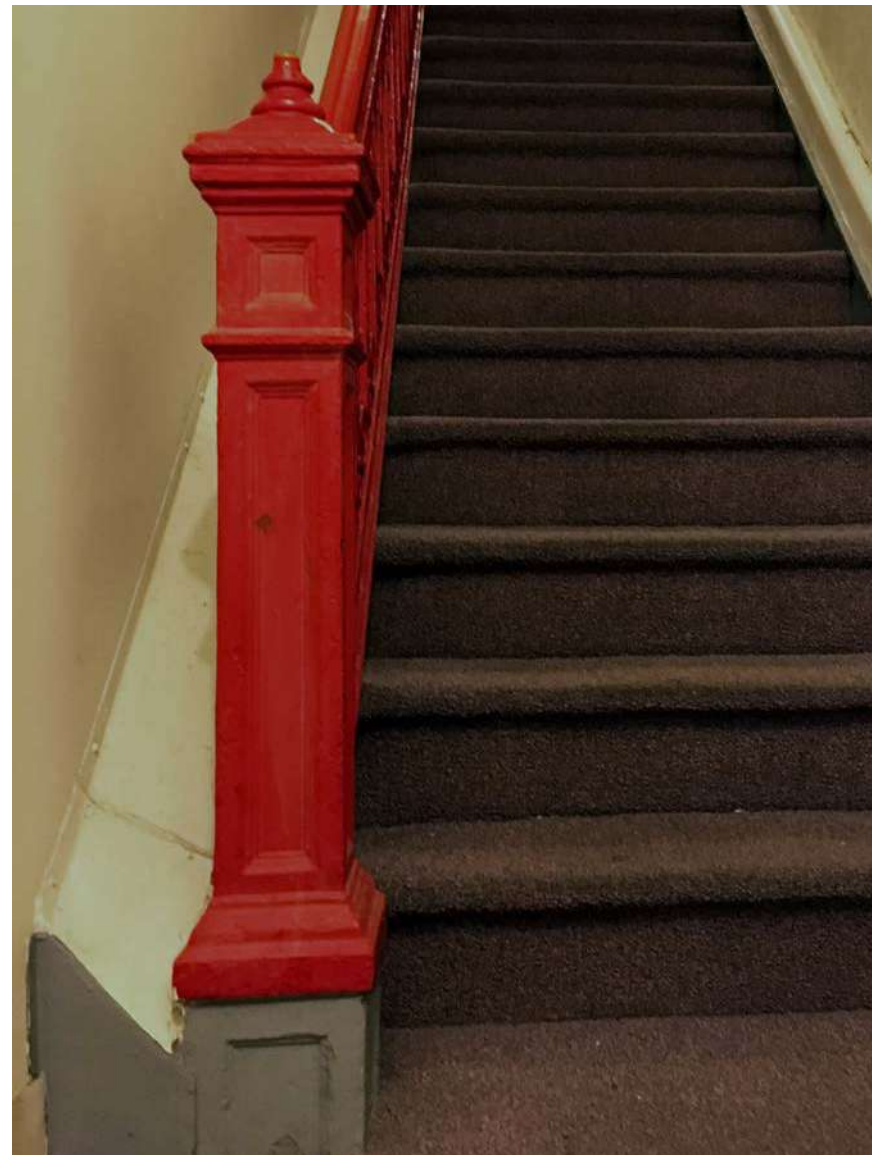
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2.



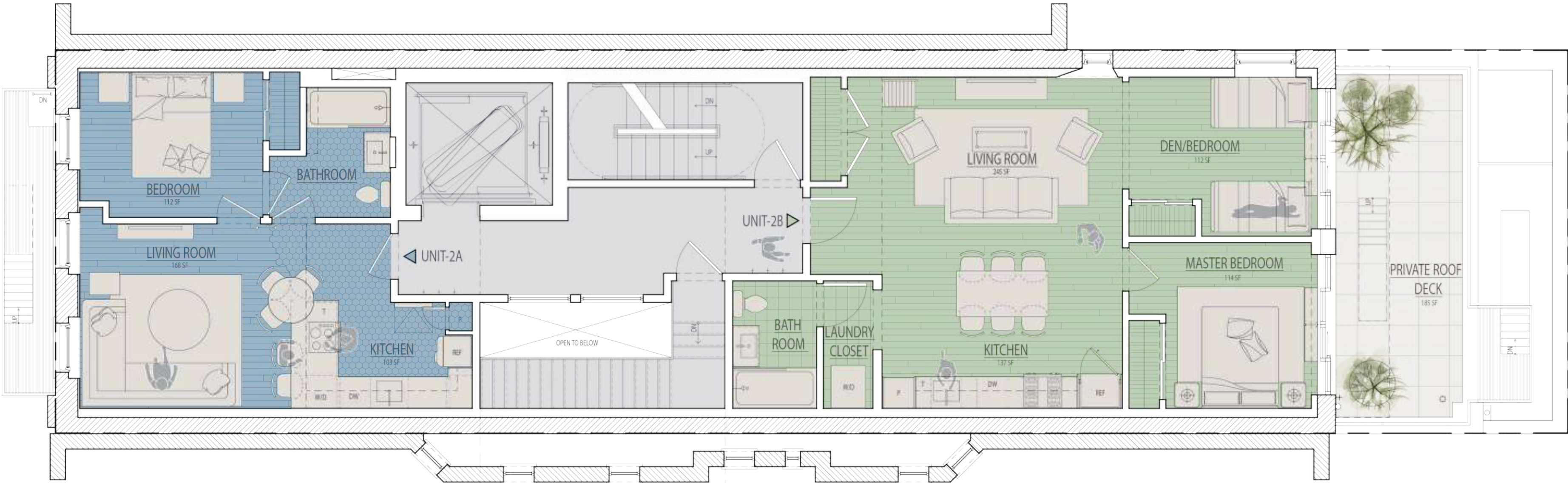
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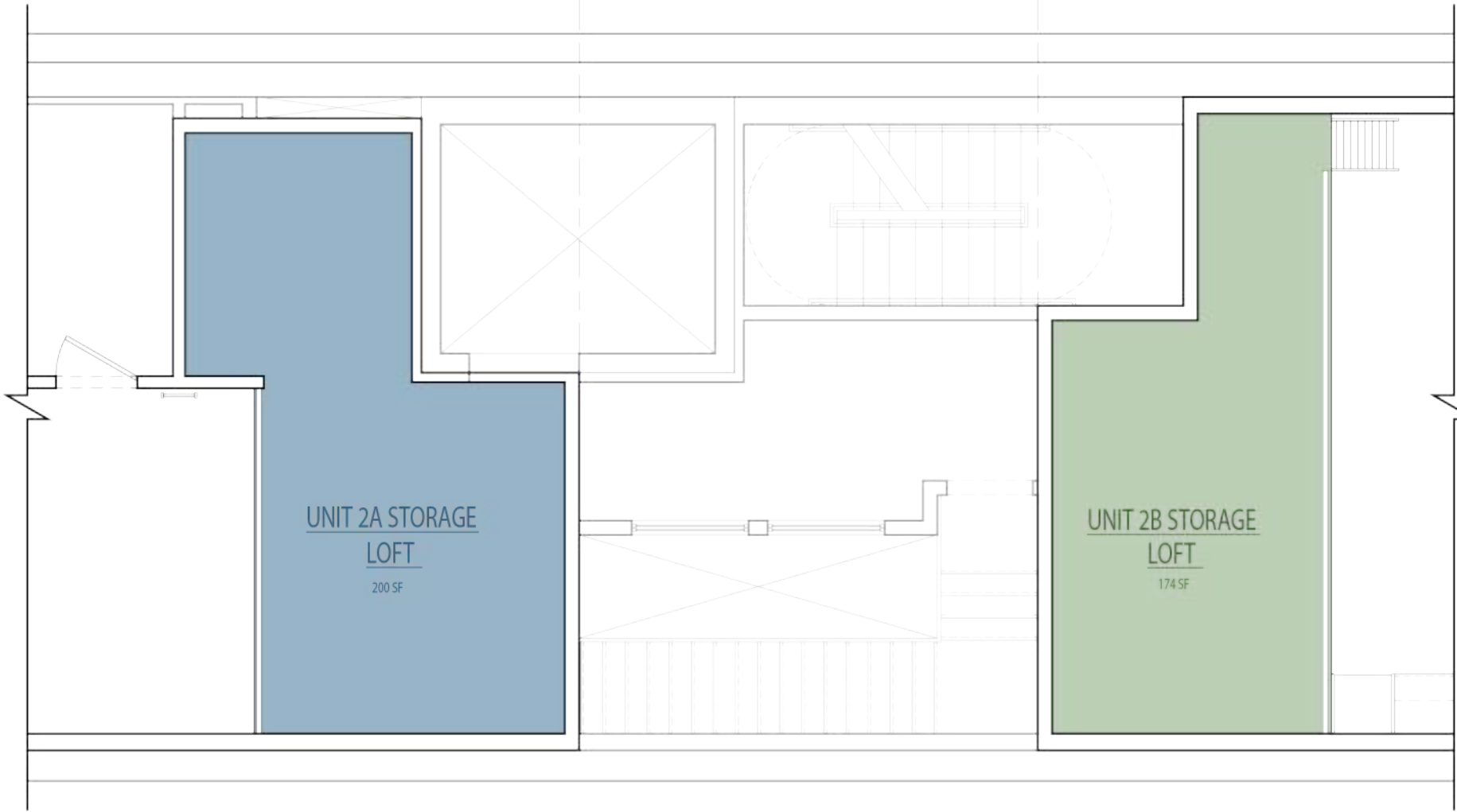
1.

- 1. EXISTING STEEL RAILING AT ENTRY
- 2. PROPOSED ENTRY STAIR W/ RESTORED RAILING
- 3. RESTORED STEEL RAILING

# 2ND FLOOR + LOFT PLANS: UNITS 2A + 2B

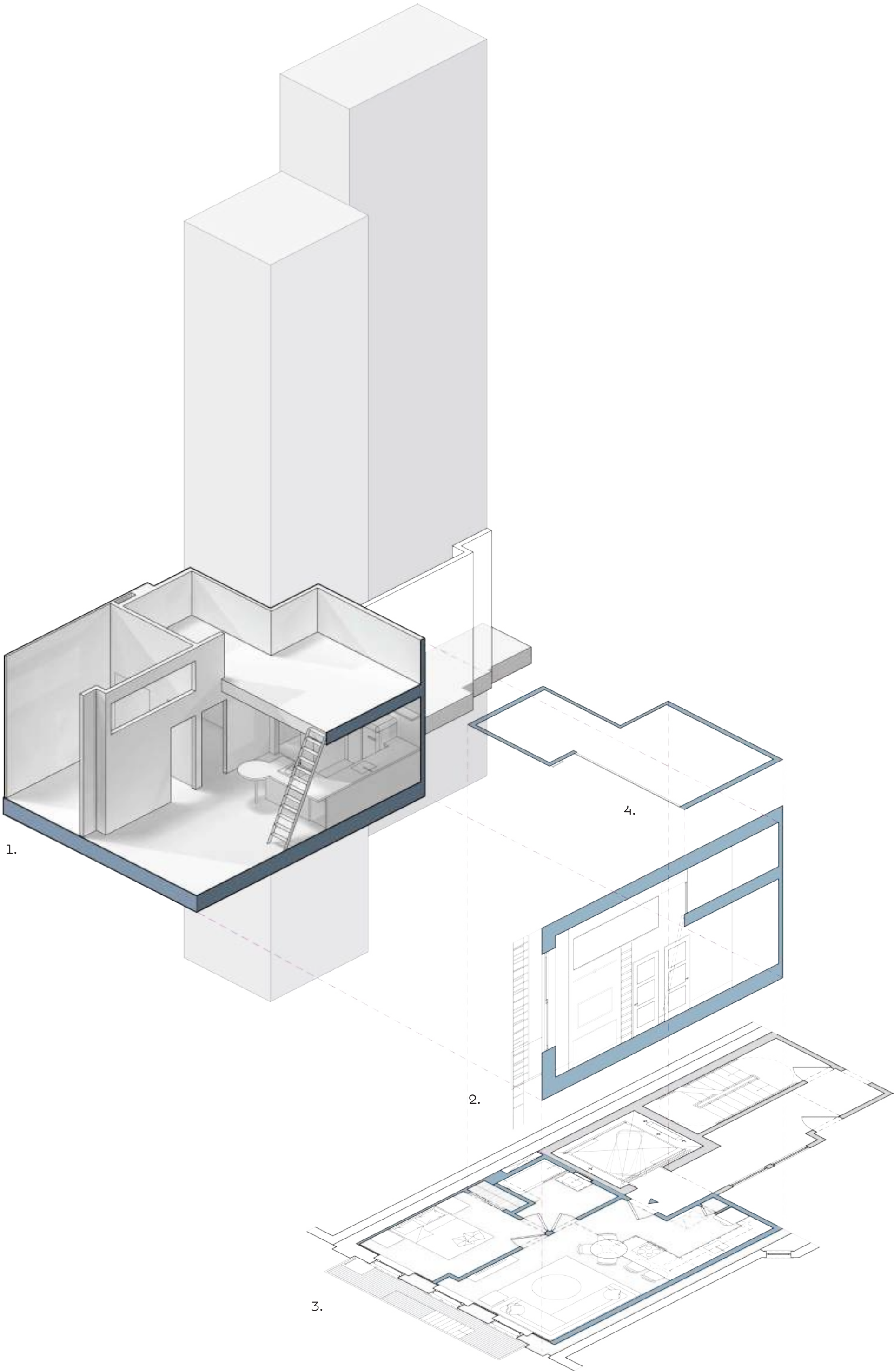


1.



2.

- 1. 2ND FLOOR:  
UNITS 2A + 2B
- 2. UNITS 2A + 2B  
STORAGE LOFTS



FEATURES

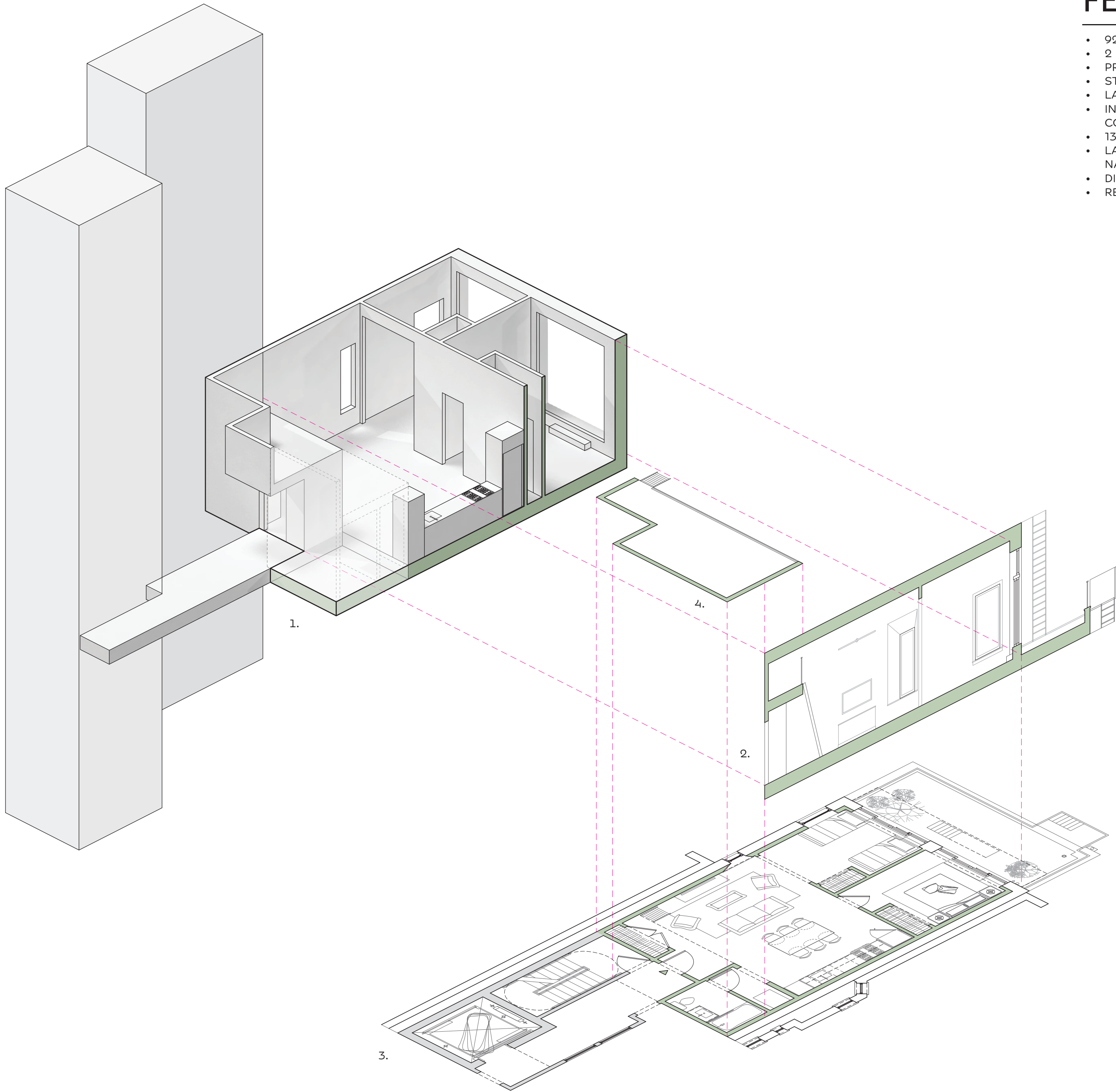
- 623 SF
- 1 BR, 1 BATH.
- IN-UNIT WASHER, DRYER, DISHWASHER
- INDIVIDUAL ROOM TEMPERATURE CONTROL
- 13' TALL CEILINGS
- LARGE WINDOWS/ABUNDANT NATURAL LIGHT
- RECLAIMED WOOD FLOORS
- MOBILE LADDER FOR LOFT ACCESS

NOTES

1. AXON
2. SECTION
3. 2NDFLOOR PLAN
4. LOFT FLOOR PLAN

FEATURES

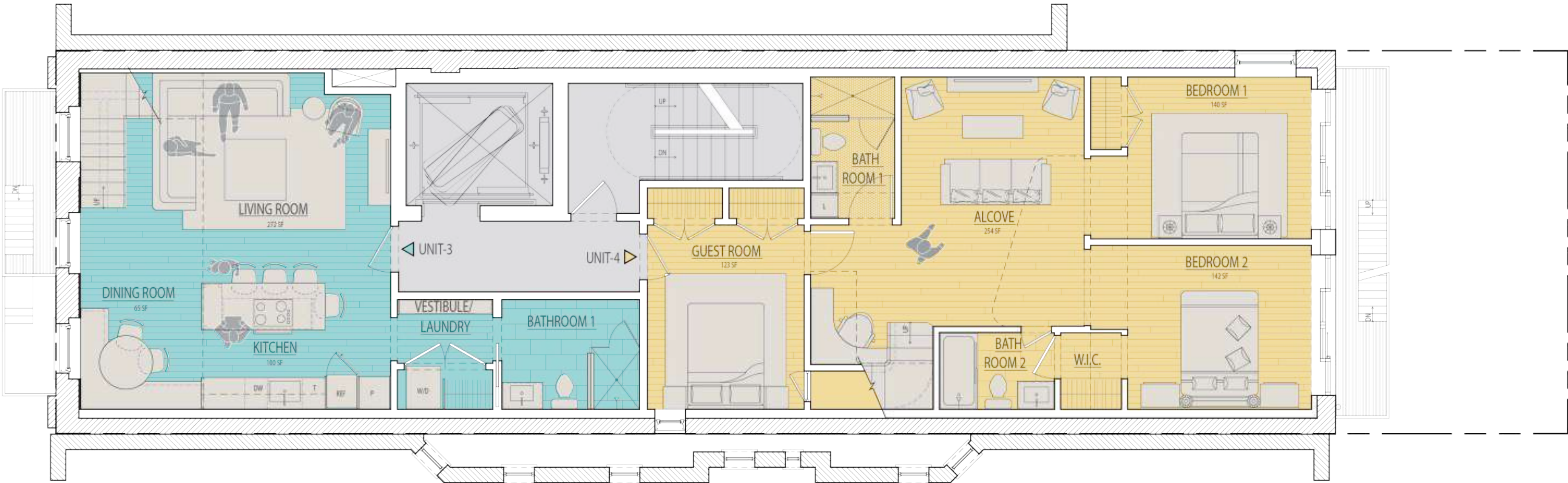
- 926 SF
- 2 BR, 1 BATH.
- PRIVATE ROOF DECK
- STORAGE LOFT
- LAUNDRY CLOSET
- INDIVIDUAL ROOM TEMPERATURE CONTROL
- 13' TALL CEILINGS
- LARGE WINDOWS/ABUNDANT NATURAL LIGHT
- DISHWASHER
- RECLAIMED WOOD FLOORS



NOTES

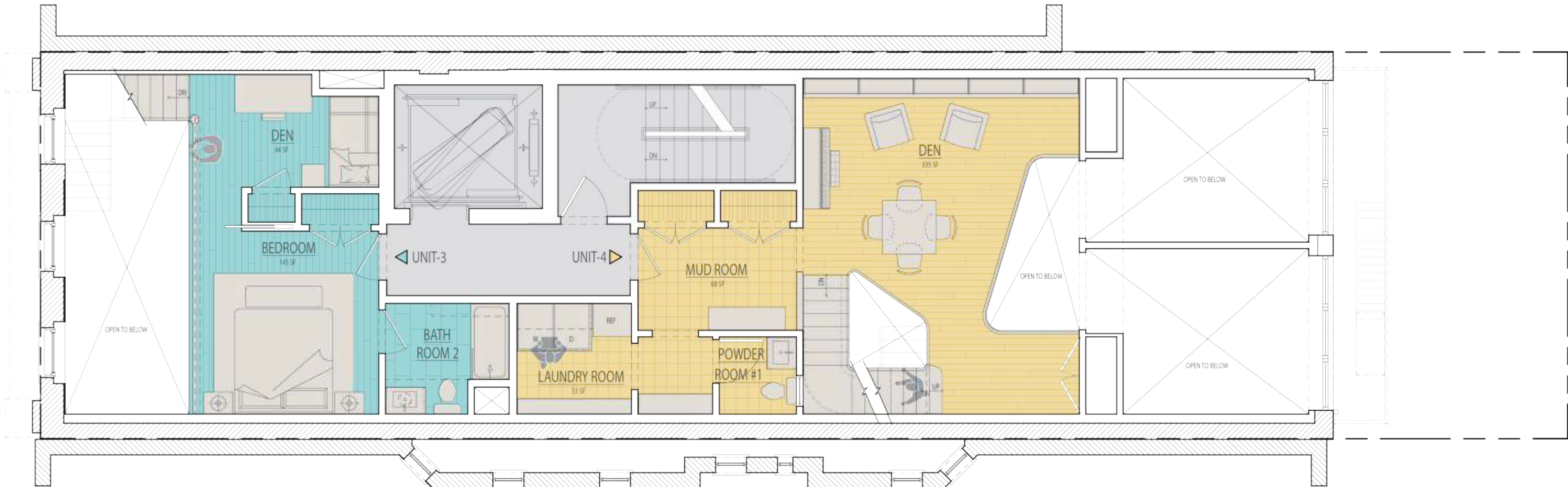
1. AXON
2. SECTION
3. 2NDFLOOR PLAN
4. LOFT FLOOR PLAN

# 3RD + 4TH FLOOR PLANS: UNITS 3 + 4



1.

- 1. 3RD FLOOR:  
UNITS 3 AND 4
- 2. 4TH FLOOR:  
UNITS 3 AND 4

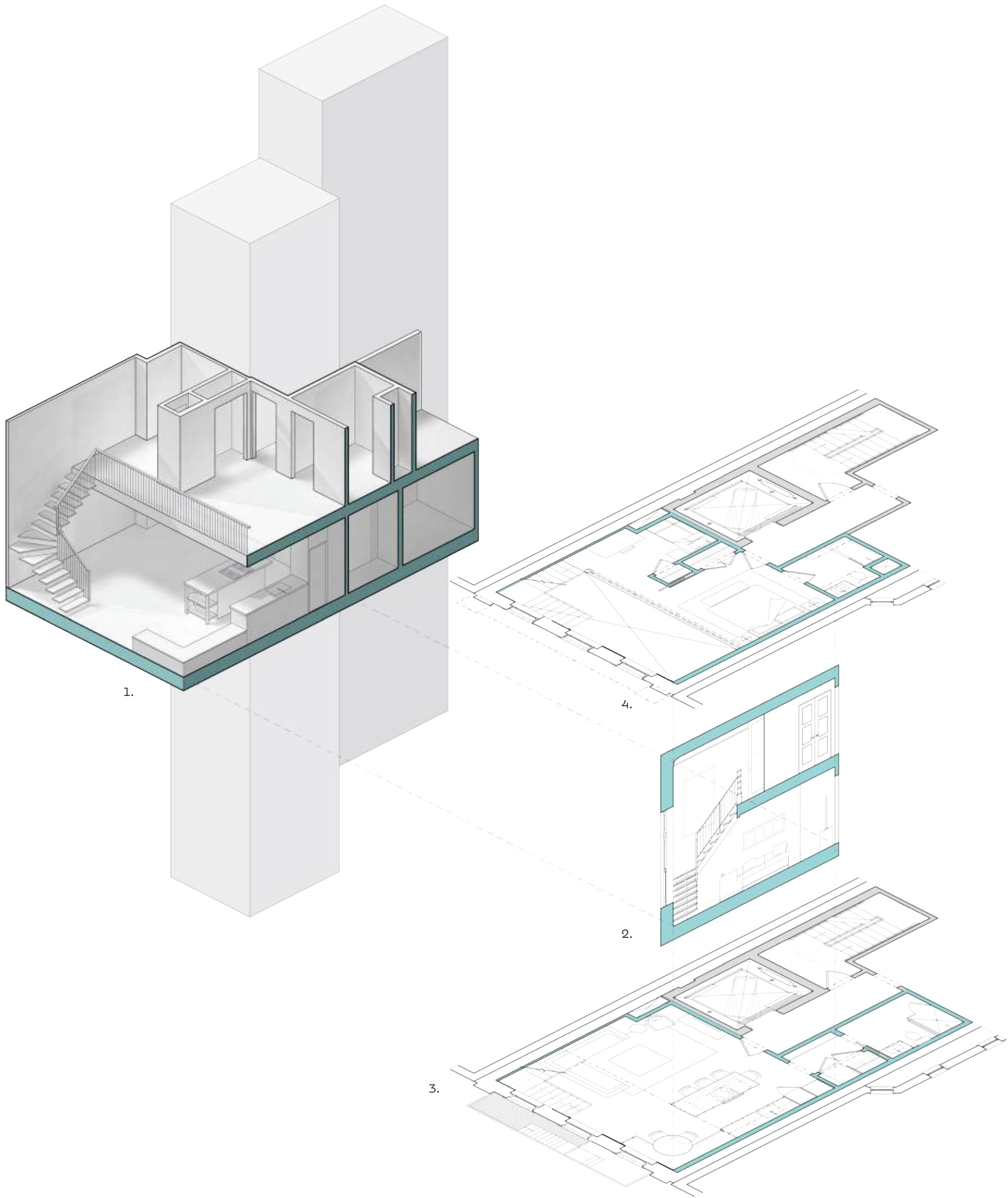


2.



FEATURES

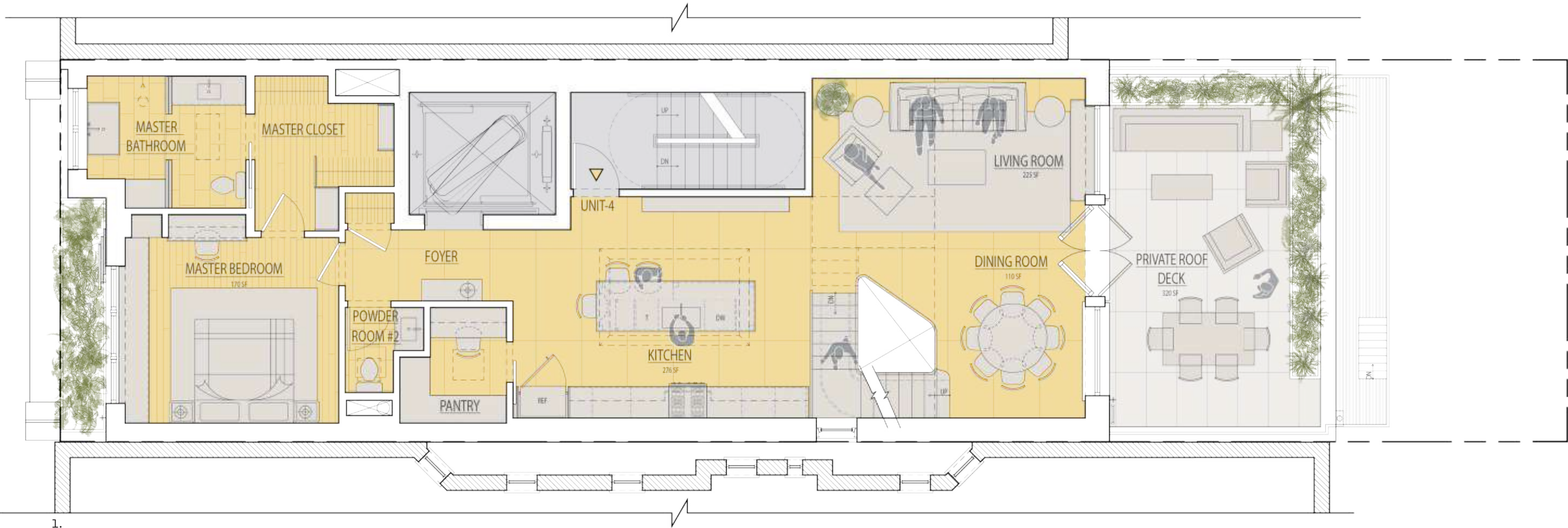
- 1165 SF DUPLEX
- 1 BR, 2 BATH.
- DOUBLE-HEIGHT SPACE + BONUS MEZZANINE SPACE
- LAUNDRY CLOSET
- INDIVIDUAL ROOM TEMPERATURE CONTROL
- 13' TALL CEILINGS
- LARGE WINDOWS/ABUNDANT NATURAL LIGHT
- DISHWASHER
- RECLAIMED WOOD FLOORS



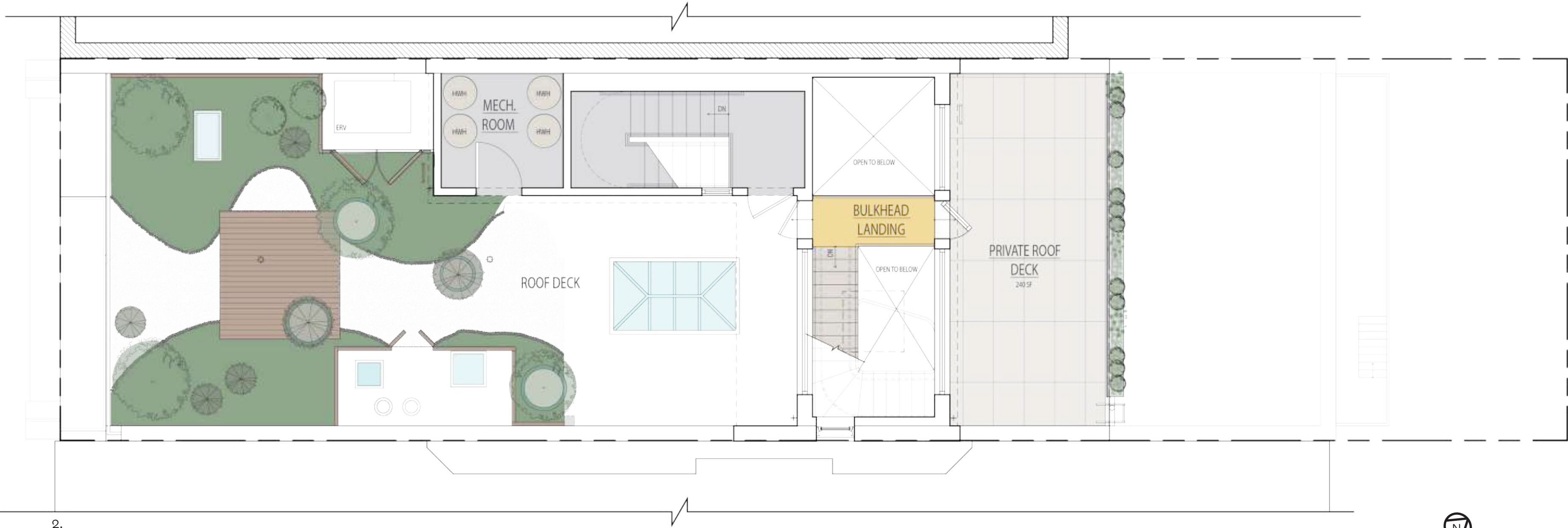
NOTES

1. AXON
2. SECTION
3. 3RD FLOOR PLAN
4. 4TH FLOOR PLAN
5. RENDERING OF STAIR/LOFT

# 5TH FLOOR + ROOF PLANS: UNIT 4 & SHARED ROOF



1. 5TH FLOOR: UNIT 4  
2. BULKHEAD/ROOF:  
UNIT 4 + SHARED ROOF



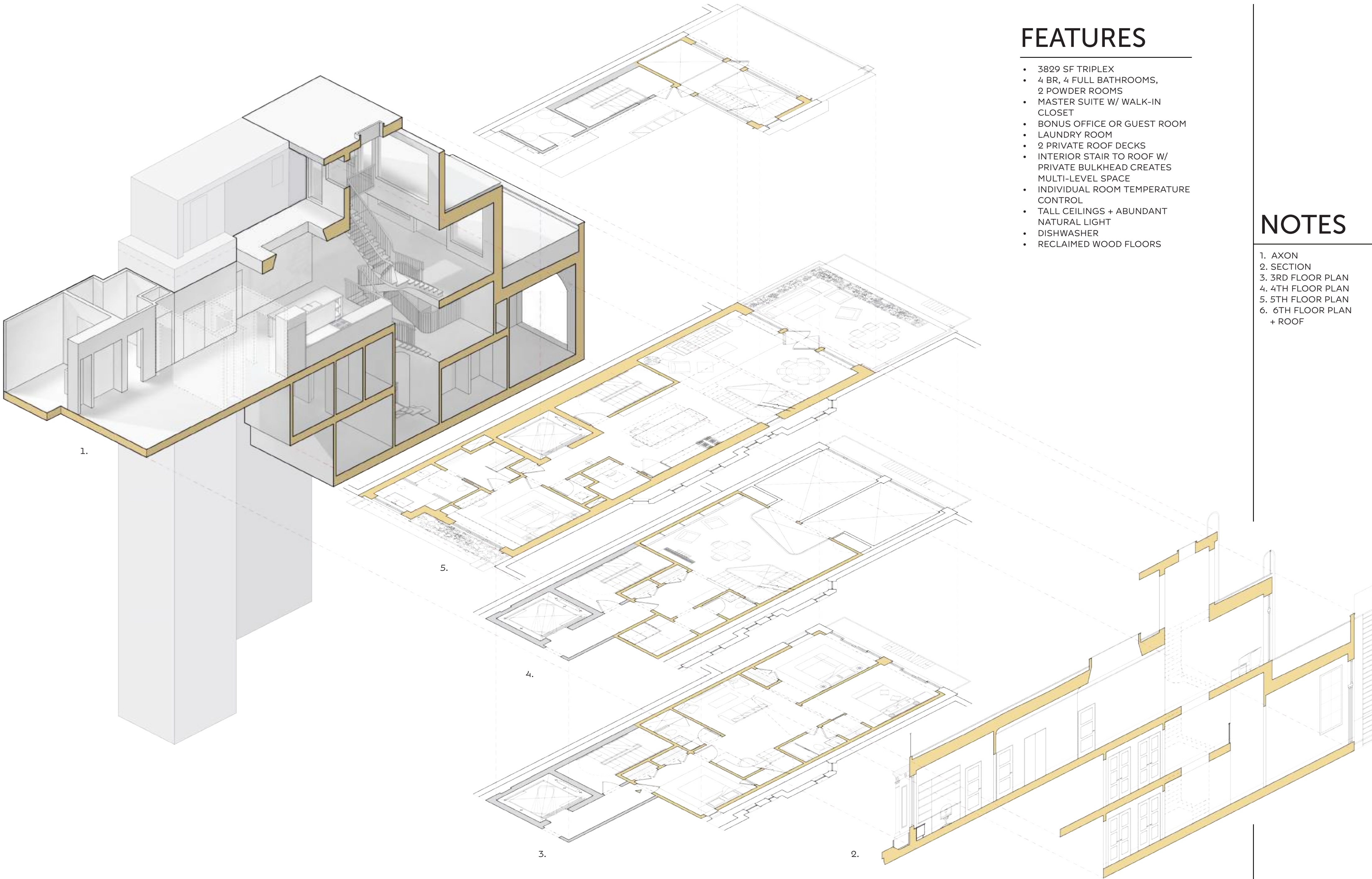
# UNIT 4 TRIPLEX

## FEATURES

- 3829 SF TRIPLEX
- 4 BR, 4 FULL BATHROOMS, 2 POWDER ROOMS
- MASTER SUITE W/ WALK-IN CLOSET
- BONUS OFFICE OR GUEST ROOM
- LAUNDRY ROOM
- 2 PRIVATE ROOF DECKS
- INTERIOR STAIR TO ROOF W/ PRIVATE BULKHEAD CREATES MULTI-LEVEL SPACE
- INDIVIDUAL ROOM TEMPERATURE CONTROL
- TALL CEILINGS + ABUNDANT NATURAL LIGHT
- DISHWASHER
- RECLAIMED WOOD FLOORS

## NOTES

1. AXON
2. SECTION
3. 3RD FLOOR PLAN
4. 4TH FLOOR PLAN
5. 5TH FLOOR PLAN
6. 6TH FLOOR PLAN + ROOF

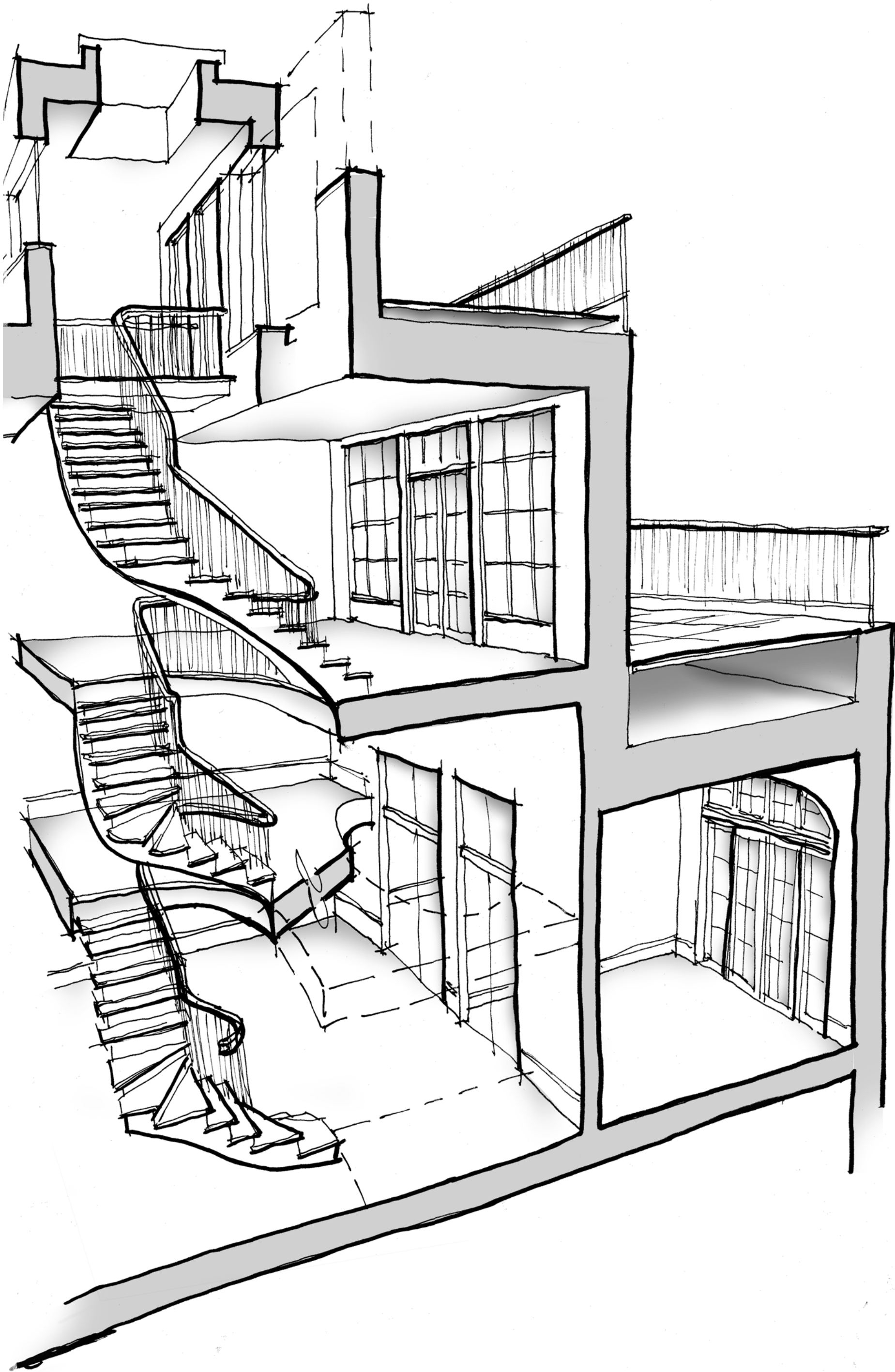




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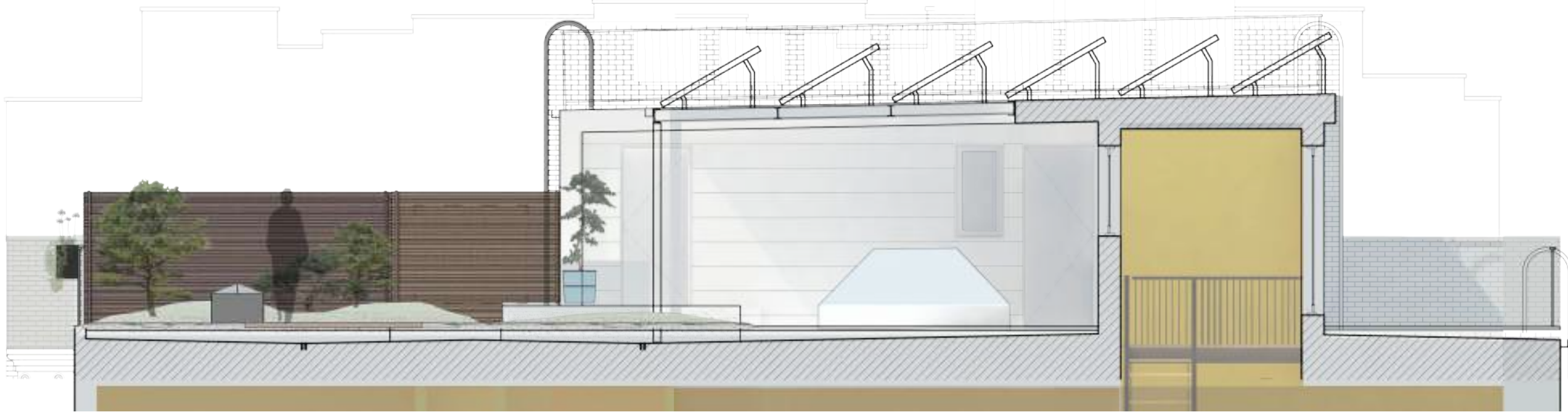
2.



3.

- 1. ROOF KEY PLAN
- 2. FRONT ROOF DECK RENDERING
- 3. UNIT 4 STAIR SKETCH

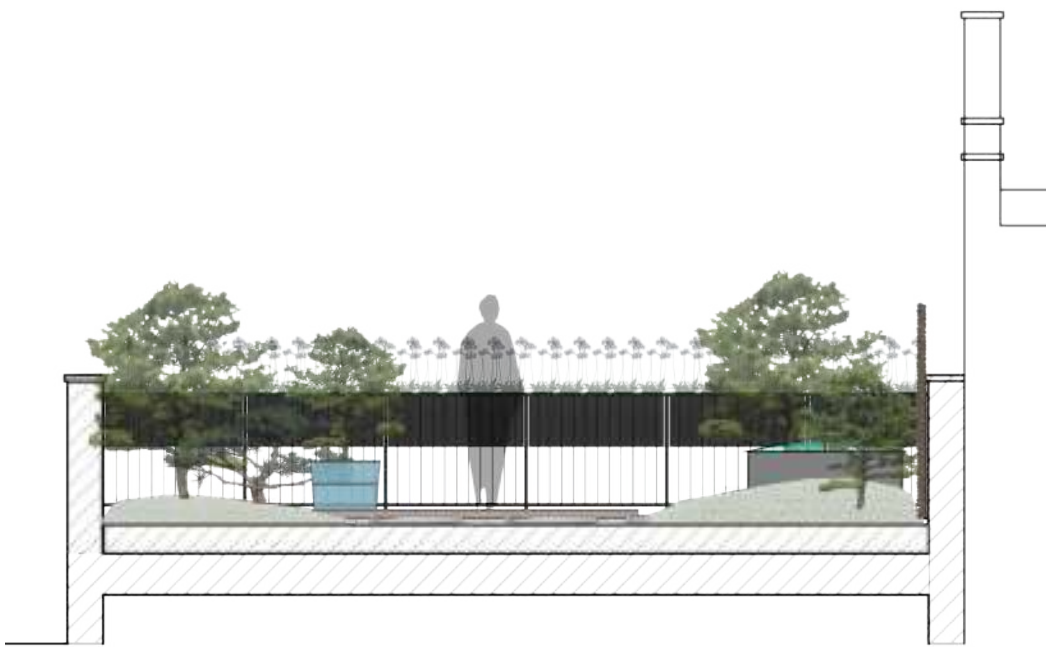
# BULKHEAD ELEVATIONS & PLAN



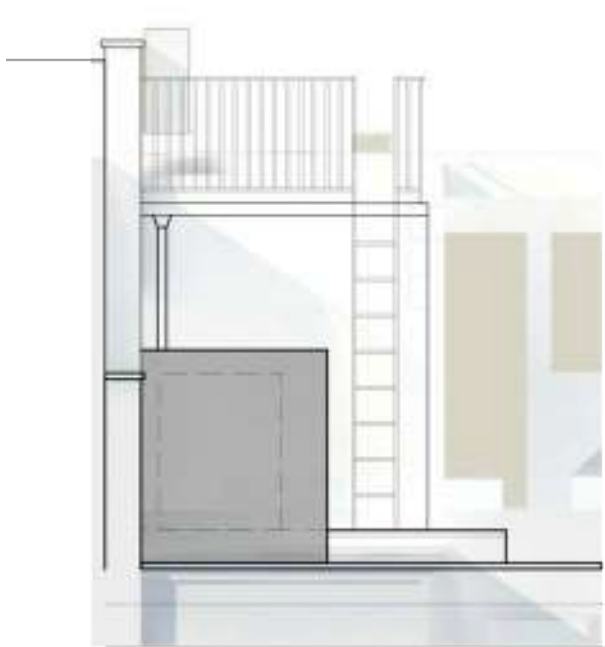
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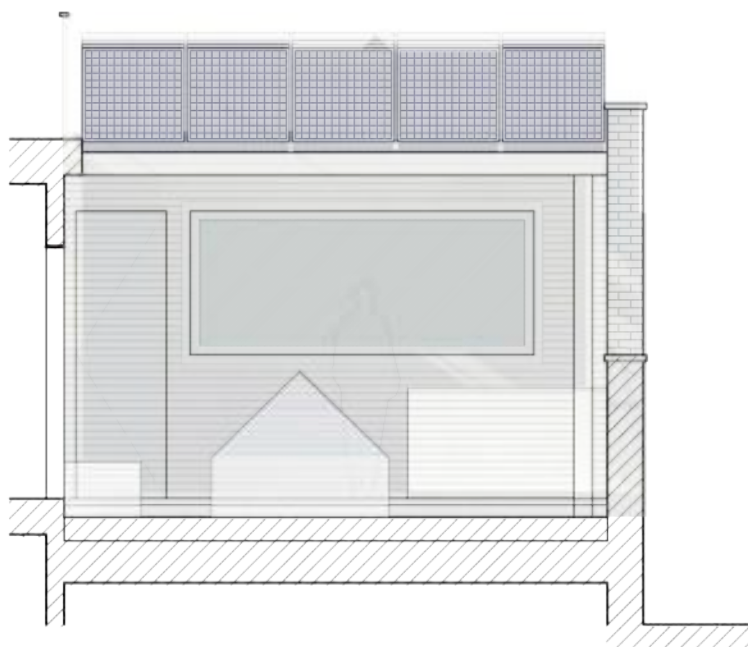
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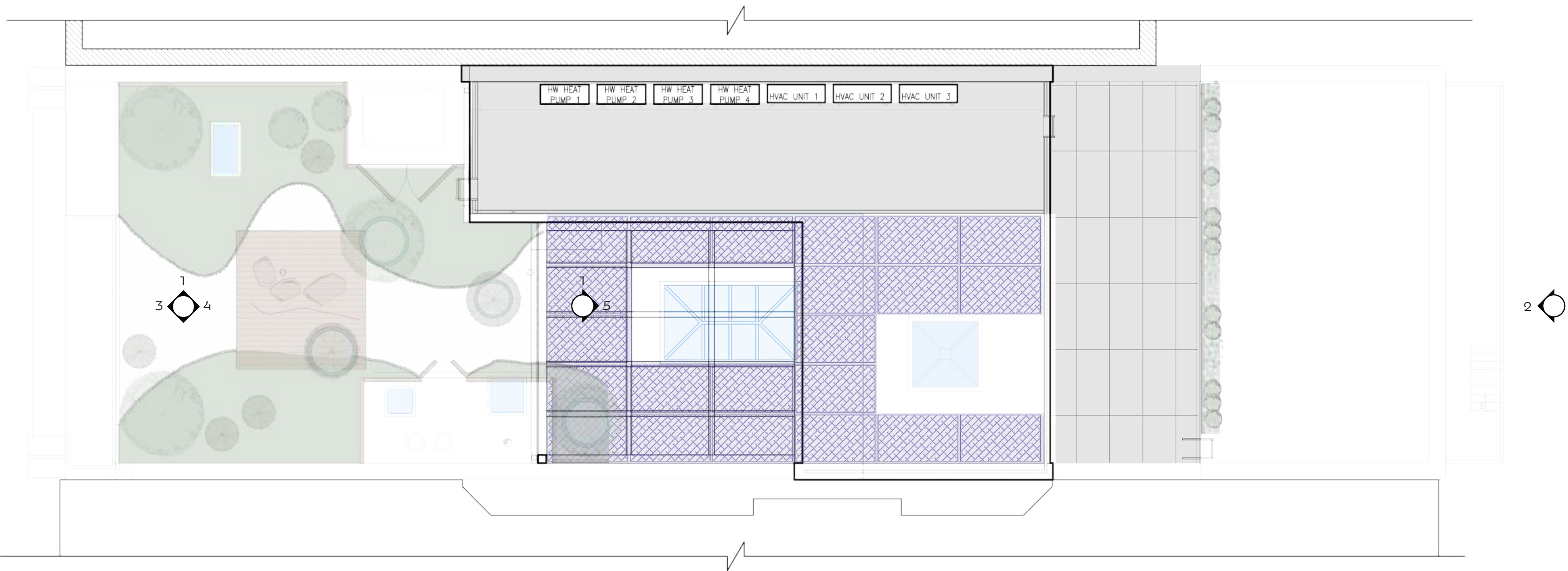
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4.



5.

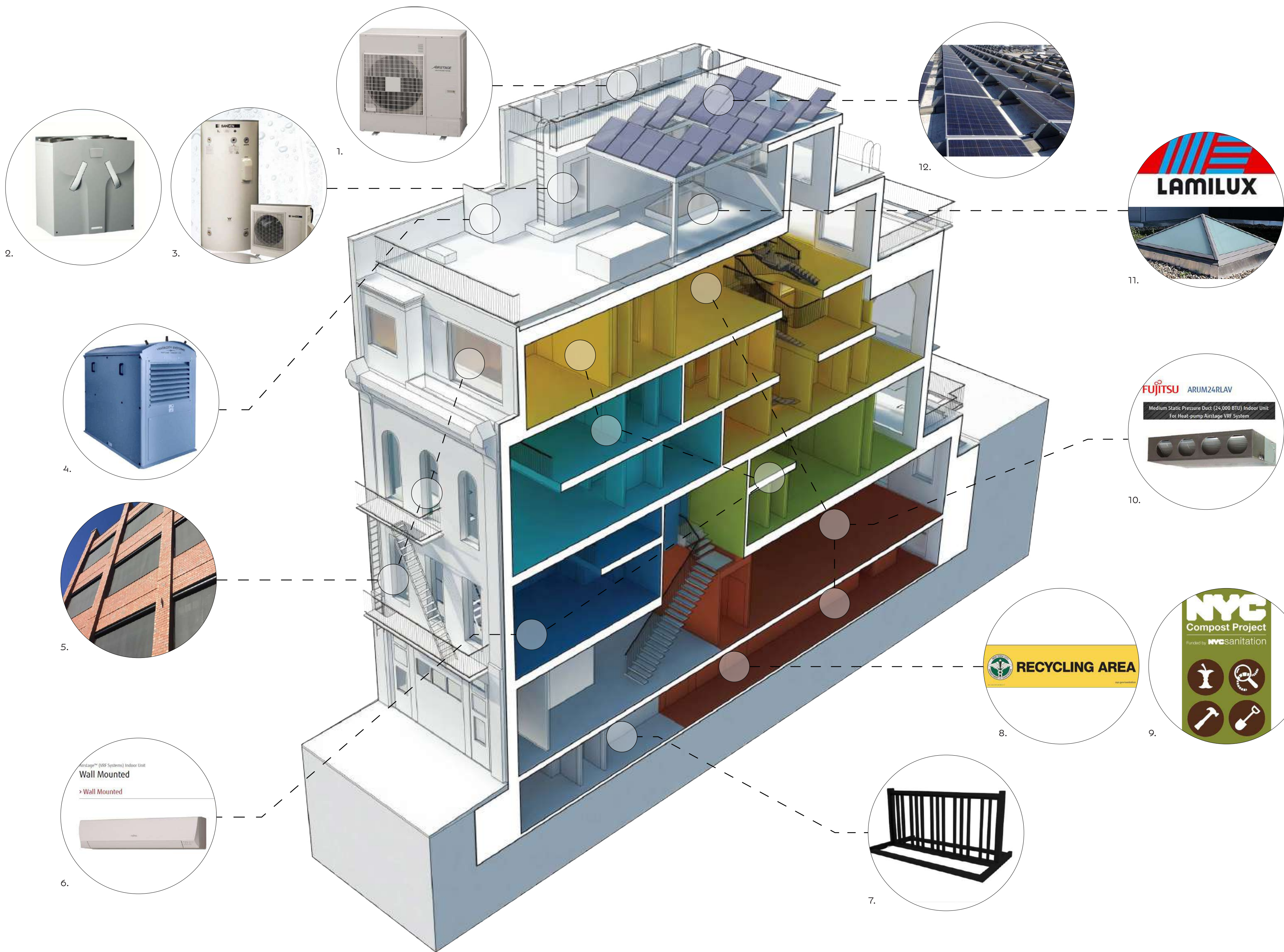


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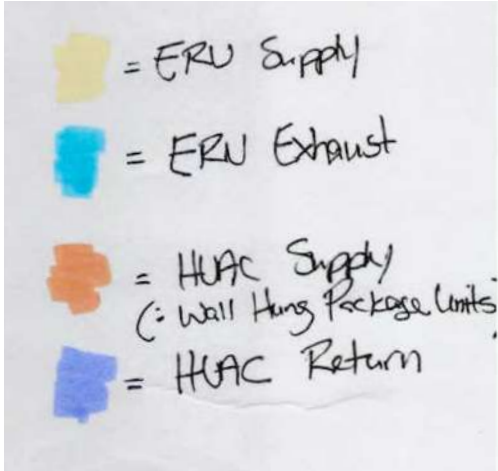
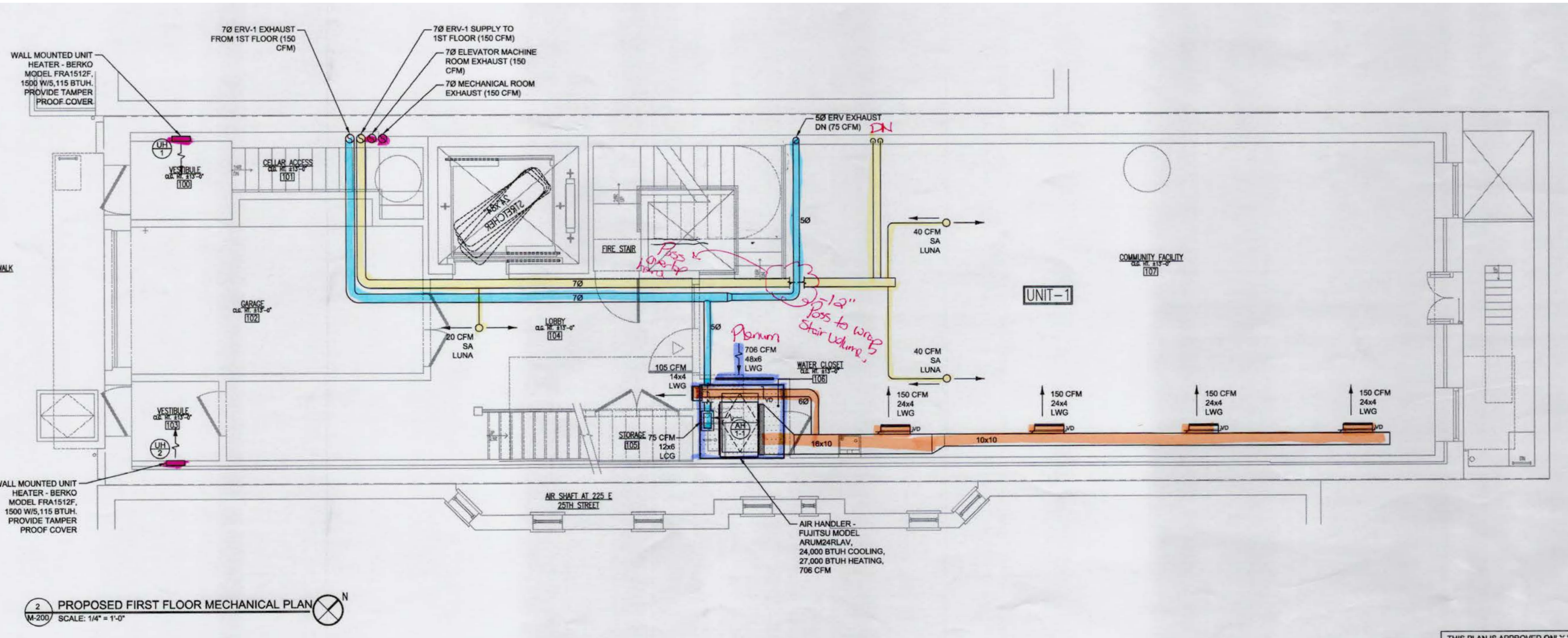
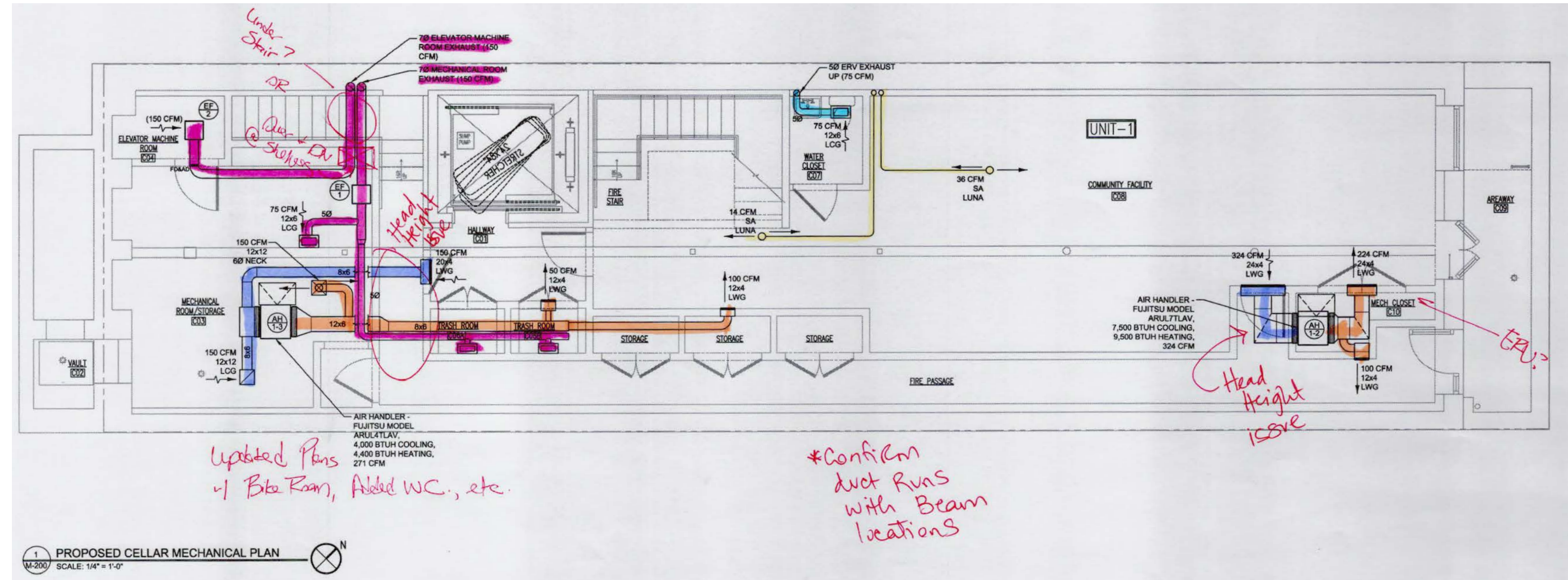


- 1. EAST BULKHEAD ELEVATION & SECTION (FACING WEST)
- 2. NORTH BULKHEAD ELEVATION (FACING NORTH)
- 3. FRONT ROOF DECK RAILING (FACING SOUTH)
- 4. SOUTH BULKHEAD ELEVATION (FACING NORTH)
- 5. SOUTH BULKHEAD ELEVATION (FACING NORTH)
- 6. BULKHEAD ROOF PLAN

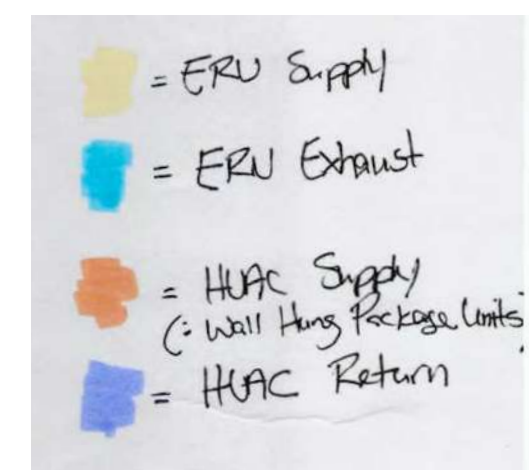
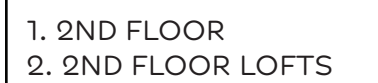
# MECHANICAL UNITS + AMENITIES



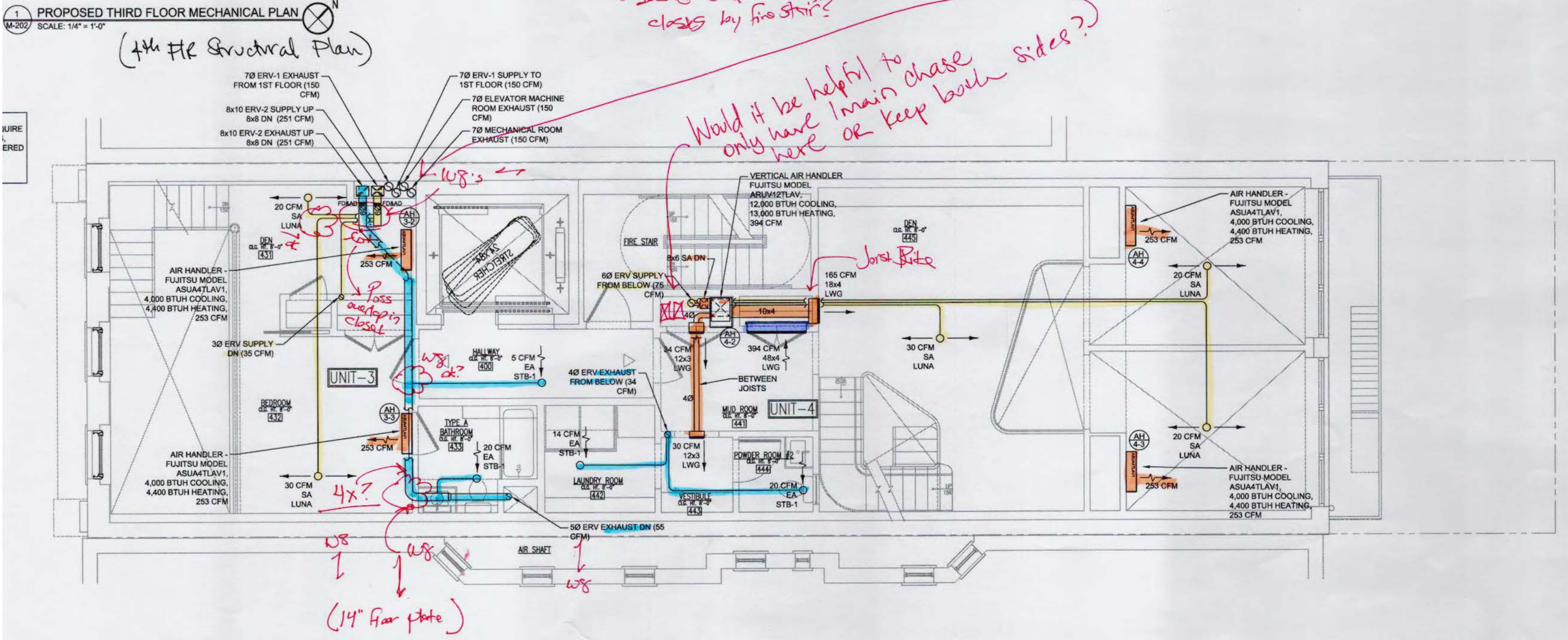
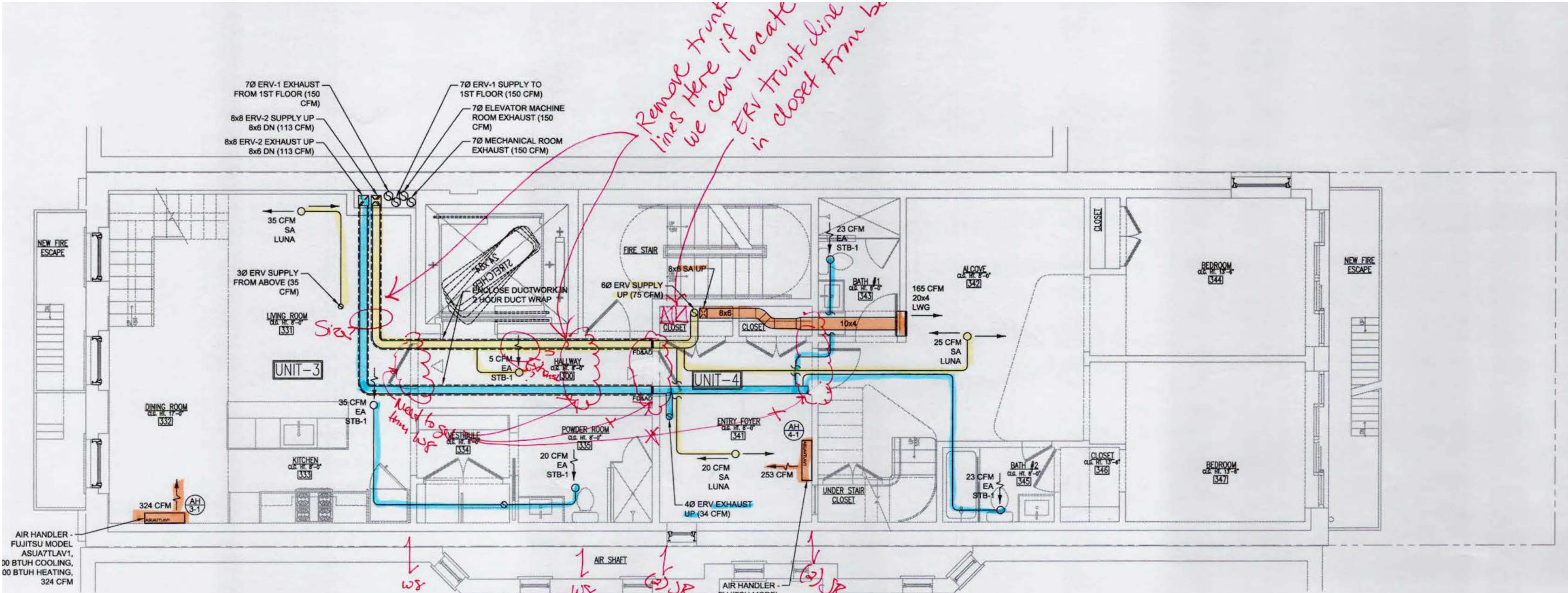
# MECHANICAL PLANS: CELLAR + 1ST FLOOR



**BAXT** | **INGUI**  
Architects PC



# MECHANICAL PLANS: 3RD + 4TH FLOOR

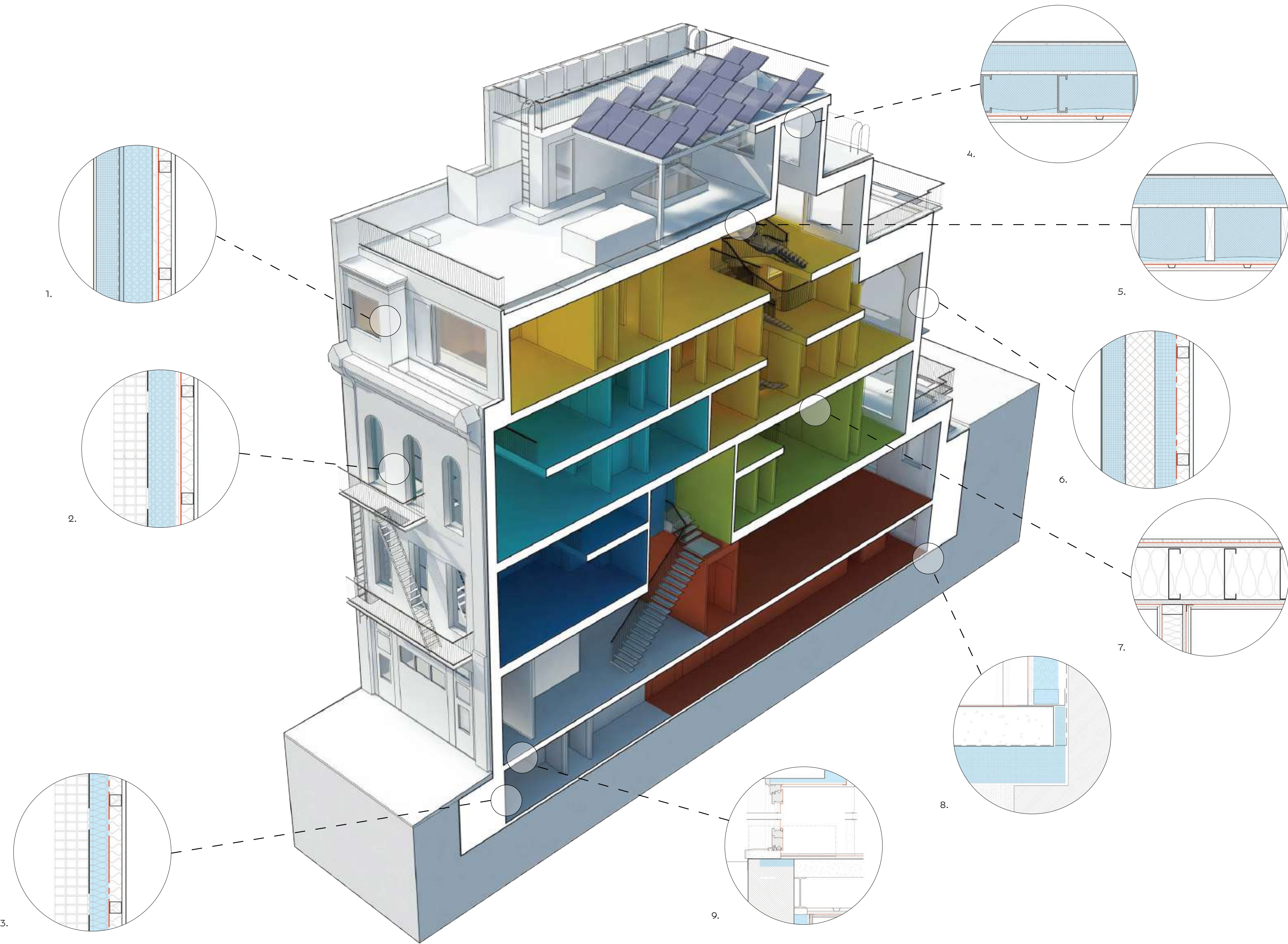


1. 3RD FLOOR  
2. 4TH FLOOR

BAXT | INGUI  
Architects PC

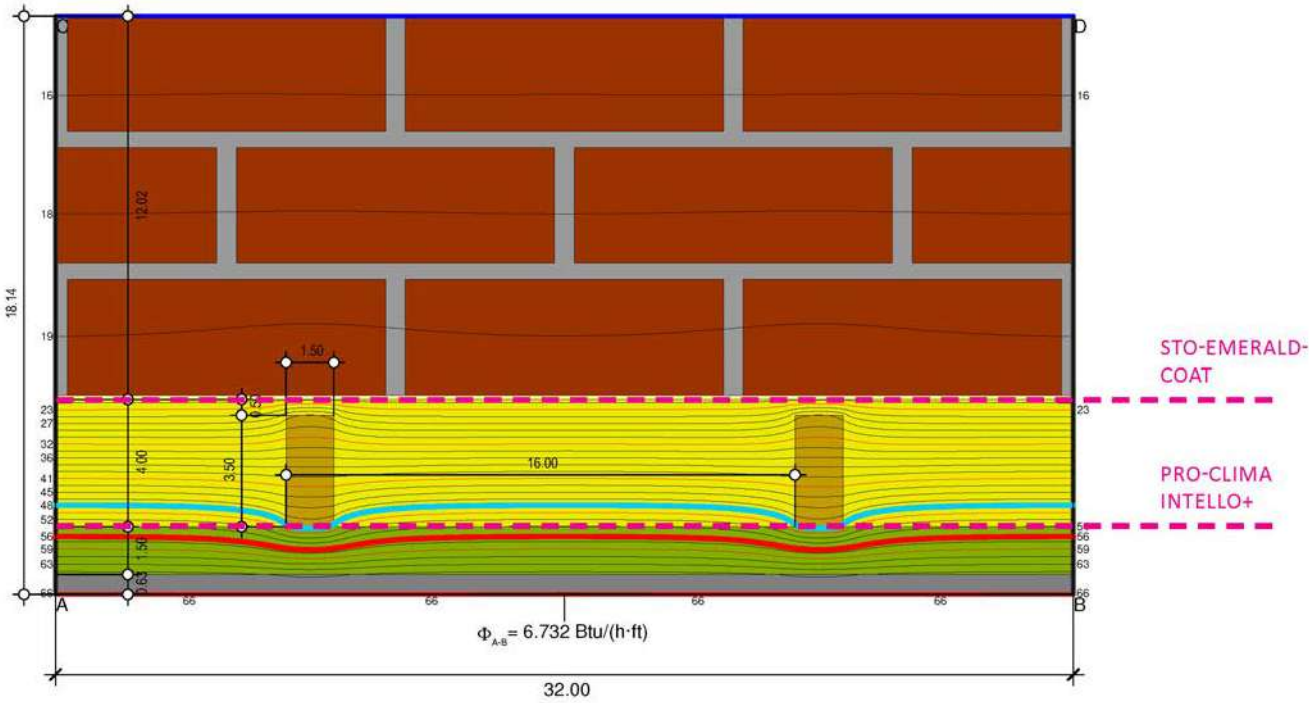
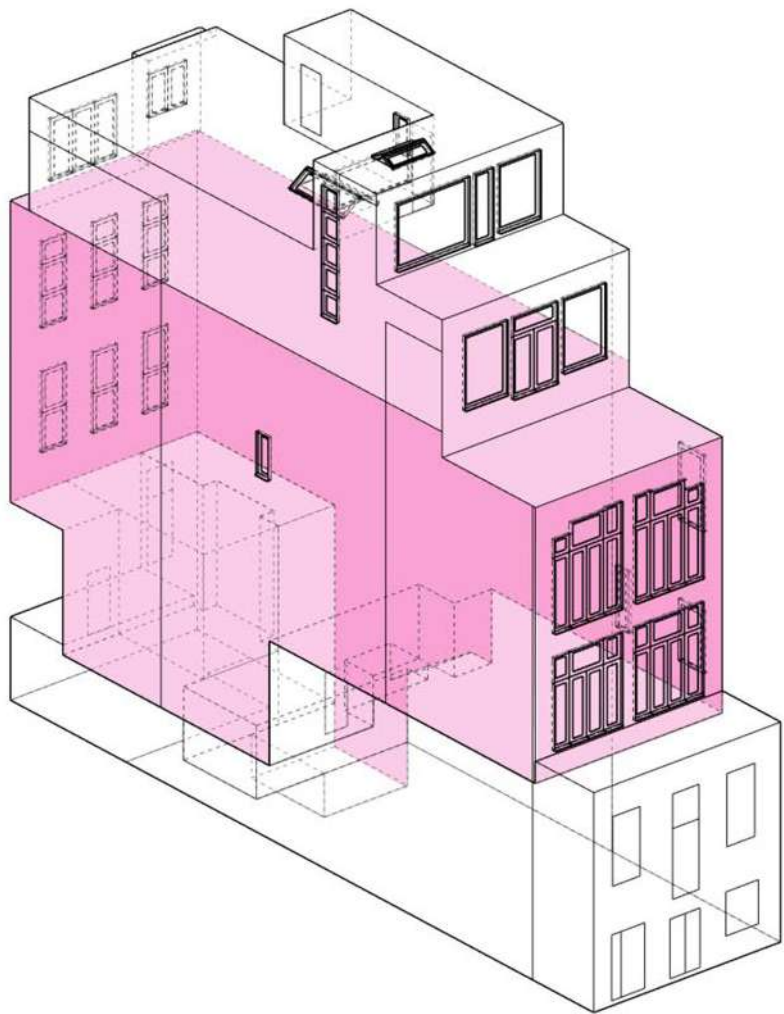
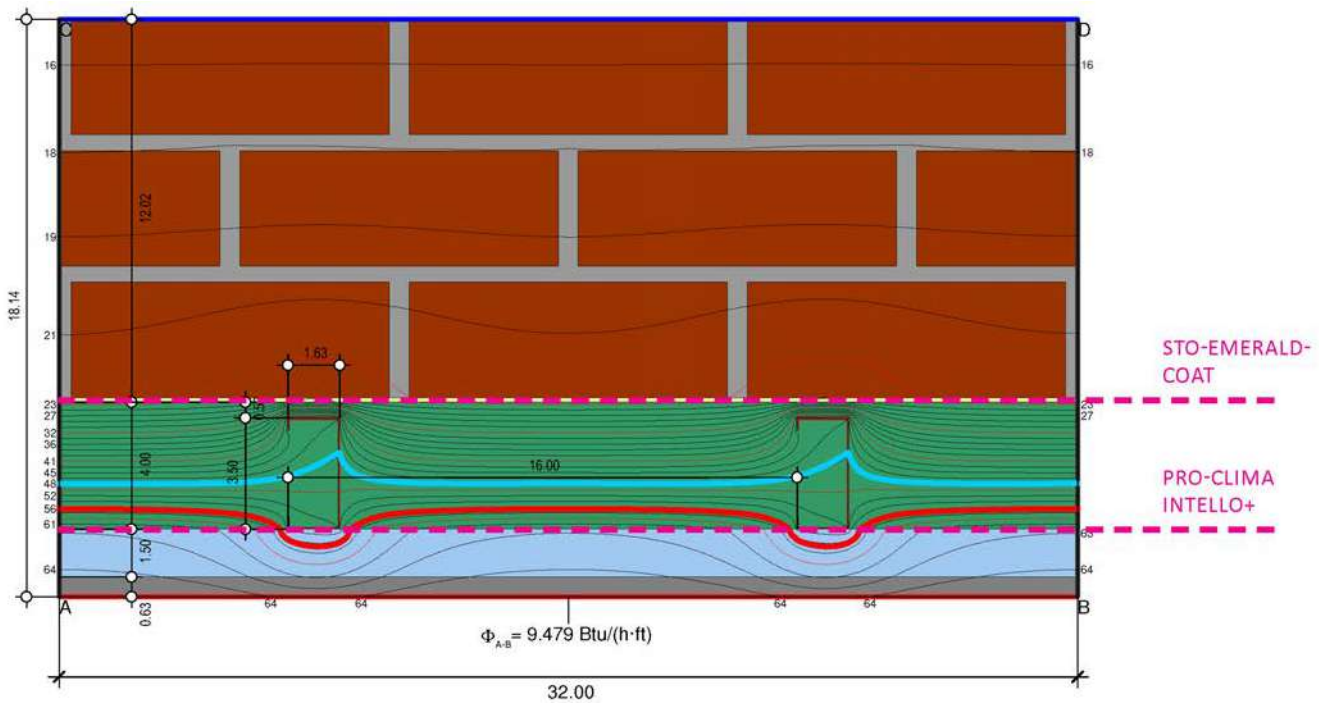
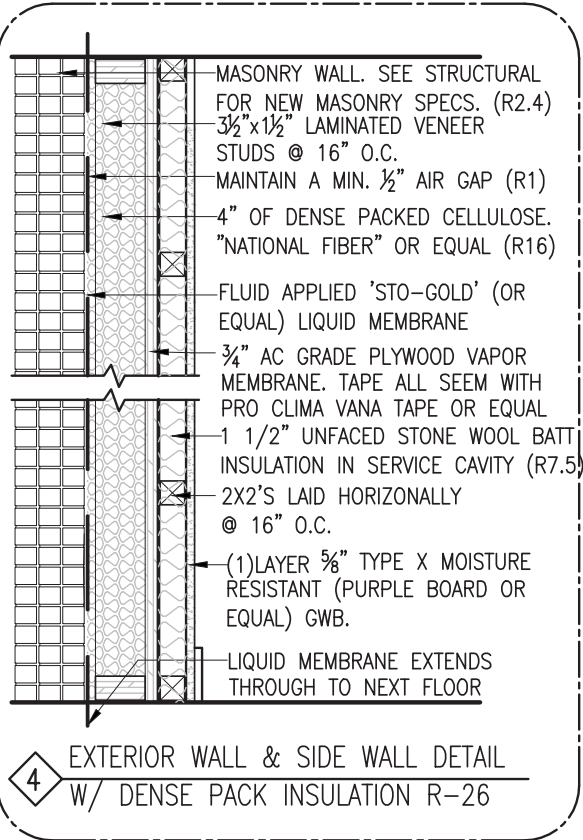
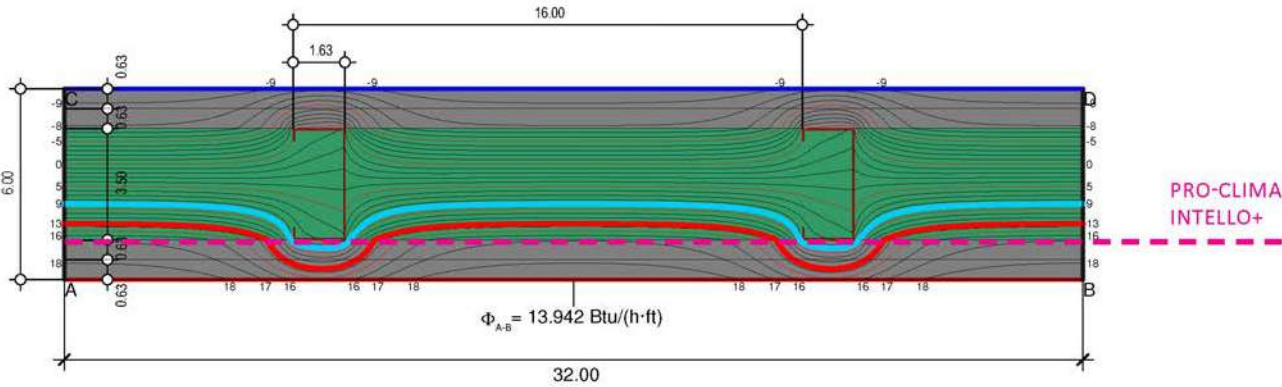
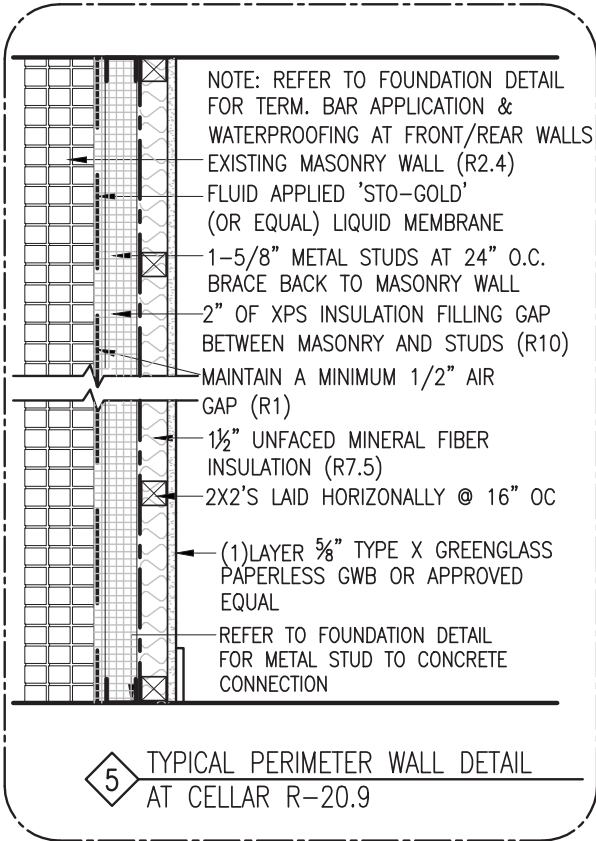
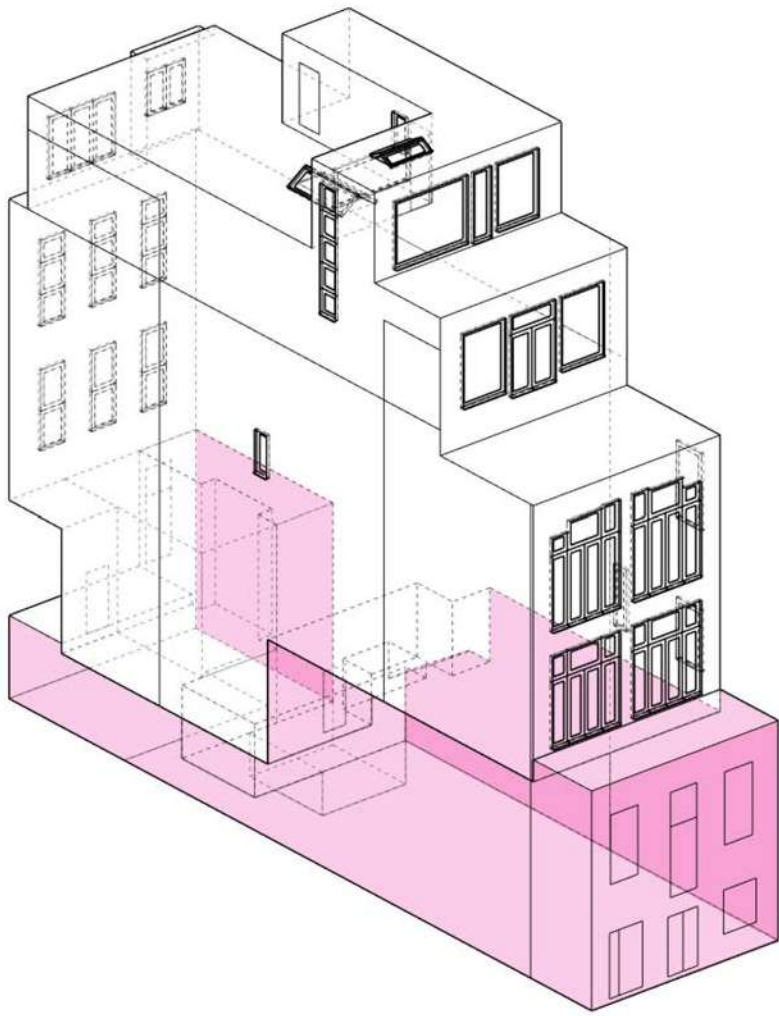
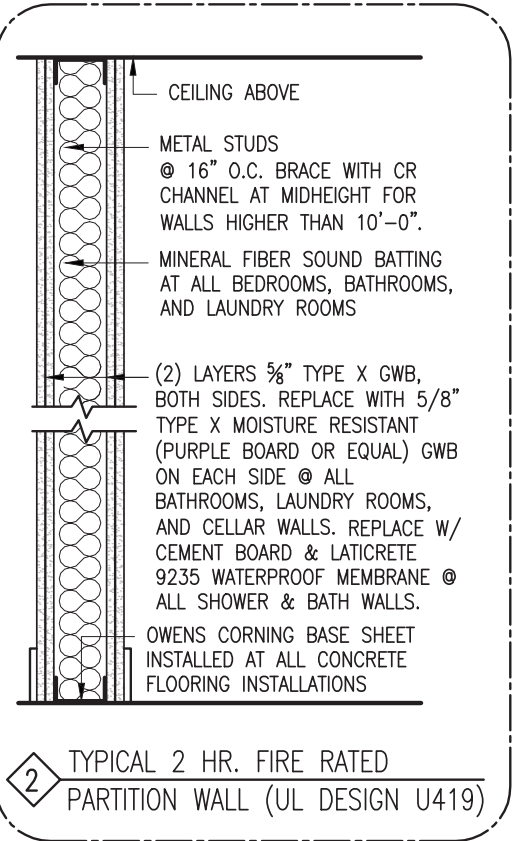
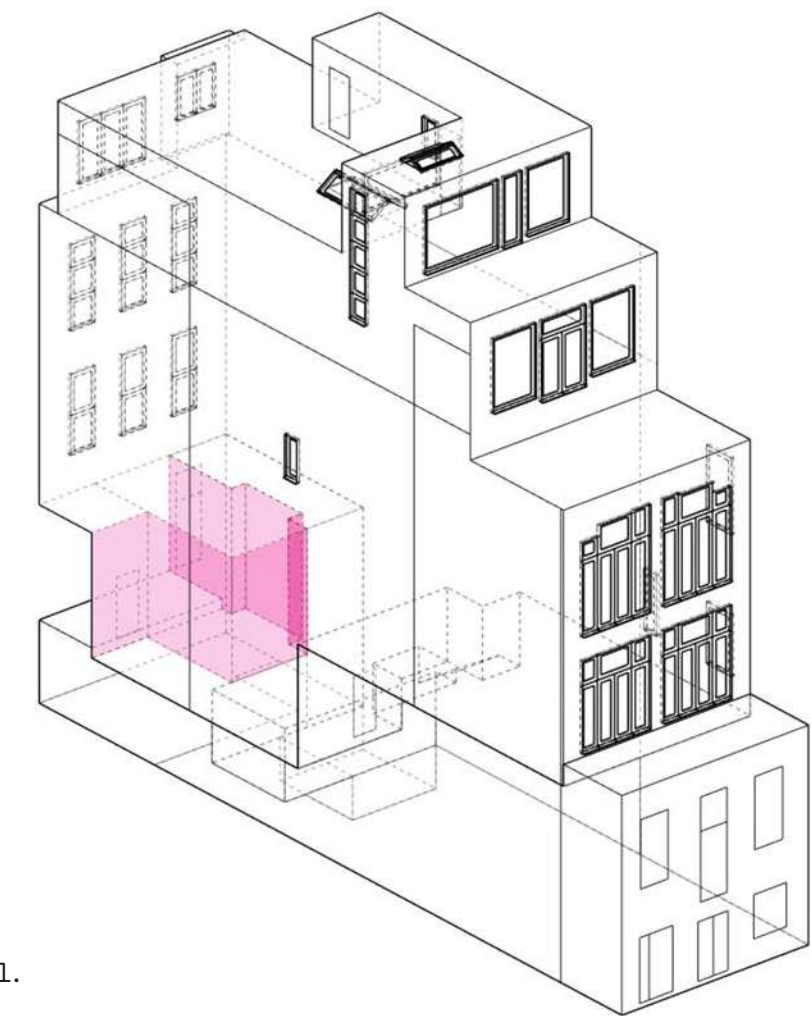


# TYPICAL WALL + FLOOR ASSEMBLIES



- 1. WALL TYPE #7: NEW STEEL STUD WALL W/ EXTERIOR FOAM
- 2. WALL TYPE #4: EXISTING MASONRY WALL W/ CELLULOSE INSULATION
- 3. WALL TYPE #5: EXISTING MASONRY WALL W/ STEEL STUD + MINERAL WOOL
- 4. ROOF TYPE #9: NEW METAL JOIST W/ CELLULOSE INTERIOR INSULATION + EXTERIOR FOAM
- 5. ROOF TYPE #8: NEW WOOD JOIST W/ CELLULOSE INTERIOR INSULATION + EXTERIOR FOAM
- 6. WALL TYPE #6: NEW MASONRY WALL W/ CELLULOSE INTERIOR INSULATION + EXTERIOR FOAM
- 7. UNIT TO UNIT AIR SEALING DETAIL
- 8. CELLAR SLAB DETAIL
- 9. VESTIBULE AIR SEALING + INSULATION DETAIL

WALL DETAILS



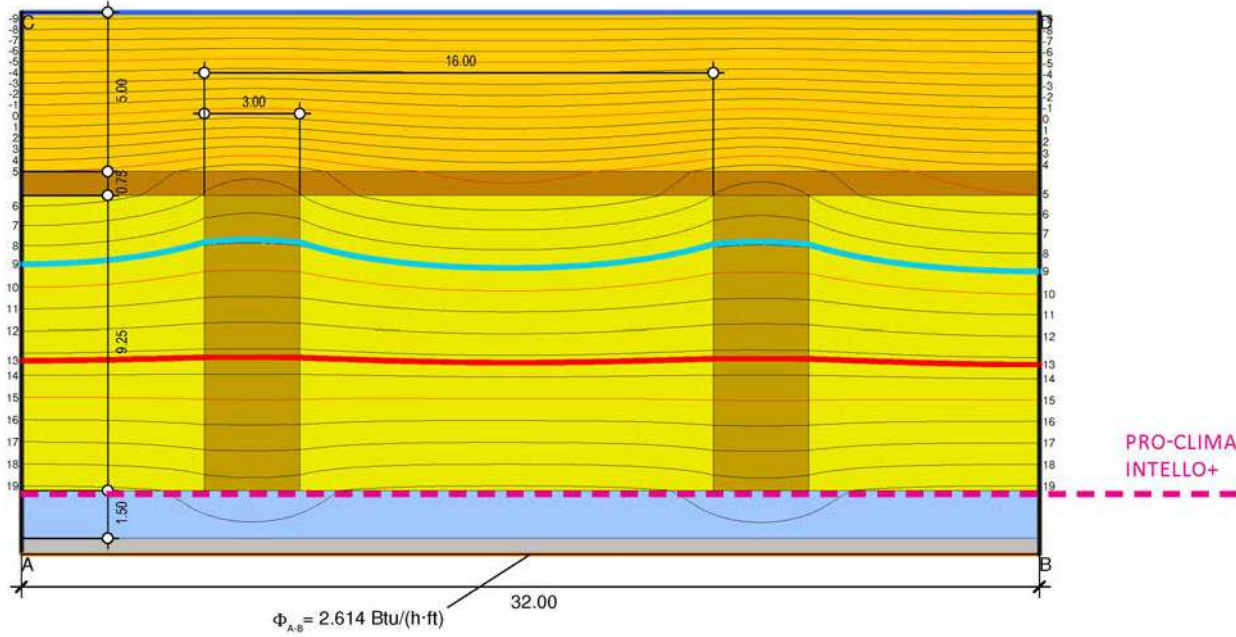
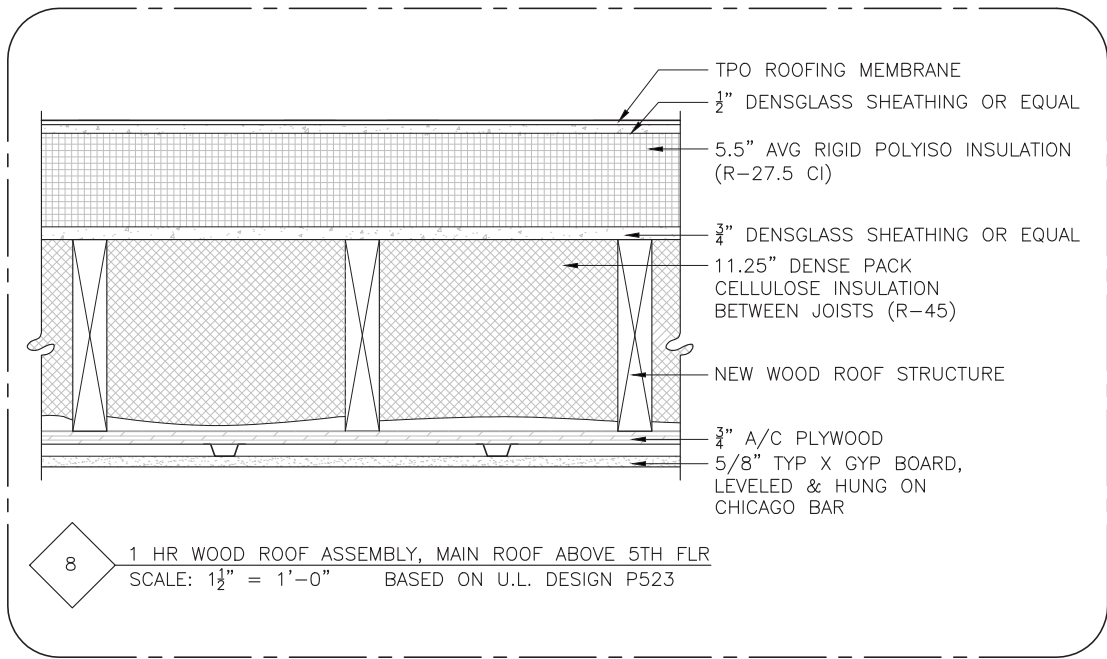
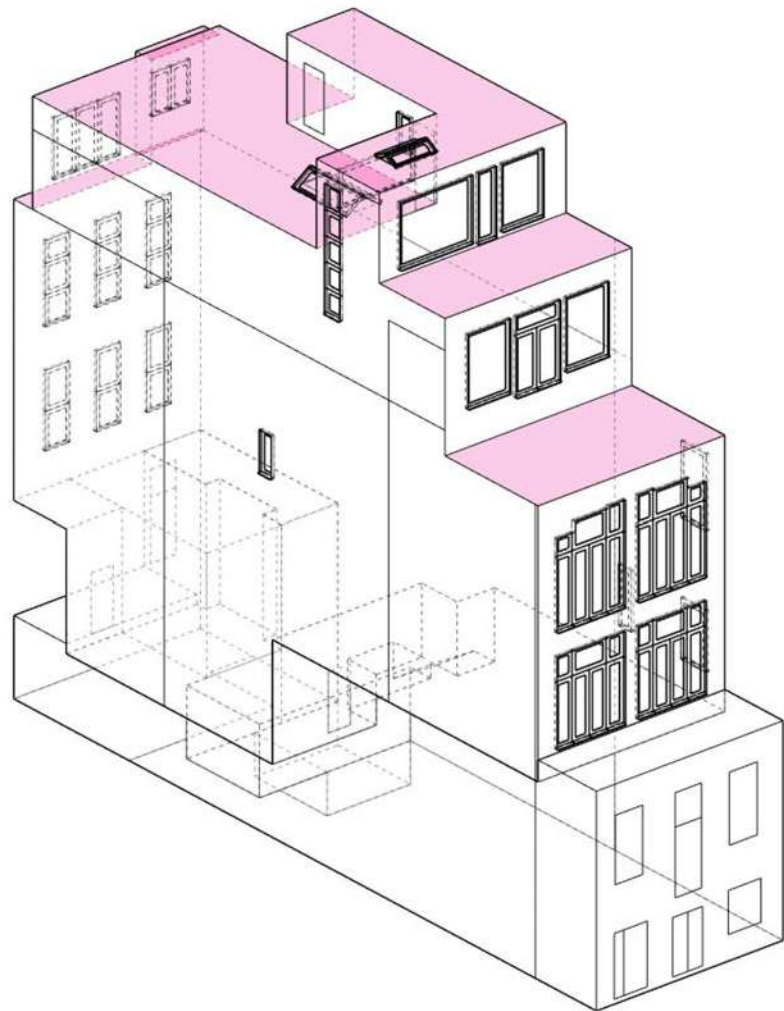
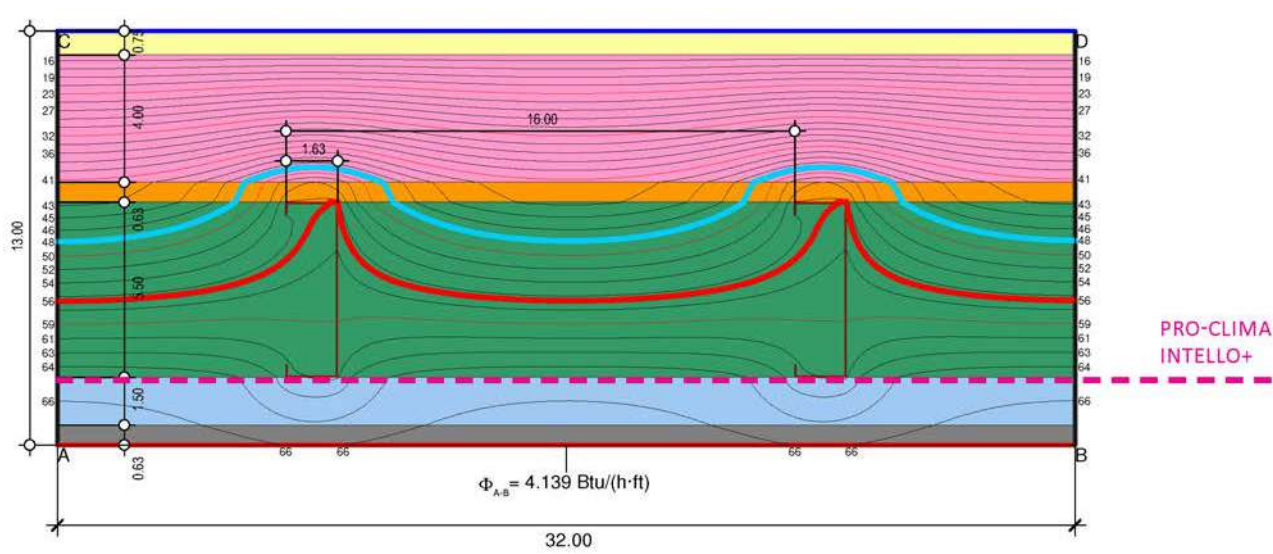
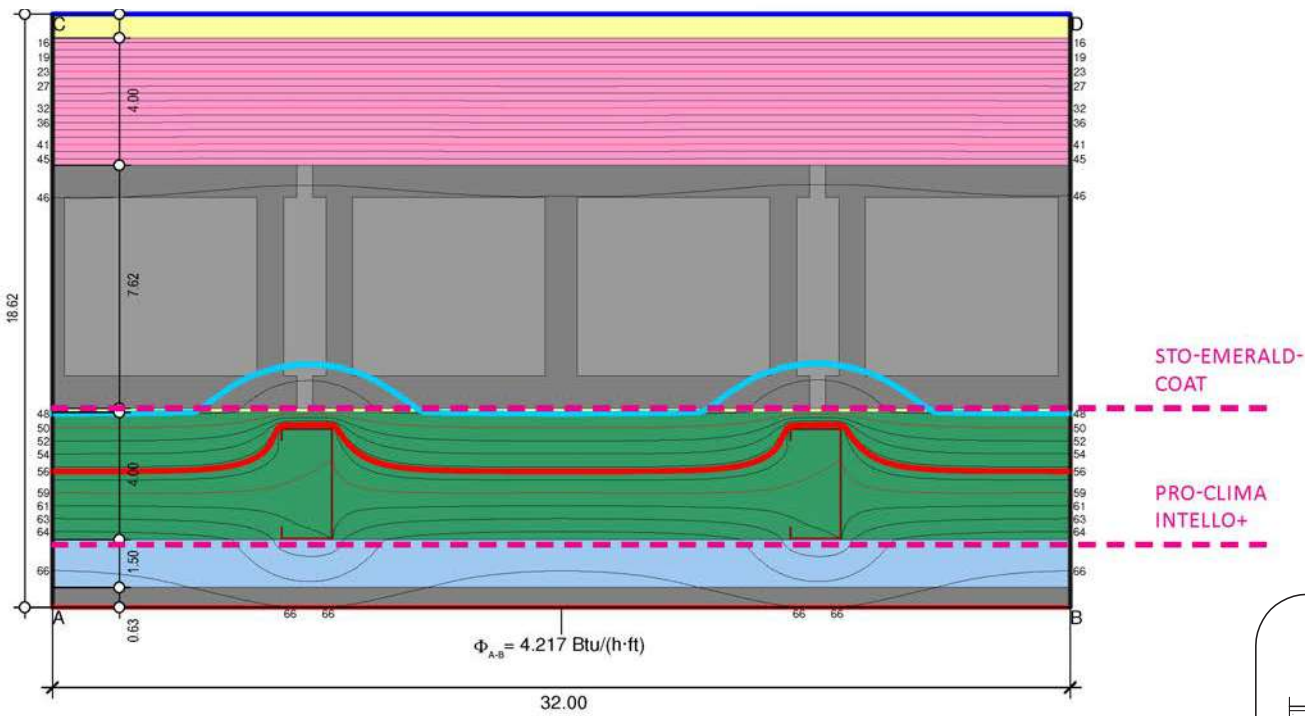
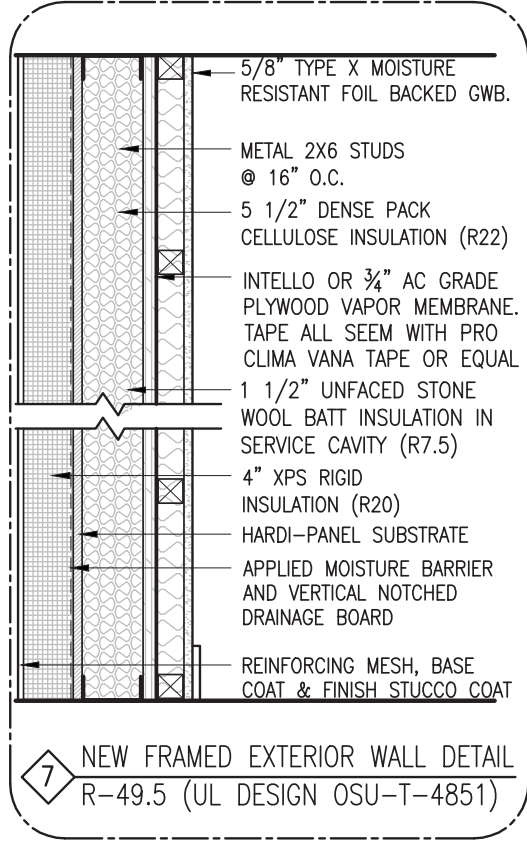
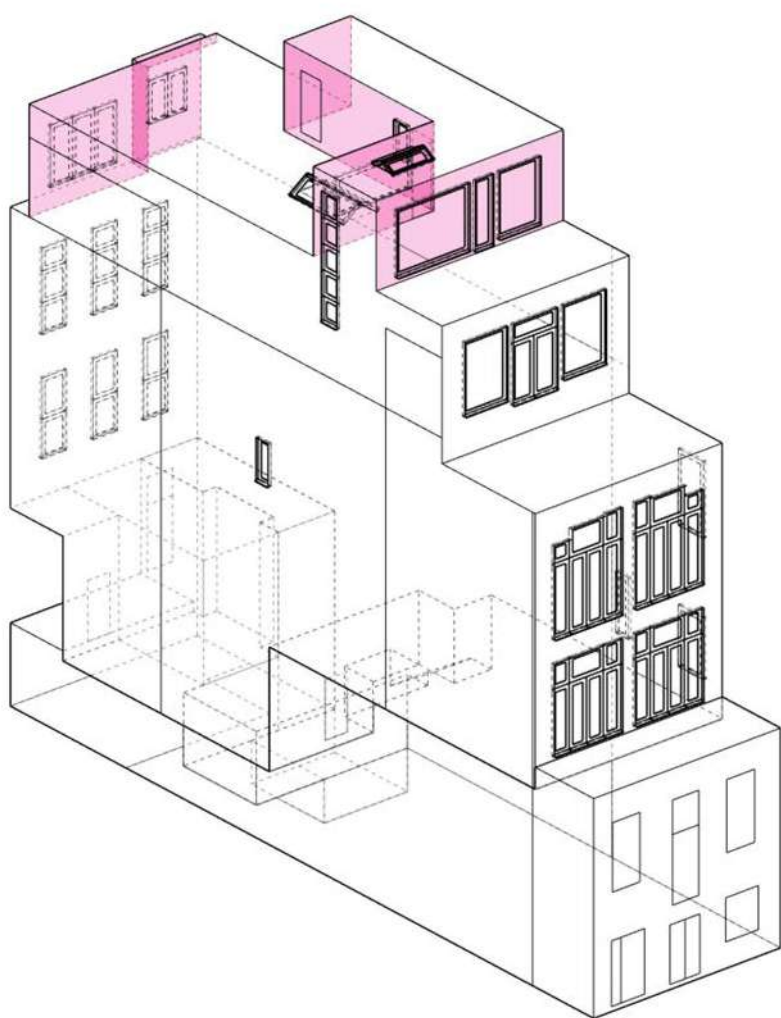
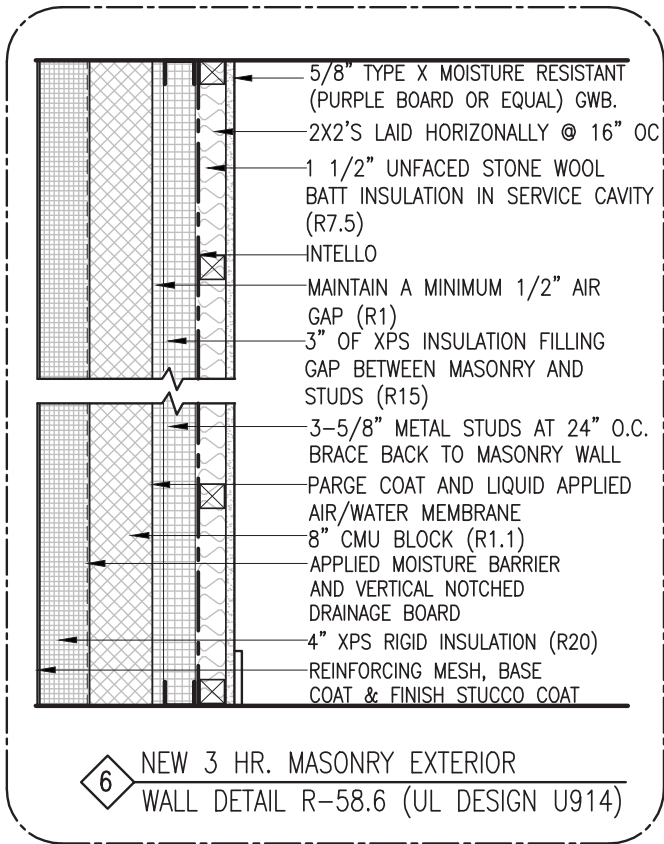
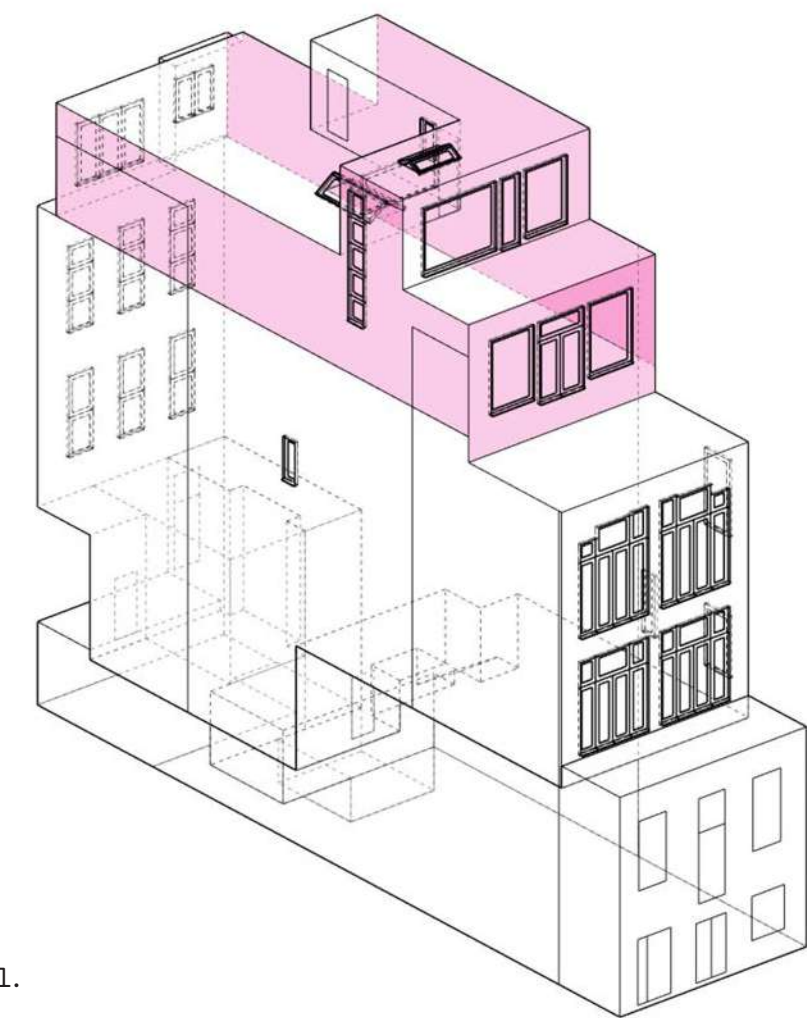
Boundary Condition	$q[\text{Btu}/(\text{h}\cdot\text{ft}^2)]$	$\theta[^\circ\text{F}]$	$h[\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot\text{F})]$	$\epsilon$
Exterior, ventilated	14.000		1.355	
Interior, heat flux, upwards	68.000		1.761	
Symmetry/Model section	0.000			

Material	$\lambda[\text{Btu}/(\text{h}\cdot\text{ft}\cdot\text{F})]$	$\epsilon$
Air layer, unventilated, upwards, thickness: 40 mm	0.144	
Cellulose (Denspack) [R-3.7/in]	0.023	0.900
GWB (Typ) [R-0.85/in]	0.098	0.900
Plywood (Typ) [R-1.2/in]	0.069	0.900
Polyiso w Metal Fasteners [R-5.7/in]	0.015	0.900
Wood, Coniferous (Softwood) [R-1.03/in]	0.081	0.900

- 1. WALL TYPE #2: 2X4 STEEL STUD W/ MINERAL WOOL BATT
- 2. WALL TYPE #4: EXISTING MASONRY WALL W/ CELLULOSE INSULATION
- 3. WALL TYPE #5: EXISTING MASONRY WALL W/ STEEL STUD + MINERAL WOOL

WALL + ROOF DETAILS



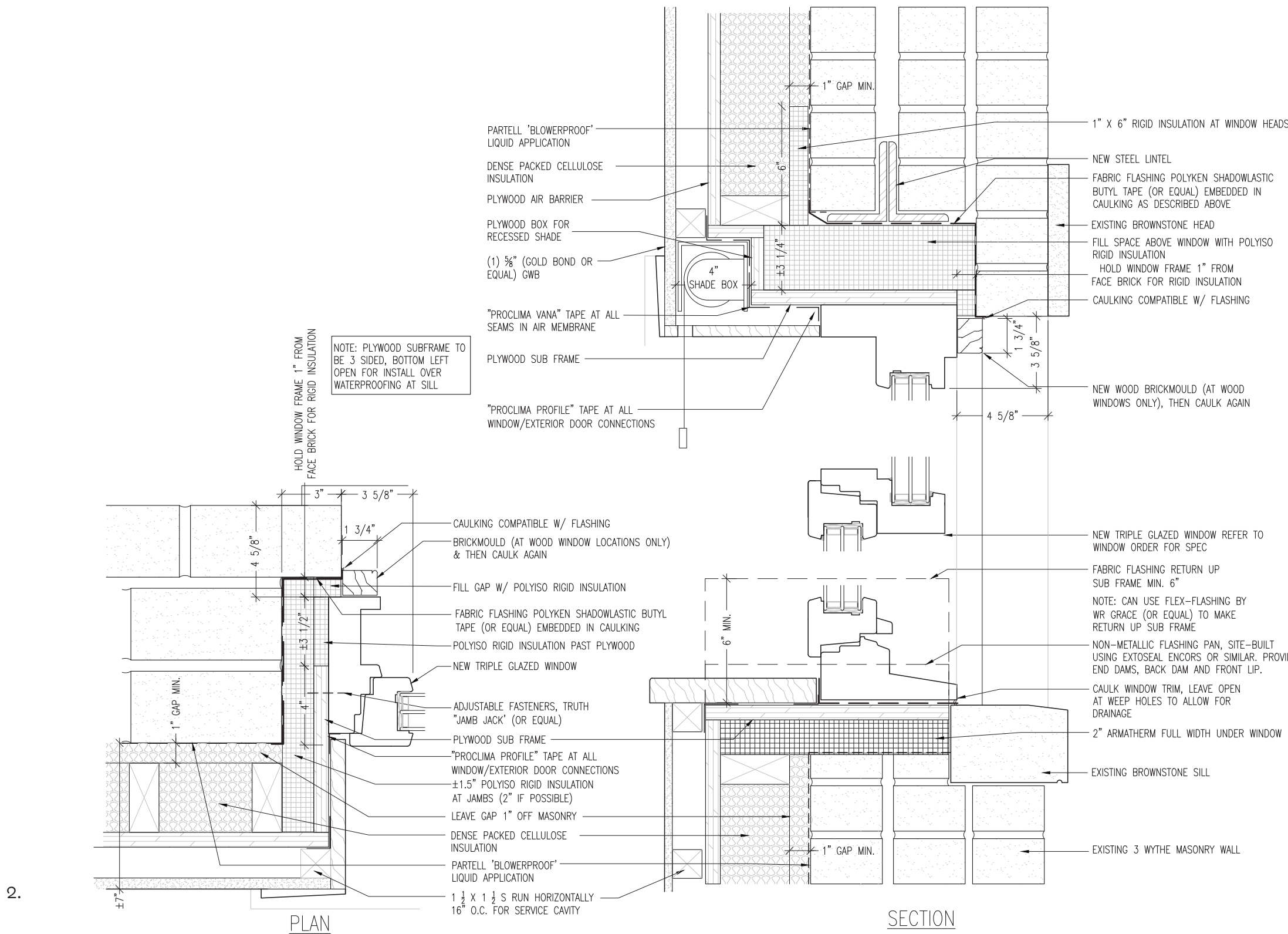
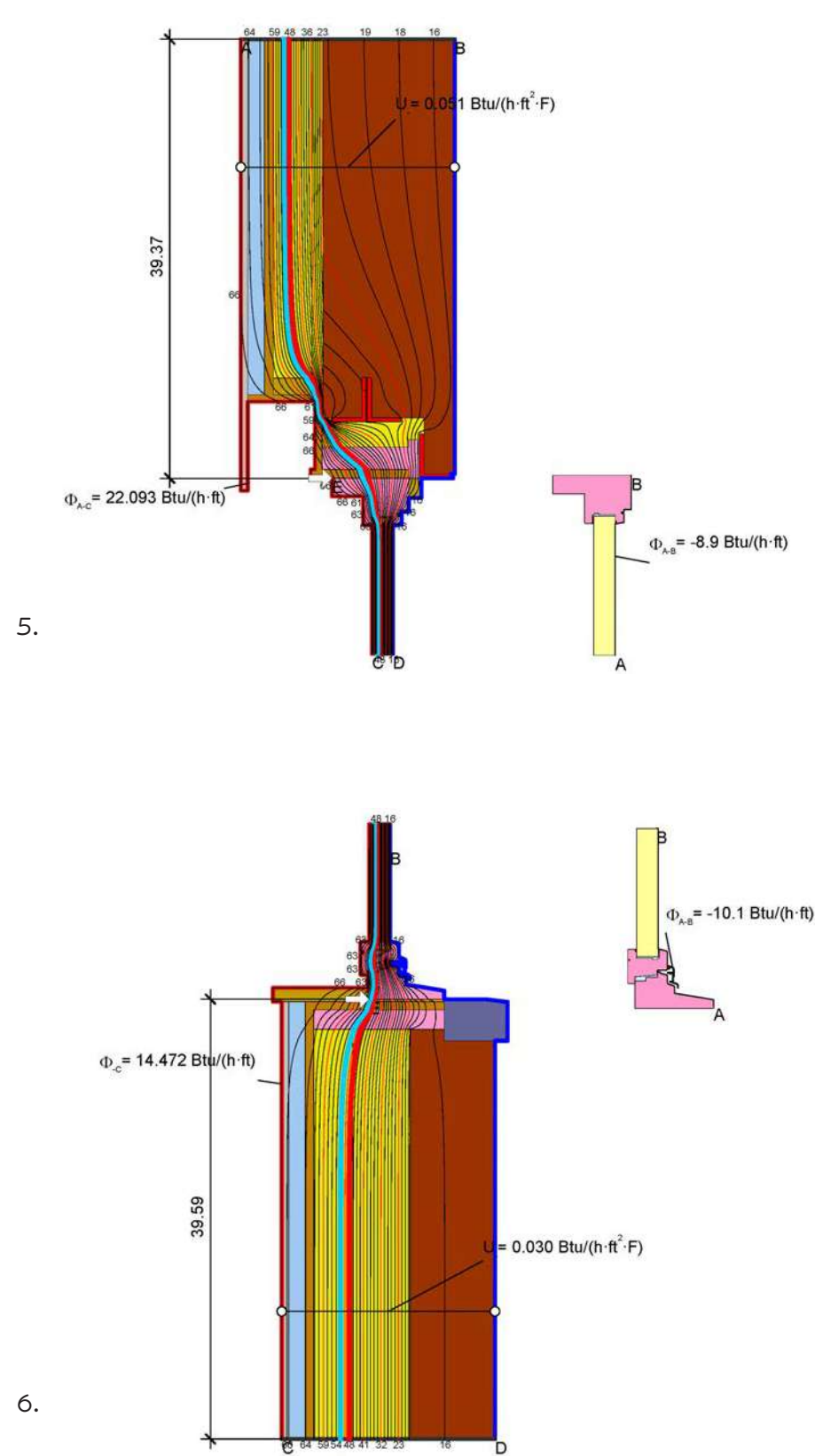
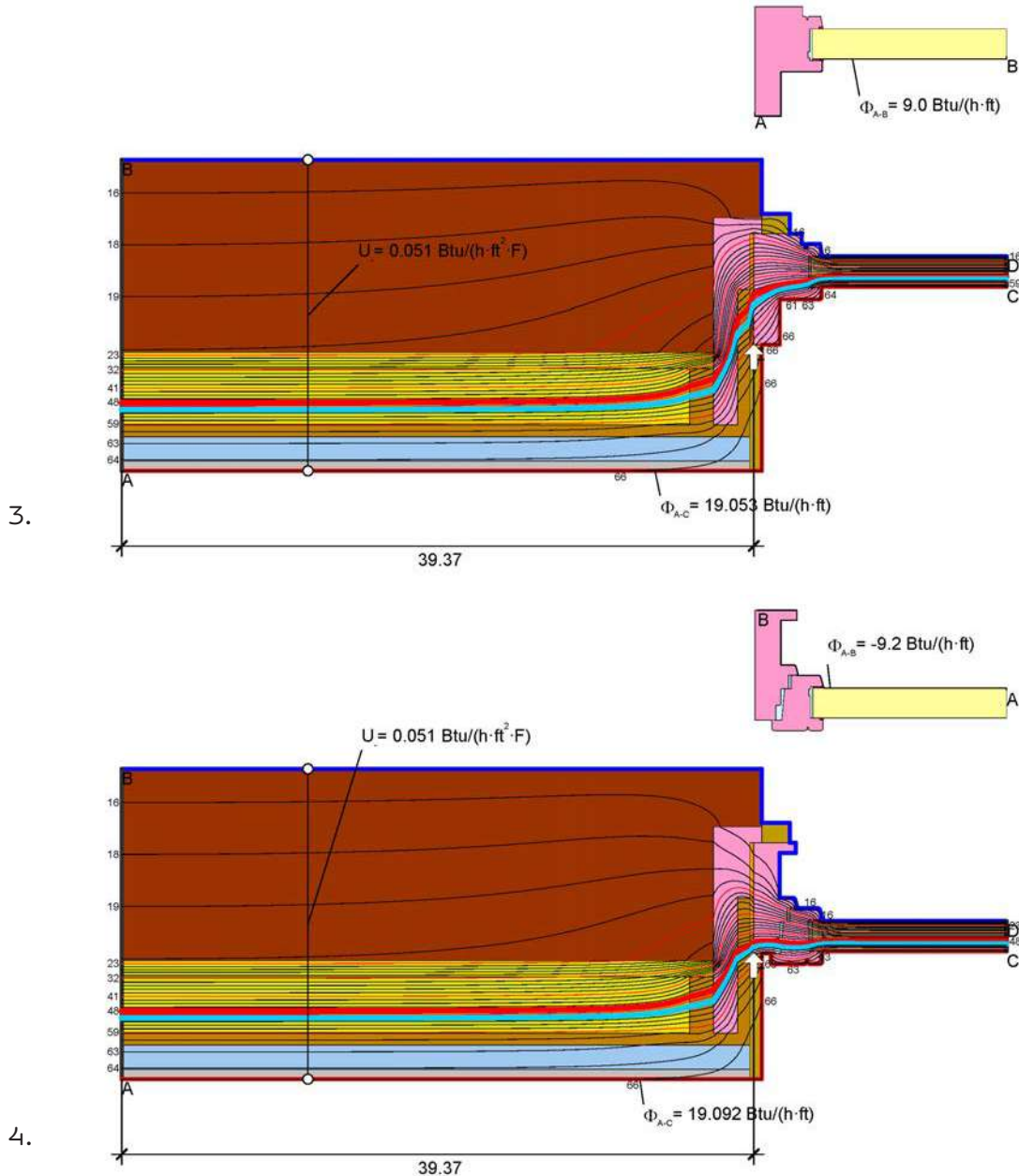
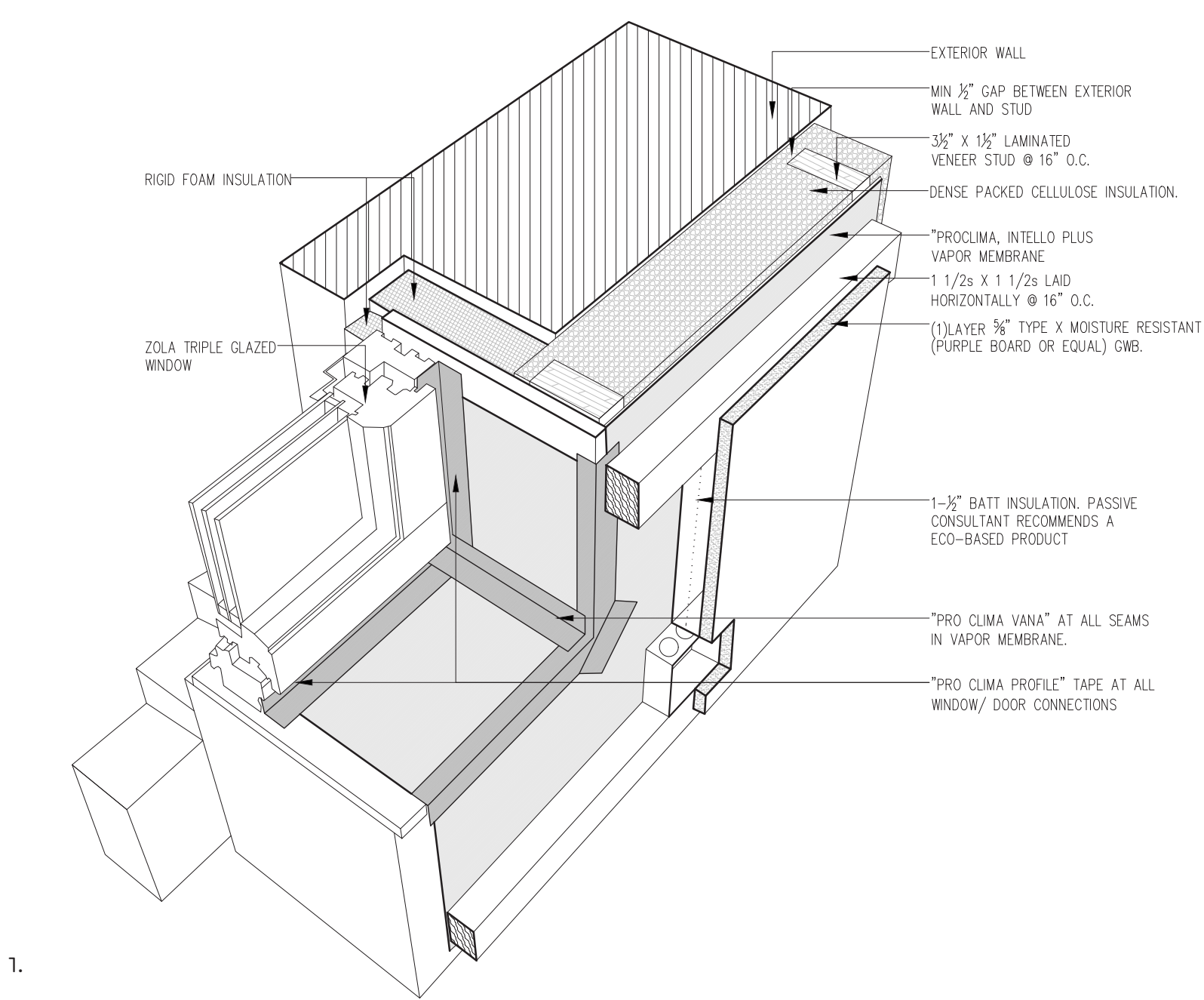
Boundary Condition	$q[\text{Btu}/(\text{h}\cdot\text{ft}^2)]$	$\theta[\text{F}]$	$h[\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot\text{F})]$	$\epsilon$
Exterior, ventilated	14.000		1.355	
Interior, heat flux, upwards	68.000		1.761	
Symmetry/Model section	0.000			

Material	$\lambda[\text{Btu}/(\text{h}\cdot\text{ft}\cdot\text{F})]$	$\epsilon$
Air layer, unventilated, upwards, thickness: 40 mm	0.144	
Cellulose (Denspack) [R-3.7/in]	0.023	0.900
GWB (Typ) [R-0.85/in]	0.098	0.900
Plywood (Typ) [R-1.2/in]	0.069	0.900
Polyiso w Metal Fasteners [R-5.7/in]	0.015	0.900
Wood, Coniferous (Softwood) [R-1.03/in]	0.081	0.900

1. WALL TYPE #6: NEW CMU WALL W/ EXTERIOR FOAM INSULATION
2. WALL TYPE #7: NEW STEEL STUD WALL W/ EXTERIOR FOAM INSULATION
3. NEW ROOF: WOOD JOIST W/ EXTERIOR FOAM INSULATION

WINDOW DETAILS



Boundary Condition	$q$ [Btu/(h·ft²)]	$\theta$ [°F]	$h$ [Btu/(h·ft²·F)]	$\epsilon$
Exterior, normal	14.000	4.403		
Interior, normal, horizontal	68.000	1.355		
Symmetry/Model section	0.000			

Material	$\lambda$ [Btu/(h·ft·F)]	$\epsilon$
Air layer, unventilated, horizontal, thickness: 40 mm	0.128	
Brick (Common) [R-0.2/in]	0.416	0.900
Stone [R-0.1/in]	0.023	0.900
Cellulose (Denspack) [R-3.7/in]	0.023	0.900
GWB (Typ) [R-0.85/in]	0.098	0.900
Panel	0.020	
Plywood (Typ) [R-1.2/in]	0.069	0.900
Stone [R-0.1/in]	0.830	0.900
Wd Stud, Cellulose, 16in OC [R-2.93/in]	0.028	0.900
Wood, Coniferous (Softwood) [R-1.03/in]	0.081	0.900
XPS, [R-5.0/in]	0.017	0.900
Zola Aluminum	92.446	0.900
Zola Elastomeric Foam, Flexible	0.029	0.900
Zola Lodgepole Pine	0.064	0.900
Zola Silicone	0.202	0.900
ccSPF [R-6.5/in]	0.013	0.900
Unventilated air cavity *		

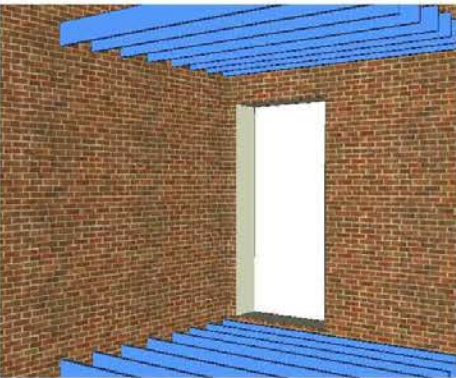
\* Simplified approach

1. WINDOW INSTALL DETAIL - AXON
2. WINDOW INSTALL DETAIL - PLAN + SECTION
3. WINDOW JAMB (FIXED) THERMAL ANALYSIS
4. WINDOW JAMB (OPERABLE) THERMAL ANALYSIS
5. WINDOW HEAD THERMAL ANALYSIS
6. WINDOW SILL THERMAL ANALYSIS

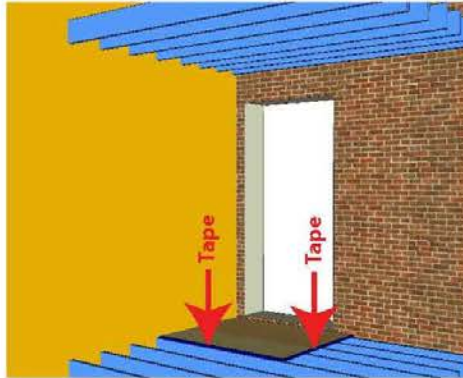
# ENTRY RETROFIT AIR SEALING DETAILS

sg.BUILD

PH Historic Retrofit: Interior Air-tight Vestibule Door Step-by-Step




**Start- Raw wall and joist**



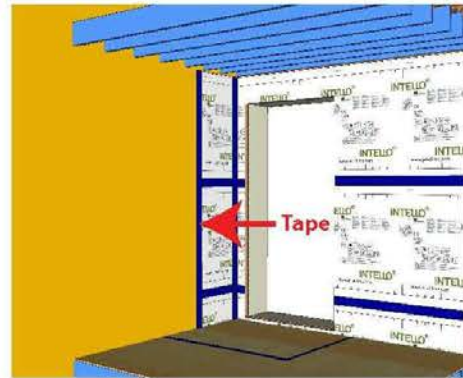
**Step #1**

- Air seal party wall with Sto liquid elastomeric paint.
- Install sub-floor with dimensions 6-10" larger than the outside dimensions of vestibule framing
- Apply tape to edge of floor plywood (see arrows)



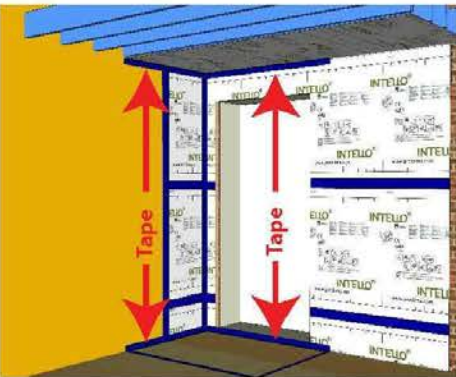
**Step #2**

- Install exterior wall framing
- Install remaining sub-floor. (No need for edge taping.)




**Step #3**

- Install air-seal membrane across framing with all connections to party wall and seams complete.




**Step #4**

- Install air-seal membrane to underside of ceiling joists. Same size as sub-floor plywood below.
- Tape sub-floor and ceiling to party wall and front wall membrane



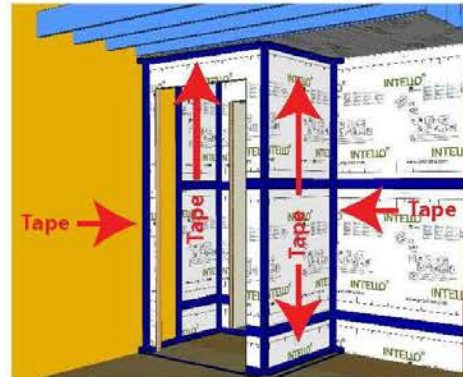
**Step #5**

- Install framing per plan



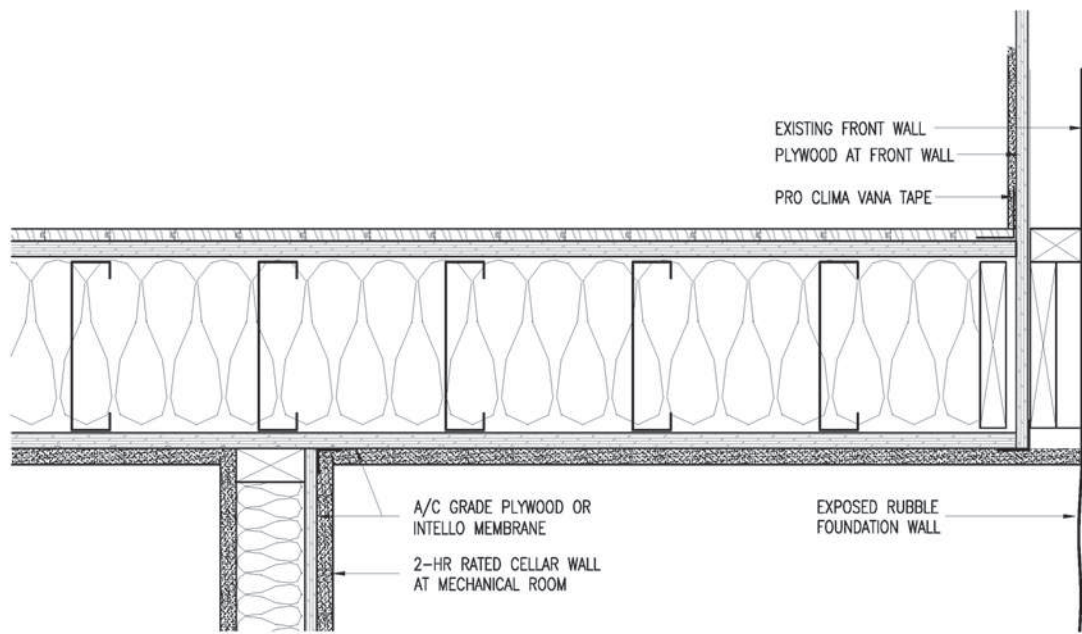
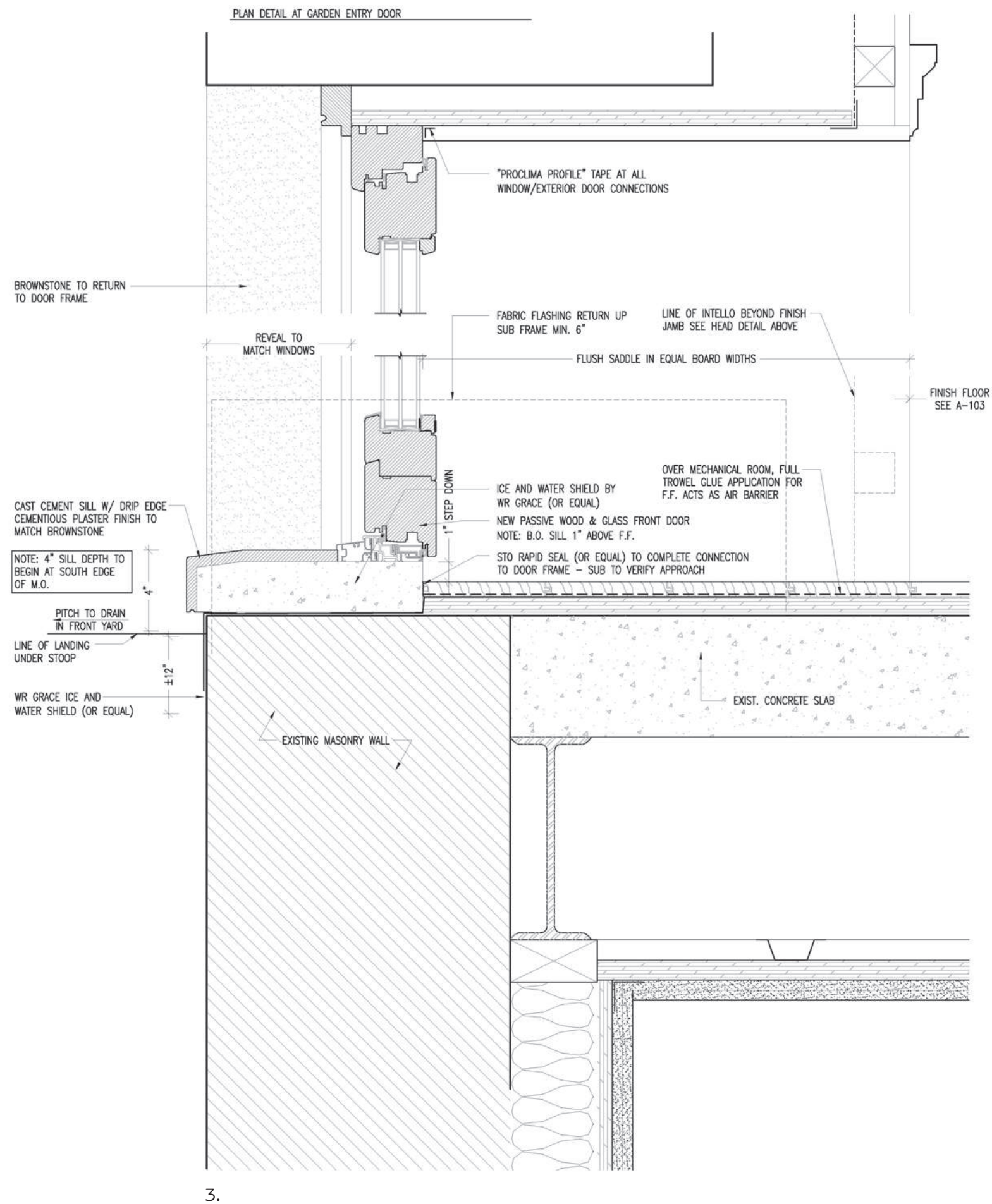
**Step #6**

- Install air seal membrane to face of framing

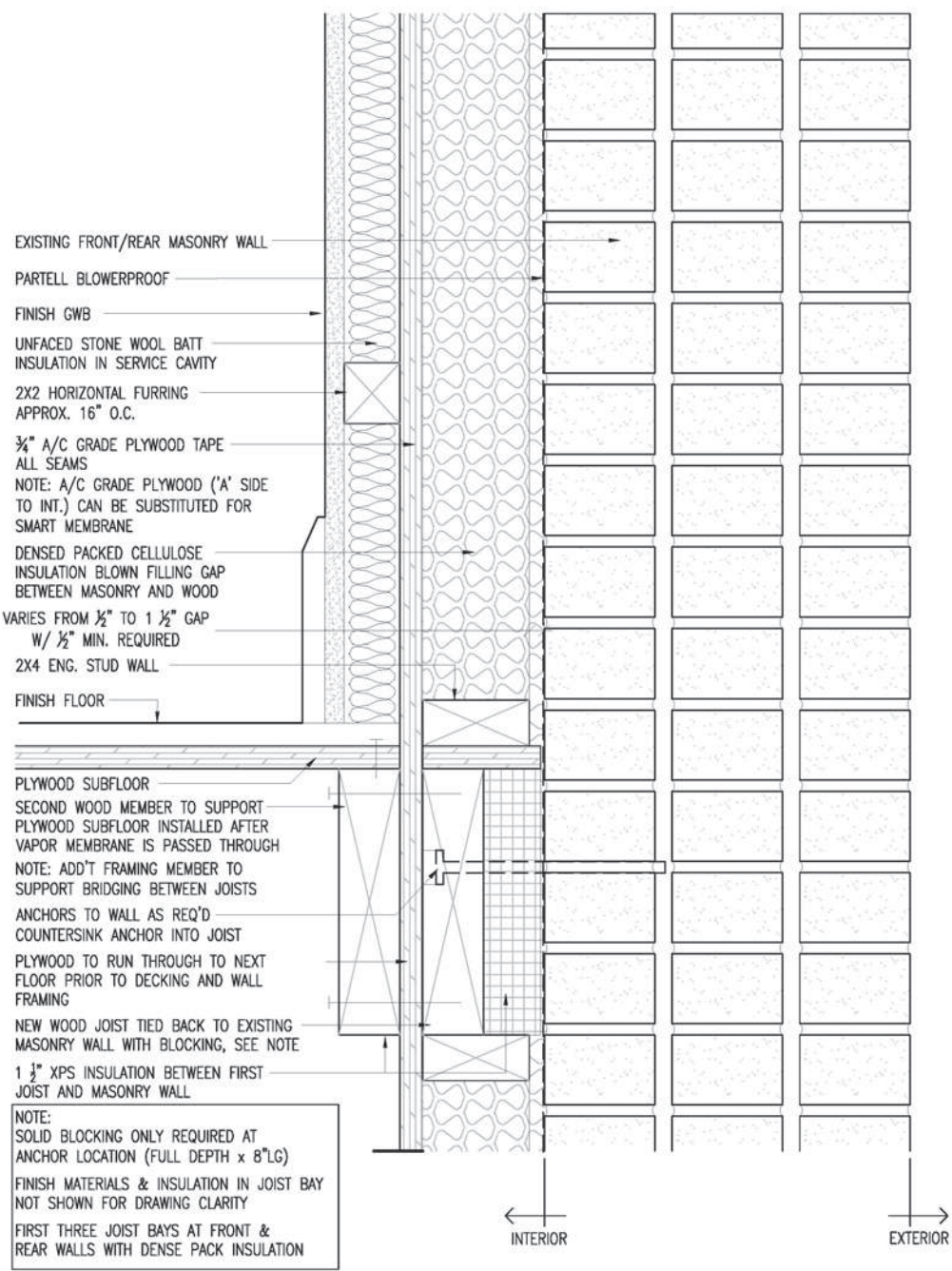


**Step #7**

- Complete tape connections between membrane and:
  - Front wall
  - Party wall
  - Sub-floor
  - Ceiling mounted membrane
- And tape all seams



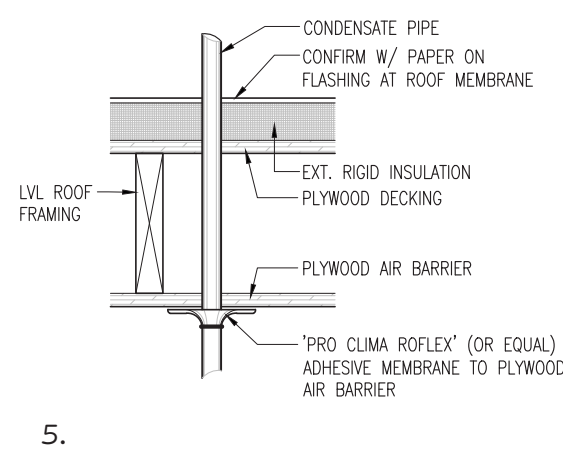
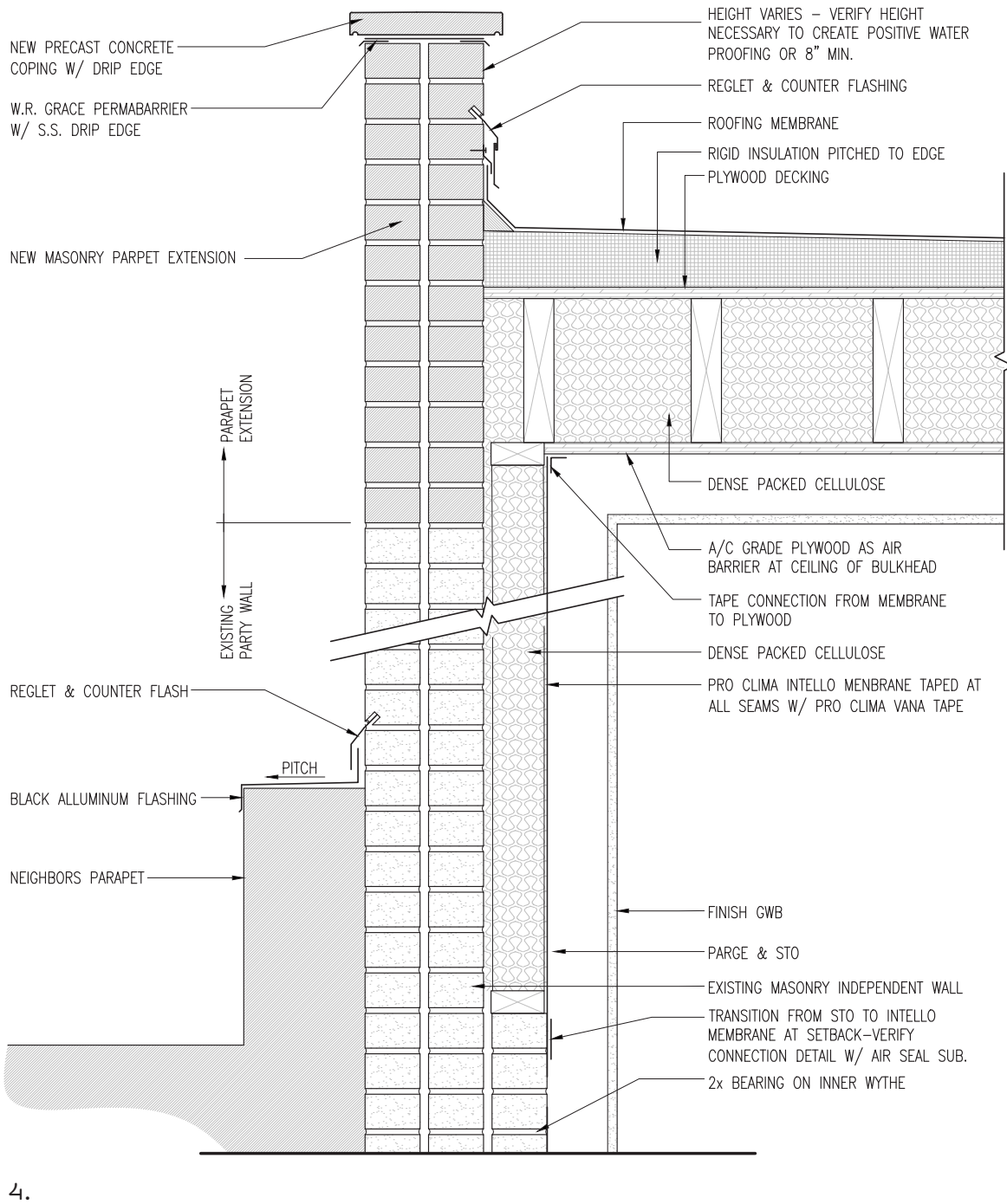
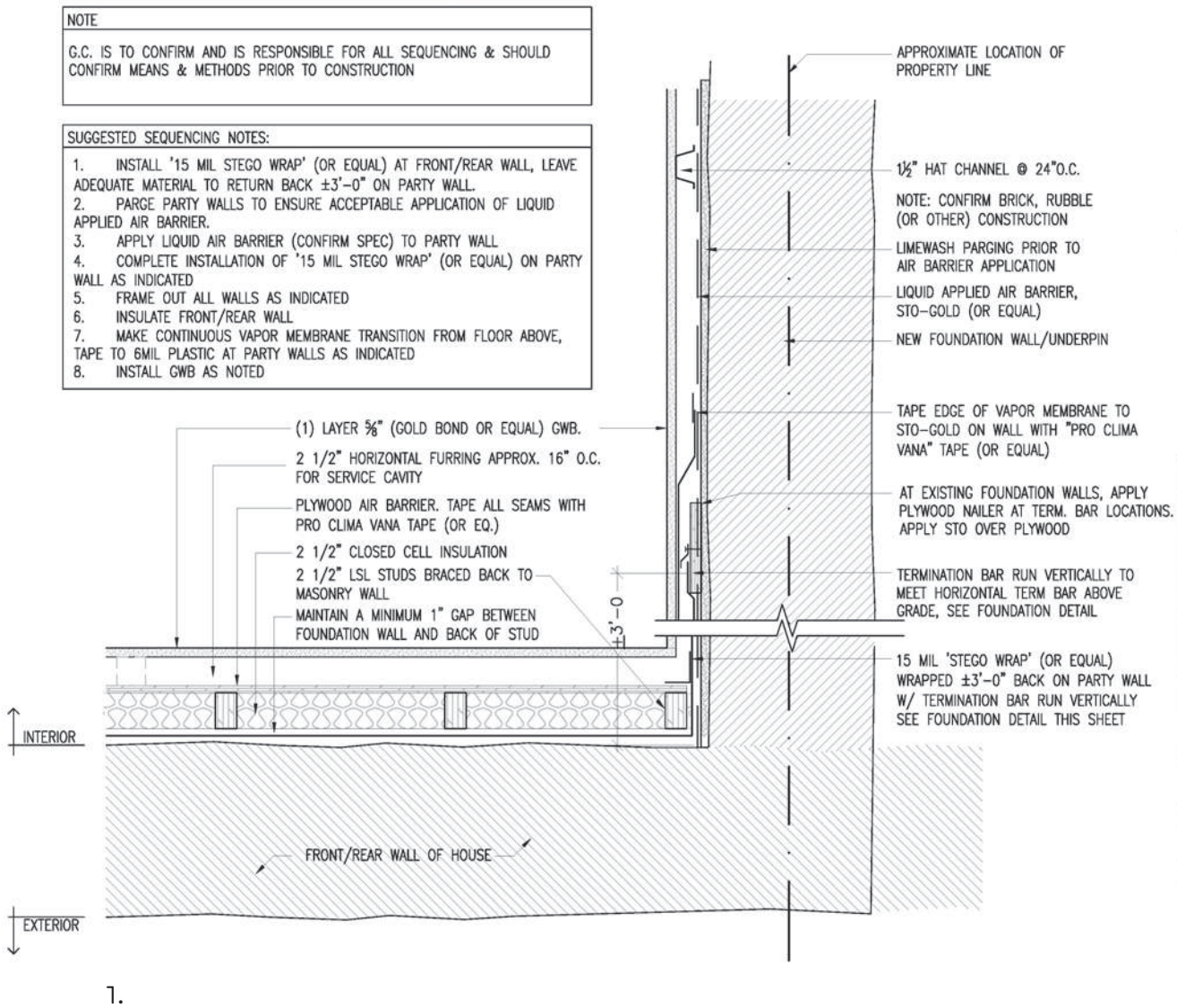
1. VESTIBULE AIR-TIGHTNESS DIAGRAM
2. FRONT + REAR WALL SECTION DETAIL - AIR SEALING AROUND FIRST FLOOR JOIST
3. ENTRY DOOR + VESTIBULE DETAIL
4. AIR-SEALING DETAIL BETWEEN FLOORS THAT SEPARATE APARTMENTS



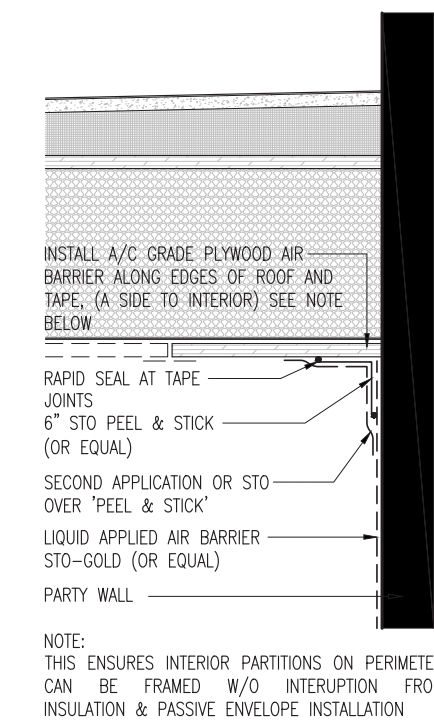
2.

4.

# MASONRY RETROFIT DETAILS

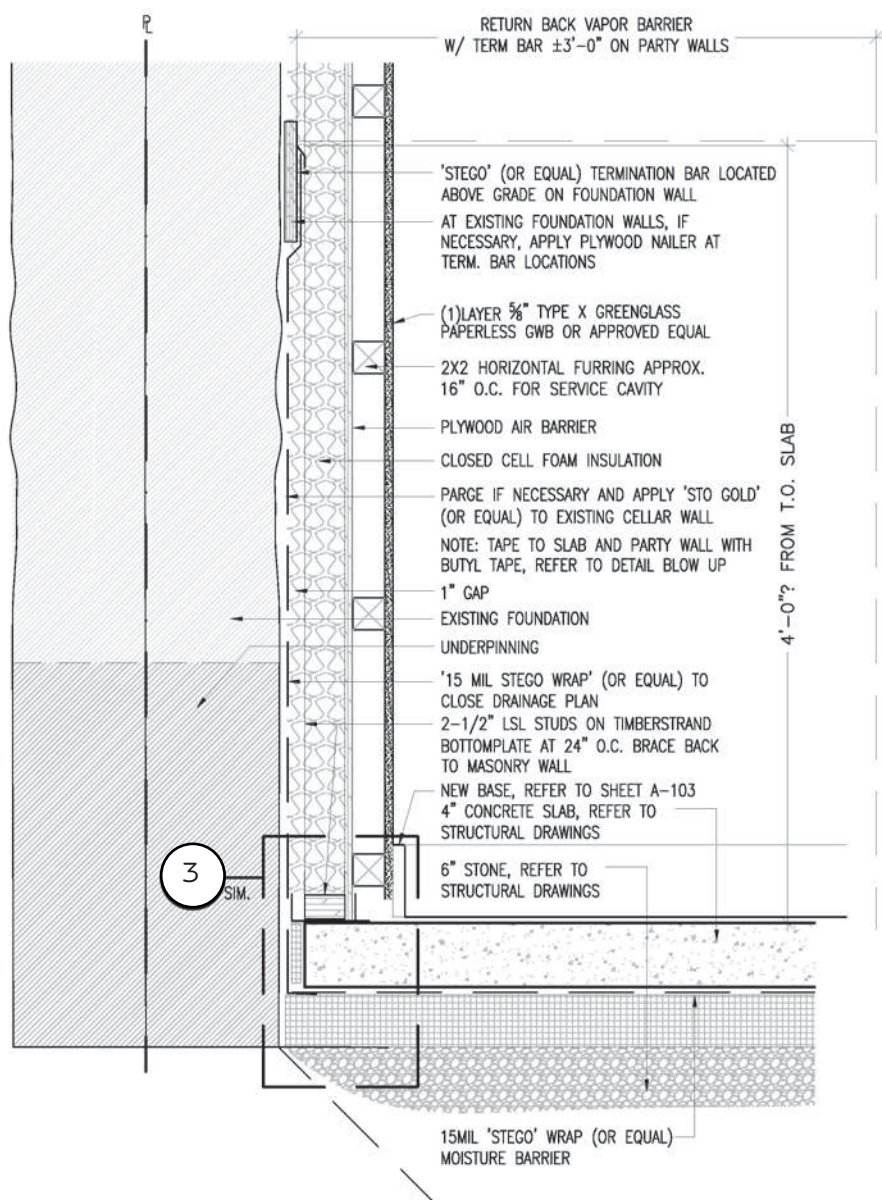


5.

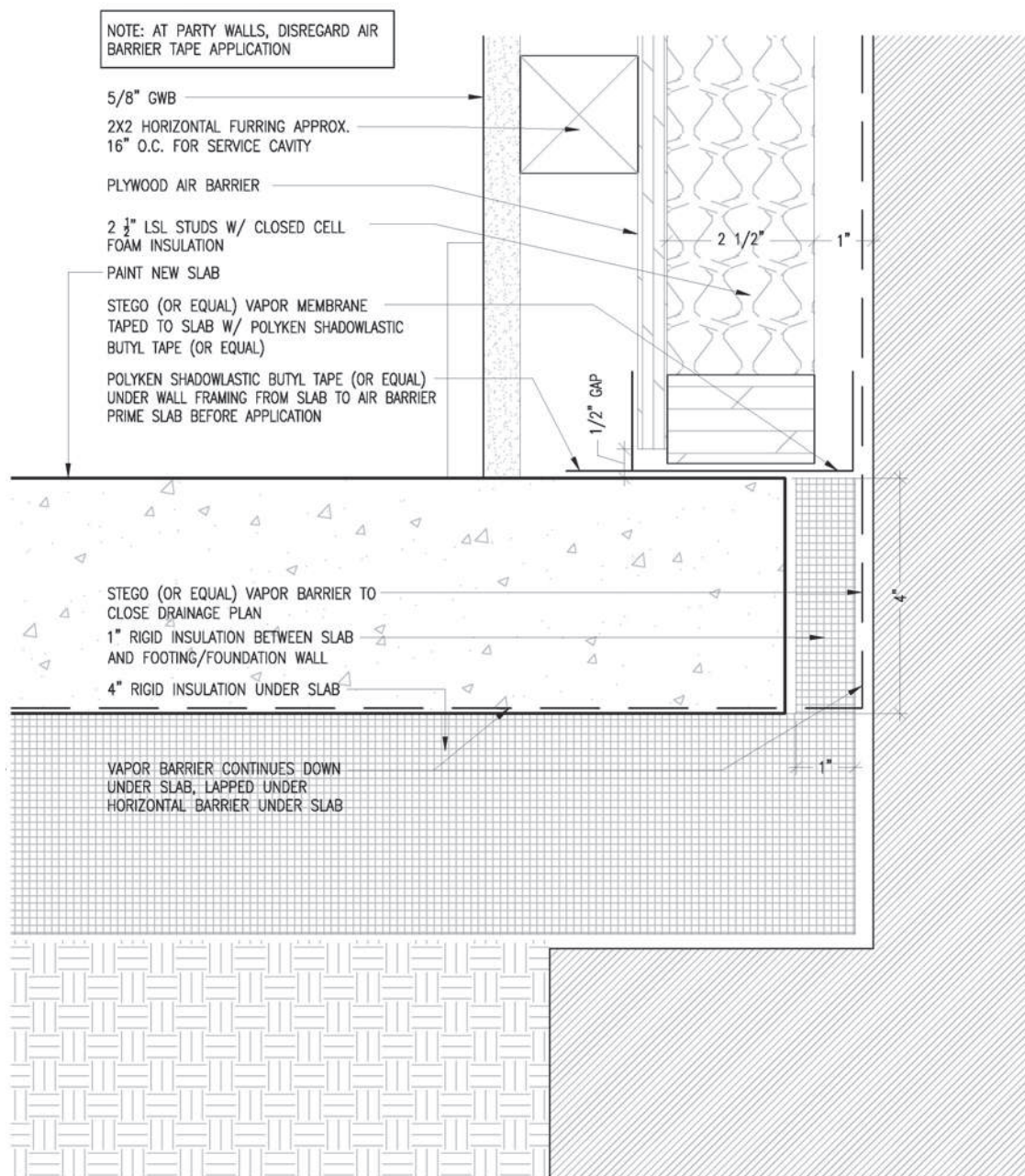


**NOTE:**  
THIS ENSURES INTERIOR PARTITIONS ON PERIMETER CAN BE FRAMED W/O INTERRUPTION FROM INSULATION & PASSIVE ENVELOPE INSTALLATION

6.



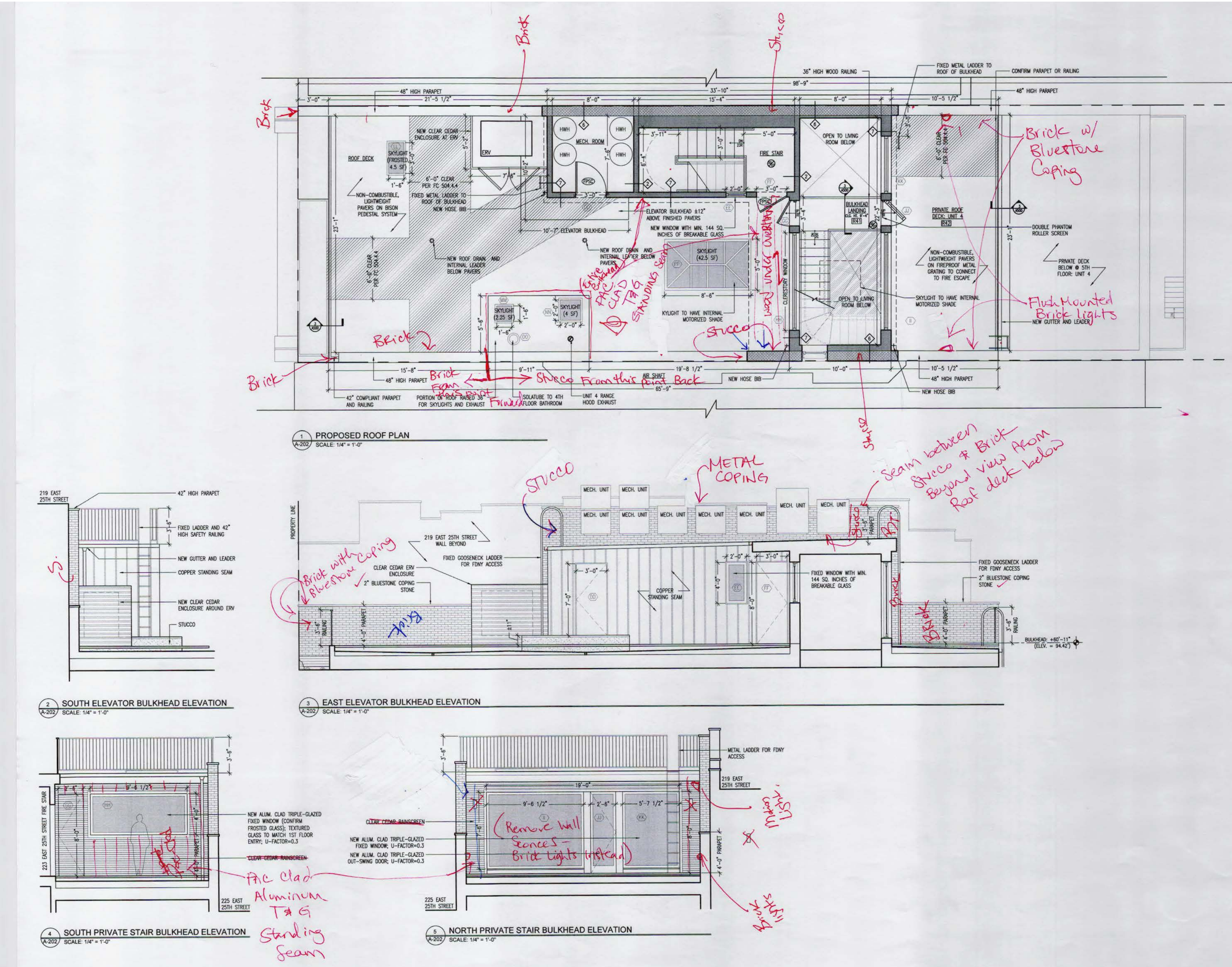
2.



3.

1. BELOW GRADE FOUNDATION WALL PLAN DETAIL
2. BELOW GRADE FOUNDATION WALL SECTION
3. BELOW GRADE SLAB/WALL SECTION DETAIL
4. PARTY WALL ROOF + PARAPET SECTION DETAIL
5. PIPE PENETRATION @ ROOF DETAIL
6. PARTY WALL / ROOF CONNECTION DETAIL

# NEXT STEPS & VALUE ENGINEERING





THANK YOU!

BAXT | INGUI  
Architects PC



# Site

197 North Miller Street



## Business Case

- 1) **Scarcity** of readily available **affordable housing** gives confidence in demand
- 2) **Negligible property costs** to drive down capital requirements
- 3) Existing building stock of **structurally sound** buildings in need of renovation
- 4) Owner-paid utility model to **turn utility cost savings into income**.

This combination of factors is **common in Newburgh, NY** and other financially distressed areas, this project can serve as an example to be **replicated by other developers and lenders**.



Project meets all performance standards for  
**PHIUS+ 2018** Passive House Certification



Project achieves a **Source Zero** designation  
(Primary Energy of 0 kWh/person.yr)

11,234 kWh/yr **On-Site Solar generation**



Project meets all **Energy Star** requirements  
for reduced energy consumption

**High Performance Tri-paned**  
windows and doors

**Airtight** building envelope

**Super-insulated** assemblies and  
**thermal bridge-free** construction



Project meets all **Energy Star** requirements  
for reduced energy consumption

**High efficiency** mini split heat pump  
cooling and heating at each unit

Balanced **Heat Recovery Ventilation**  
provides filtered fresh air at high efficiencies



Project meets all **EPA airPLUS**  
requirements for vapor control, air  
quality and radon mitigation

**Heat pump hot water** heater with  
'on command' recirculation at each unit



Plumbing system conforms with all  
**EPA Watersense** criteria



**±C**



**PHIUS+ SOURCE ZERO**

**0 kWh/person.yr**

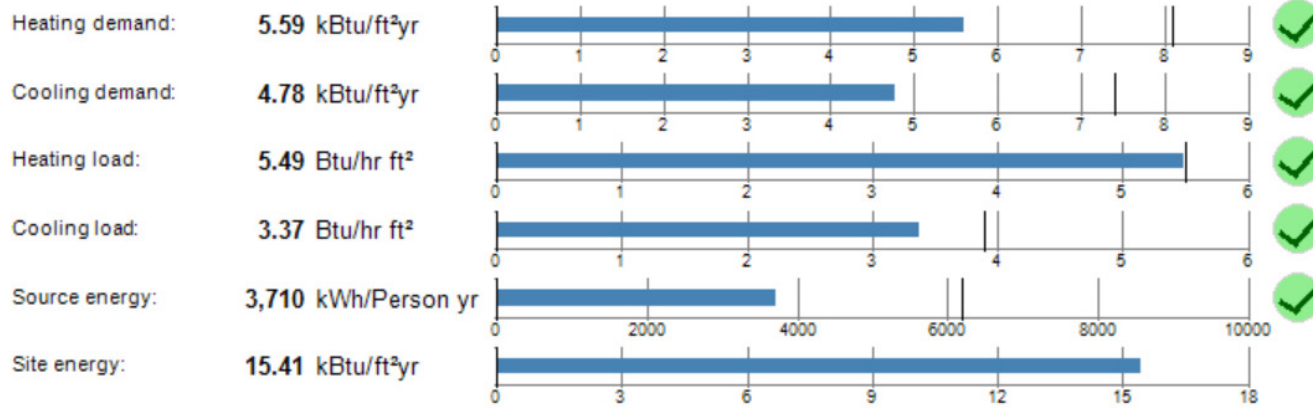


**+ Renewables**

**NORTHEAST**  
PROJECTS

**North Miller Passive**  
**Newburgh, NY**

## Project As Designed (PHIUS+ 2018)

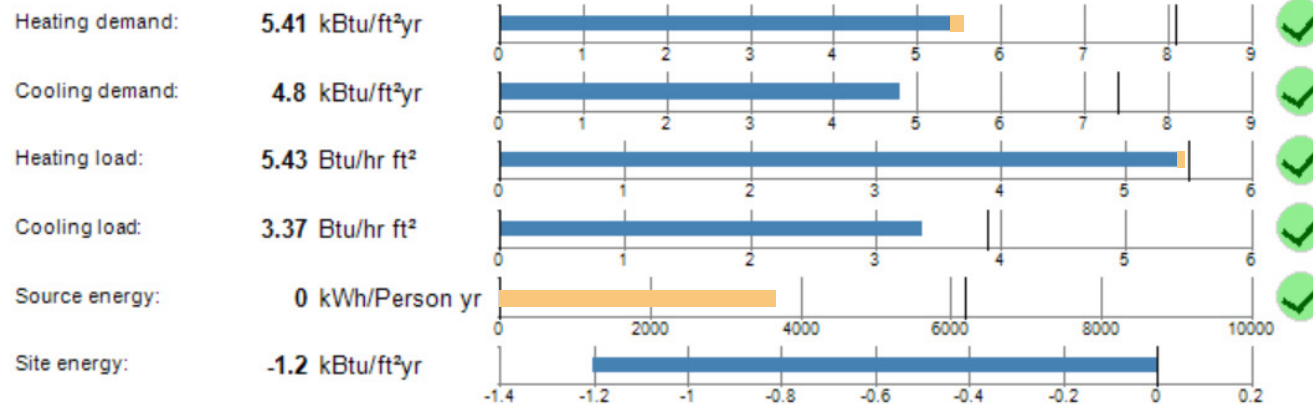


### As Designed:

- PHIUS+ 2018 certification
- Offsite Photovoltaics to satisfy source energy requirement
- Heat recovery ventilation system
- No post-occupancy monitoring



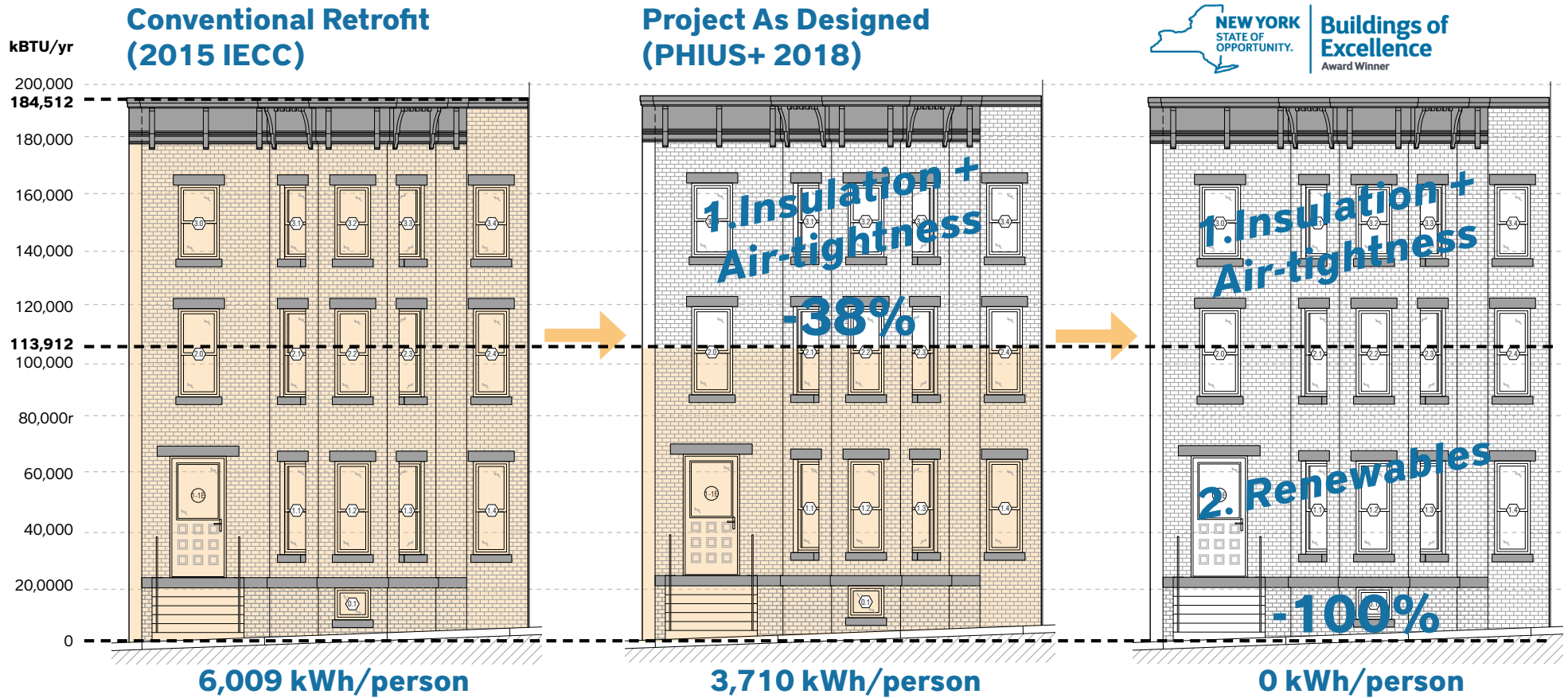
**Buildings of Excellence**  
Award Winner



### As Improved:

- PHIUS+ 2018 + **Source Zero**
- Offsite Photovoltaics + **Maximum Onsite Photovoltaic roof array**
- Upgrade to ERV
- Post-occupancy monitoring protocol
  - **Site Sage** electricity use
  - **Temperature / RH** sensors
- Information Broadcasting protocol

# The Path to Zero



# Step 1: Insulation & Air-tightness

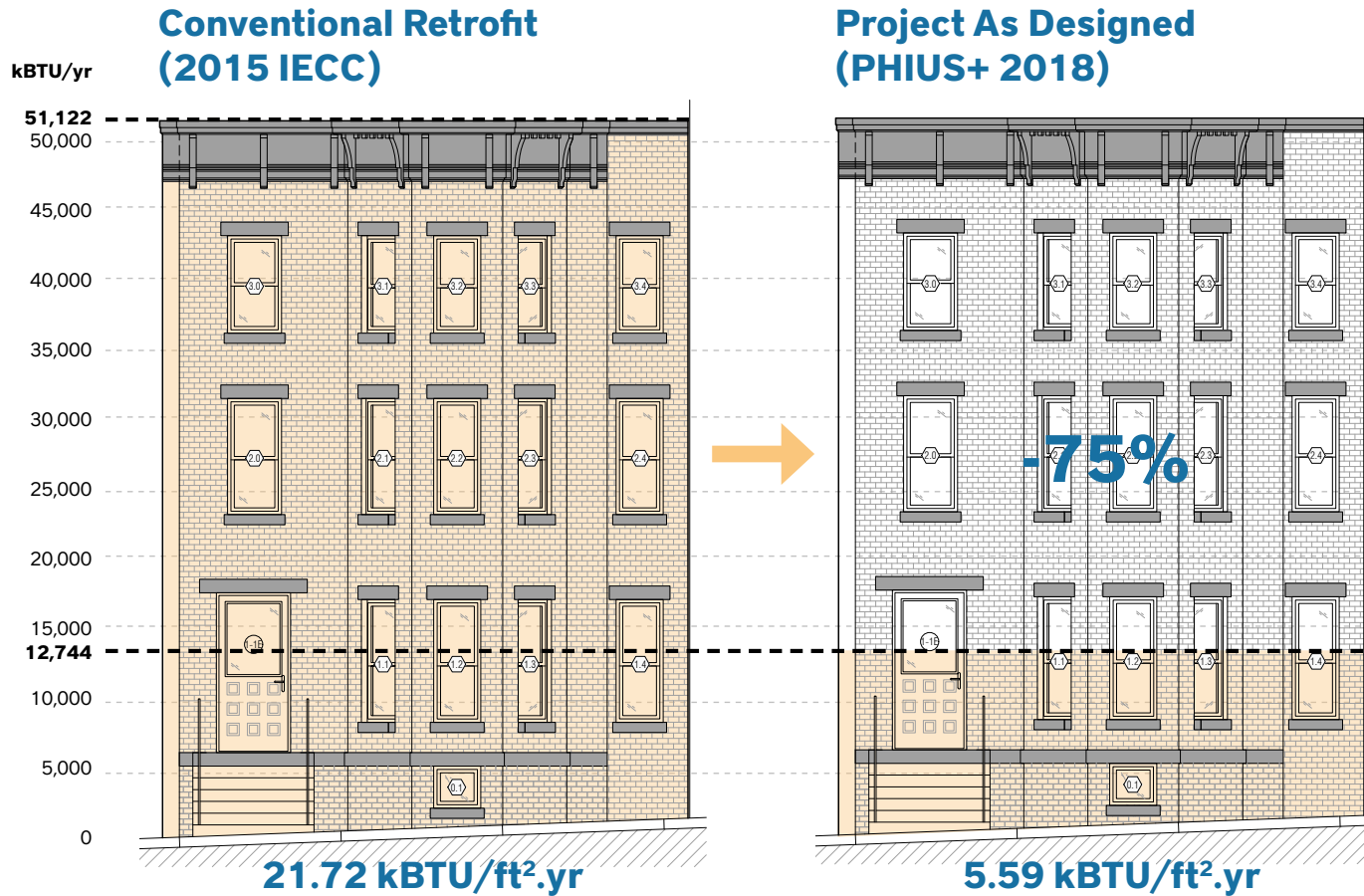
## Annual Heating Demand

### Insulation Levels

- R49 Ceiling
- R17 Walls
- R30 Floor

### Airtightness

- .4 cfm/ft<sup>2</sup>



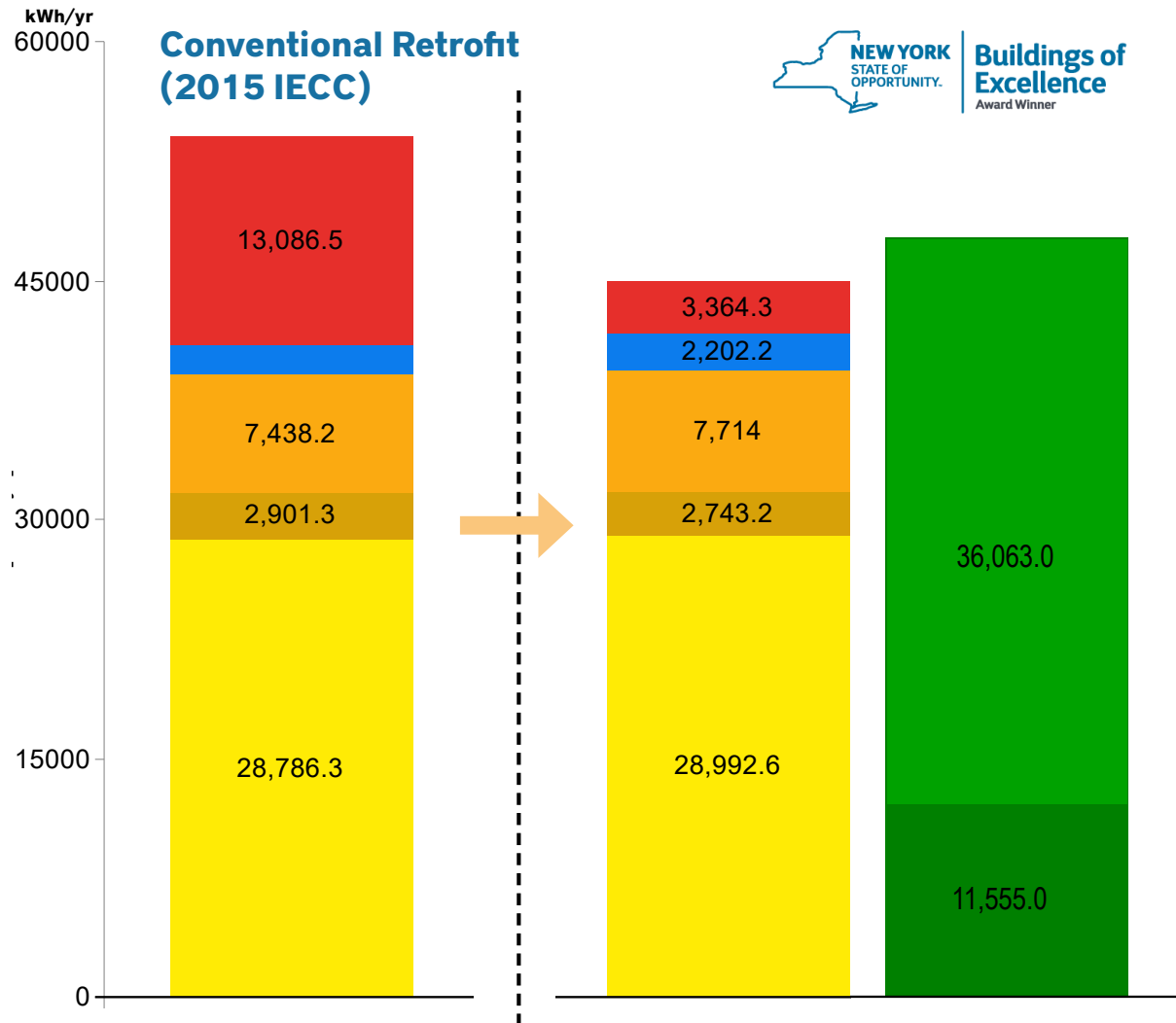
## Step 2: Add Renewables

kWh/yr



# Step 2: Add Renewables

kWh/yr

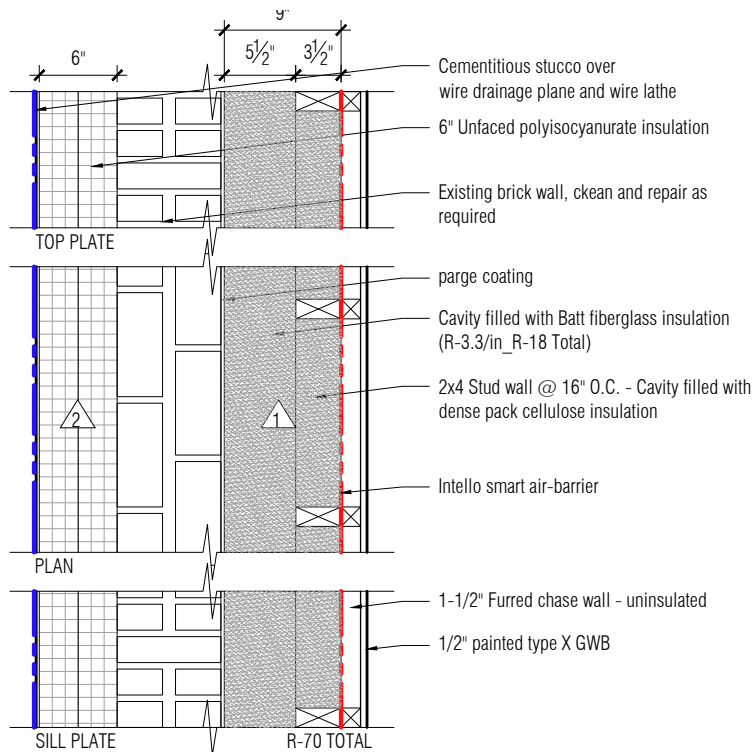


# ***Field Conditions***



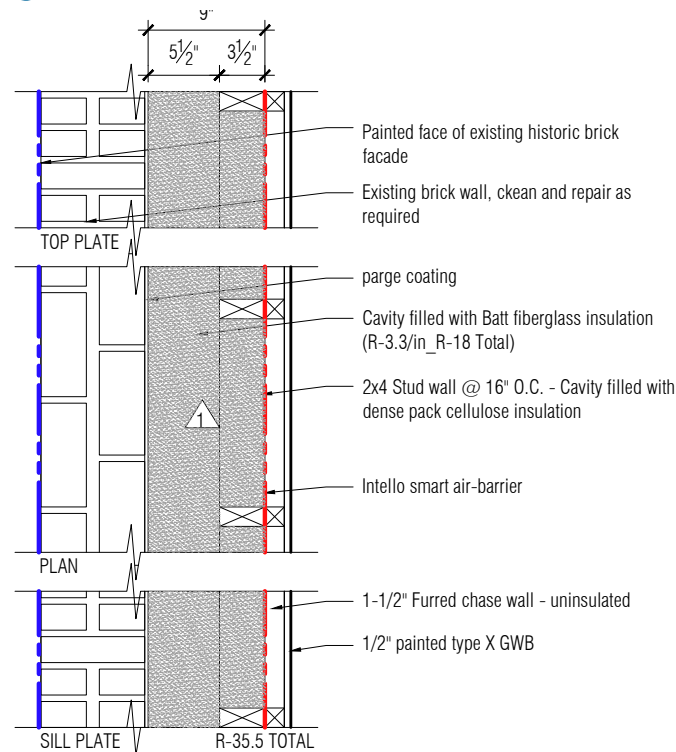
# Retrofit Assemblies

## South Wall



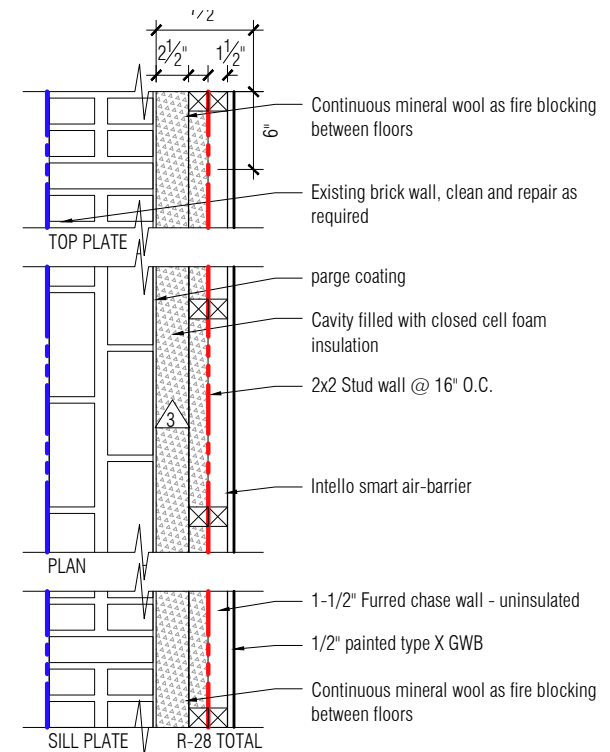
**R70**

## Typical Wall



**R35**

## Thin Wall



**R28**



Patches of existing plaster were left



New lime plaster coat



Spray applied Visconn is seemingly the magic solution



Spray-applied air barrier covers inconsistent surfaces and inside corners easily

Visconn sprays on blue and dries black



Adhesion on type O plaster -  
Visconn chips right off



Sistering of two different types of dimensional lumber

Tape origami around pocket beams





Dissimilar framing members  
and air-sealing come into  
conflict



3/8" Hole drilled between beams and filled with expanding foam

### **Blower Door 01:**

310 cfm total  
.056 cfm/ft<sup>2</sup>

2x4 strapping installed before first blower door test

Air leaking around 2x4 strapping



**Blower Door 02:**  
227 cfm total  
.041 cfm/ft<sup>2</sup>





**Blower Door 03:**  
195 cfm total  
.035 cfm/ft<sup>2</sup>





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**±C**



**PHIUS+ SOURCE ZERO**

**0 kWh/person.yr**

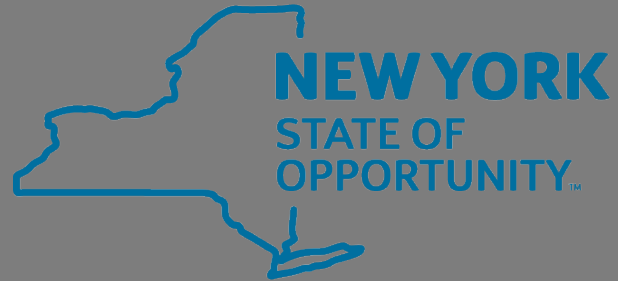


**+ Renewables**

**NORTHEAST**  
PROJECTS

**North Miller Passive**  
Newburgh, NY

# discussion.



**NYSERDA**