









- 2 stories + basement
- 1,200 finished SF
- 2 bedrooms
- 1 bath
- 5 people

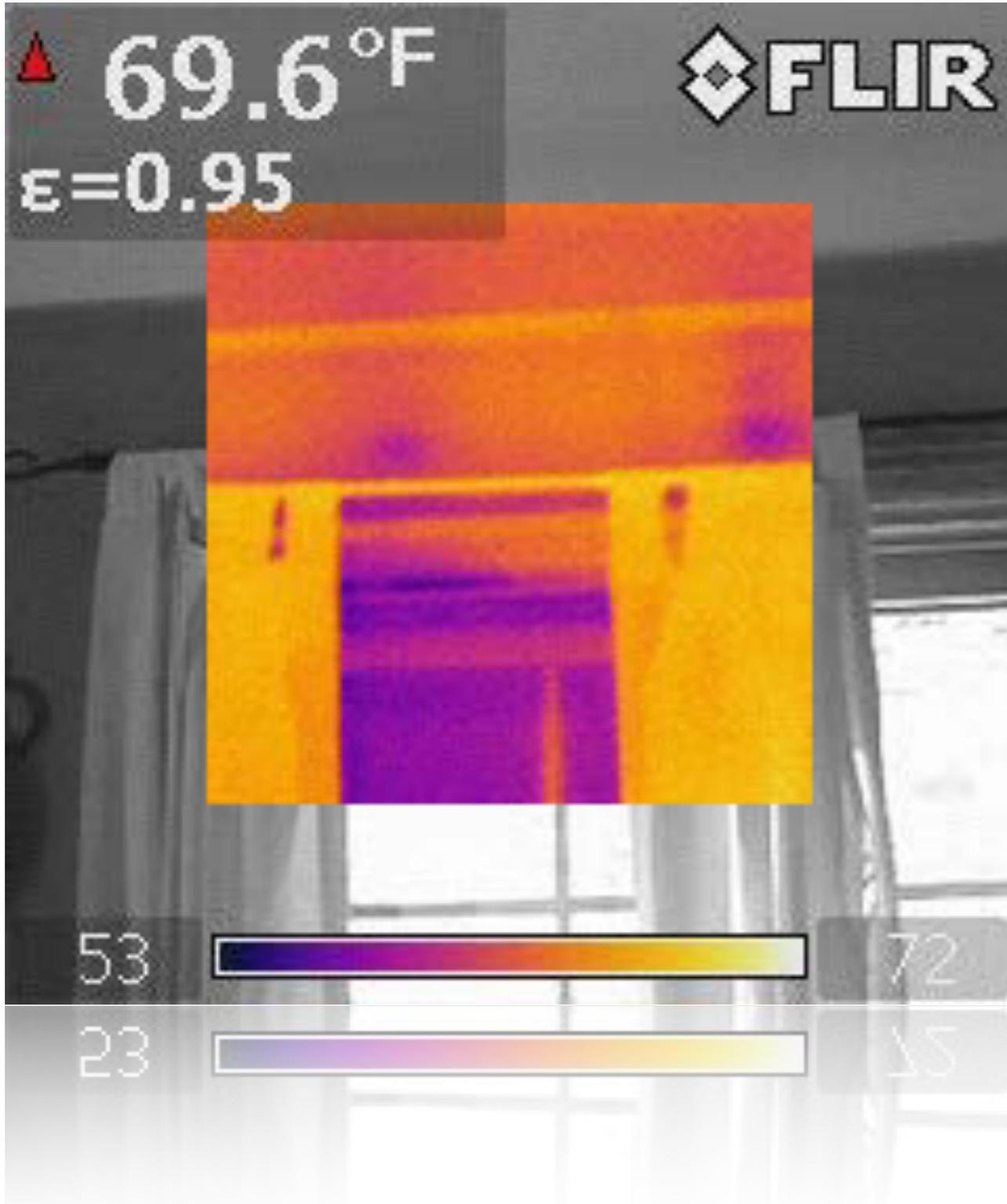




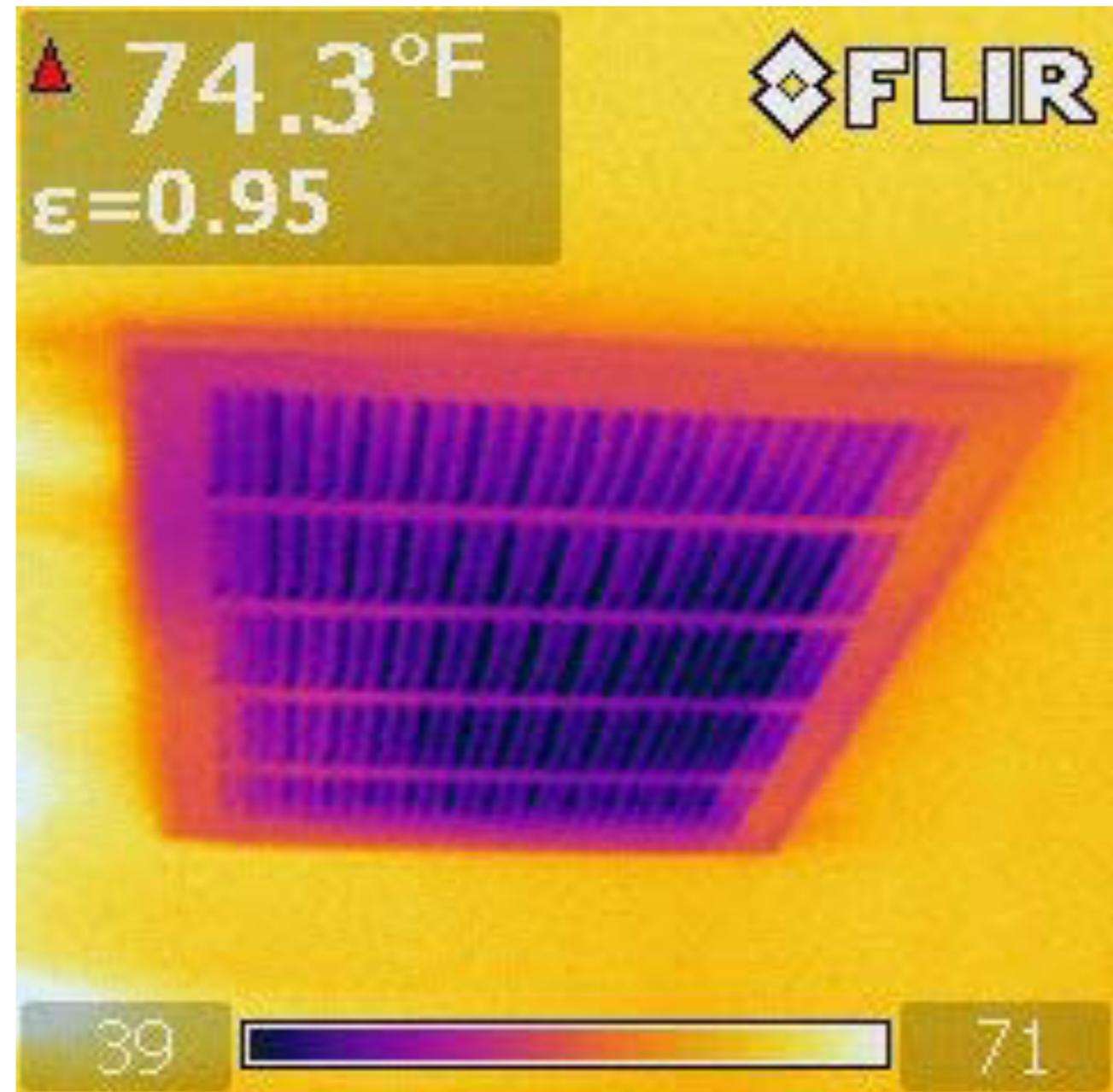
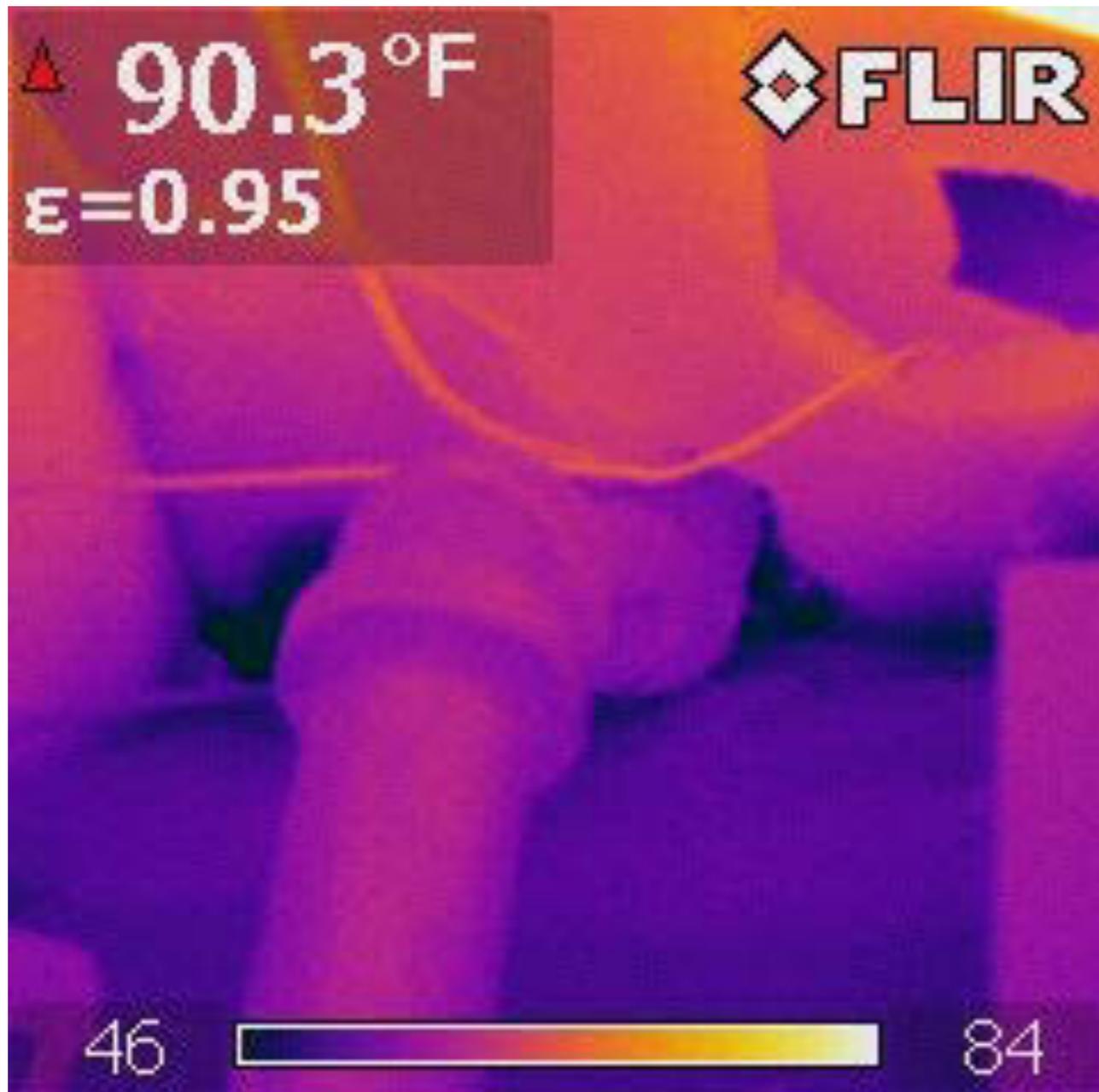
Prior Airport Noise Retrofit



Windows with Storms



Mechanicals



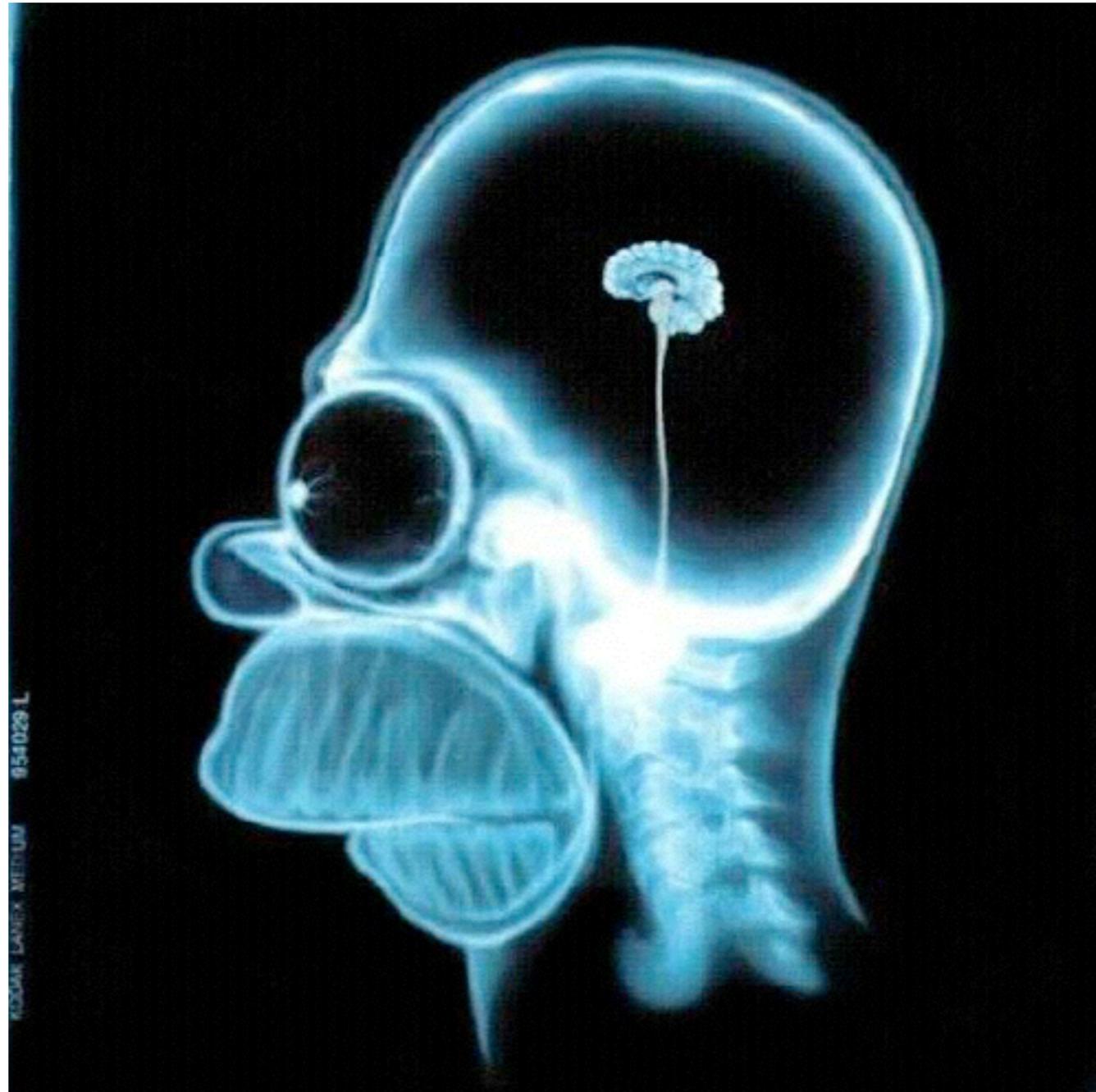


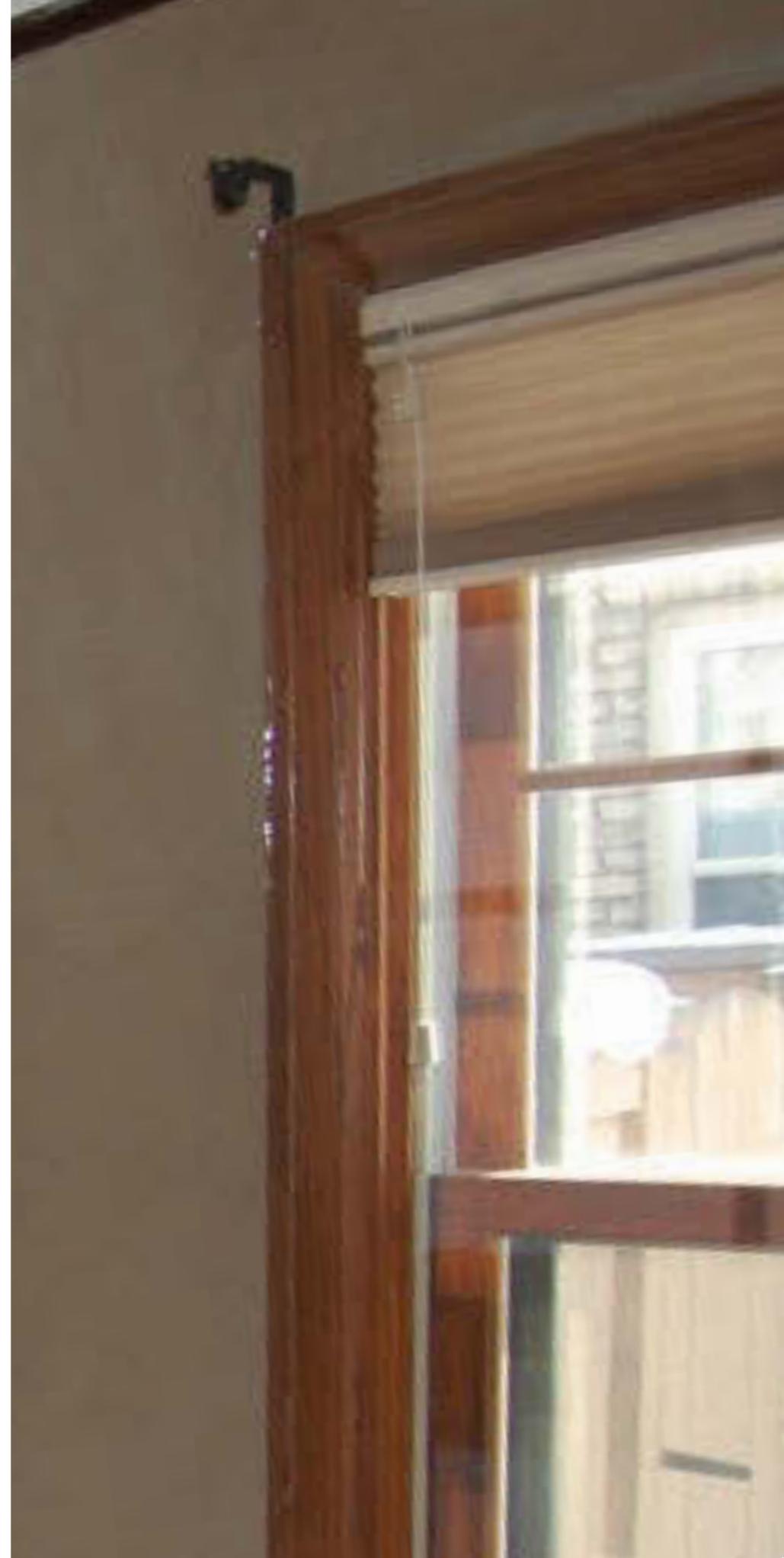
Airtightness

Initial Test

8.5 ACH₅₀ [2,100 CFM₅₀]

Pre-Existing Conditions







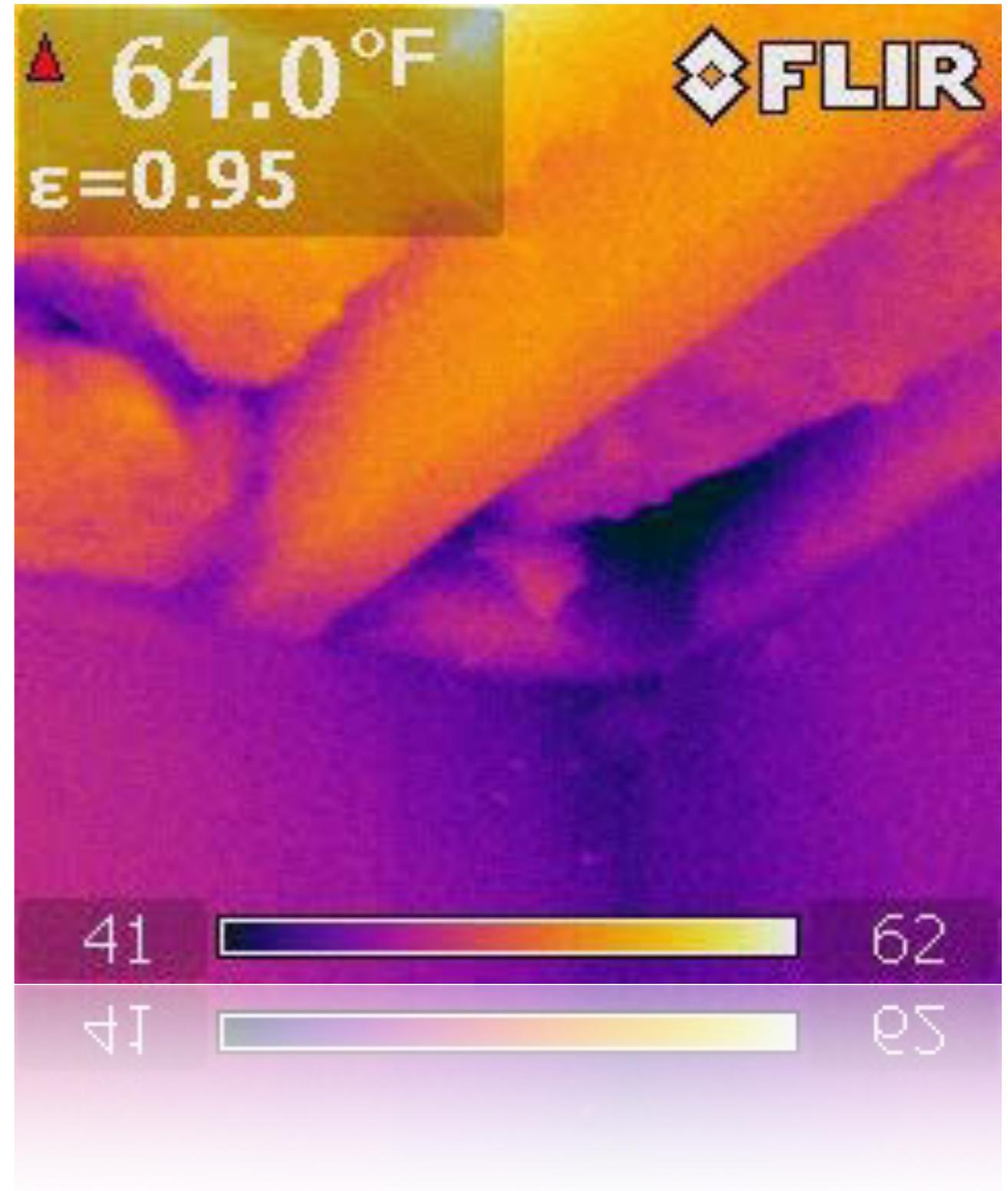
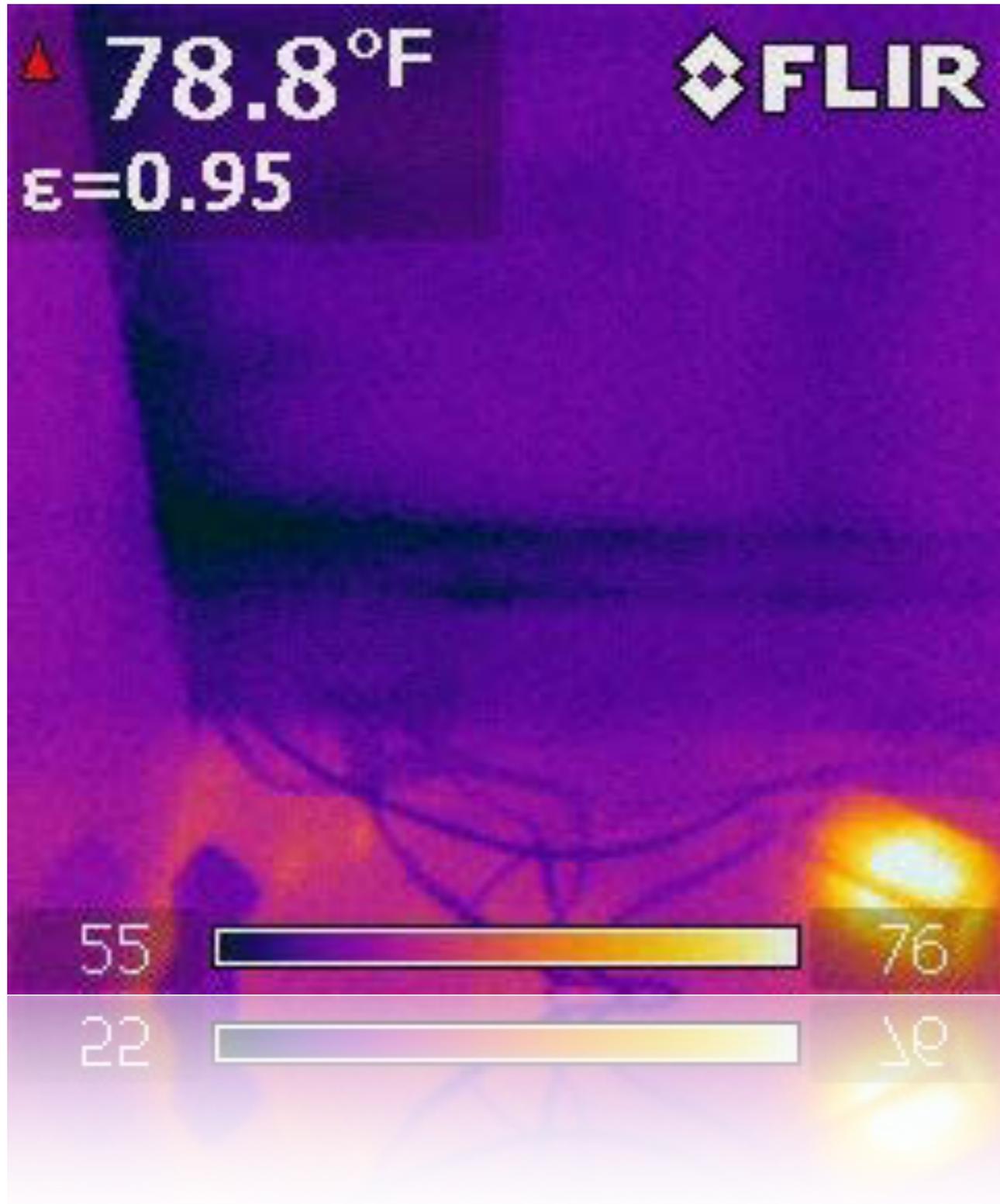
Goal \$1500
Total
- \$5825
- \$044

\$1526.50

War is a Force
That Gives Us
Meaning







So, Where Are We?

- Structure ✓
- Weather Barrier?
- Insulation ✗
- Airtightness ✗
- Moisture Management ✓
- Ventilation/ Air Quality ✗
- Comfort ✗ ✗
- Daylight ✗
- Durability (30 years?)
- Design (Sign of the Times)

Where do we go?

what we need



Image Source: Wikipedia

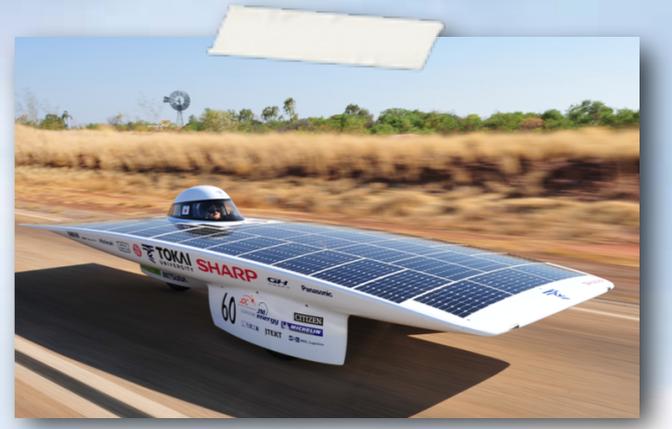
The List

- + 3 Bedrooms
- + 2 Baths
- + Mudroom
- Better kitchen
- Better living areas
- Homeschool room
- Safe stairs
- Weather-tight envelope
- Durable structure
- Healthy interiors
- Comfort & daylight
- Low operating cost
- **Energy performance**



Quality-Approved
Energy Retrofit with
Passive House Components
Dr. Wolfgang Feist

Dr. Wolfgang Feist
Passive House Components
Energy Retrofit with
Passive House Components





Passive House Institute
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64283 Darmstadt
Germany
www.passivehouse.com

EnerPHit and EnerPHit⁺

Certification Criteria for Energy Retrofits with Passive House Components

If an energy retrofit of an existing building meets Passive House criteria (for new builds), it, too, can be certified as a Certified Passive House.

It is, however, often difficult to feasibly achieve the Passive House Standard in older buildings for a variety of reasons. Passive House technology for relevant building components in such buildings does, nevertheless, lead to considerable improvements with respect to thermal comfort, structural longevity, cost-effectiveness over the building lifecycle and energy use.

Buildings that have been retrofitted with Passive House components and, to a great extent, with exterior wall insulation can achieve EnerPHit certification as evidence of both building quality and fulfilment of specific energy values. The EnerPHit⁺ designation is applied if more than 25 % of the opaque exterior wall surface has interior insulation.

How do we get there?



Holistic Energy Reduction Retrofit
≠
Weatherization



Sports car?

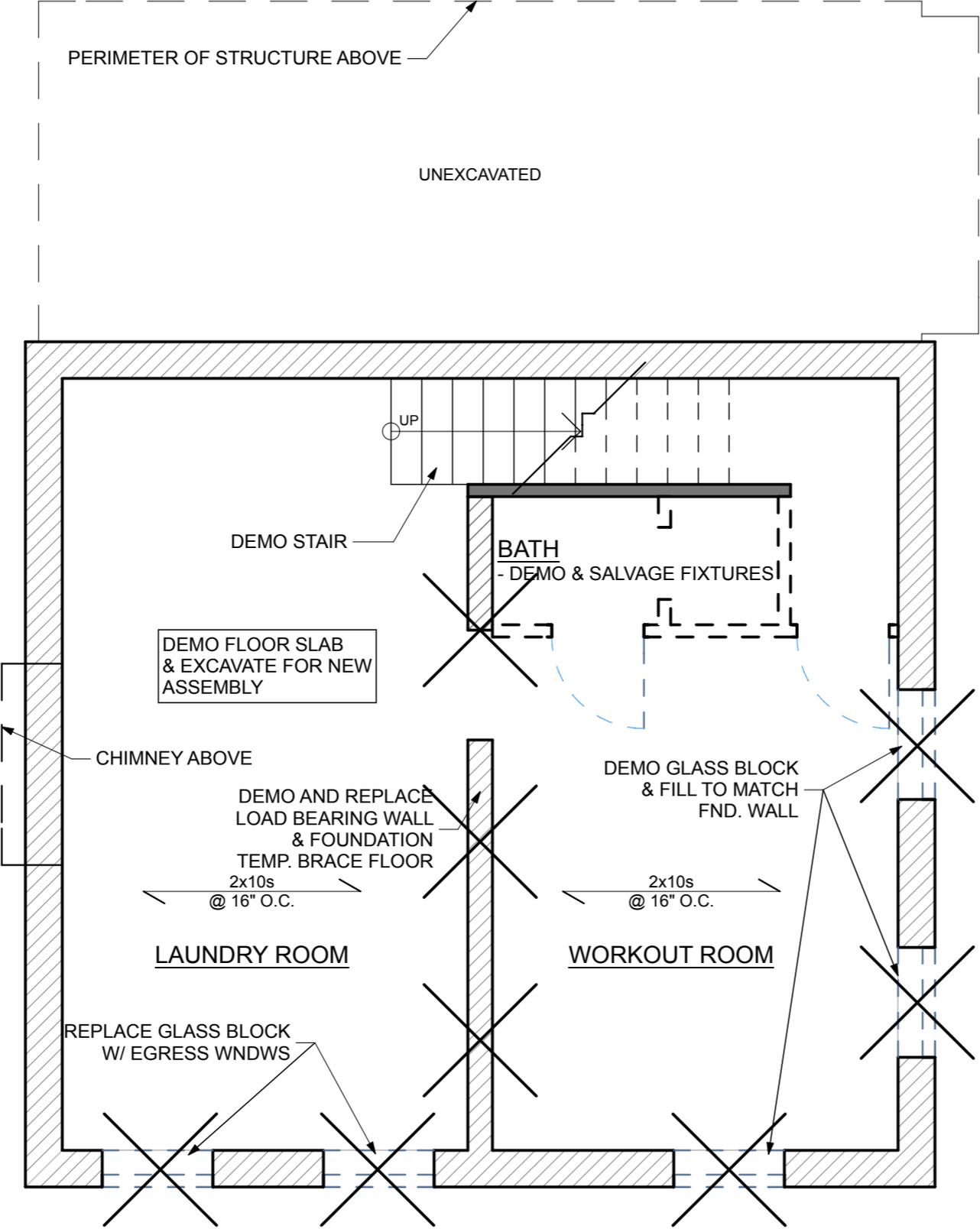
The Plan for Success

- Set goals for performance and design
- Overlay architectural program
- Make the home safe for people (code compliance)
- Control temperature, air, and moisture
- Add ventilation
- Make the envelope air- and weather-tight
- Add continuous insulation to meet the energy goals
- Assess moisture transfer through shell
- Implement robust climate zone-appropriate assemblies
- Reduce energy demand by $2/3$ and air-leakage 10X to meet Passive House retrofit standard (EnerPHit)

The Concept



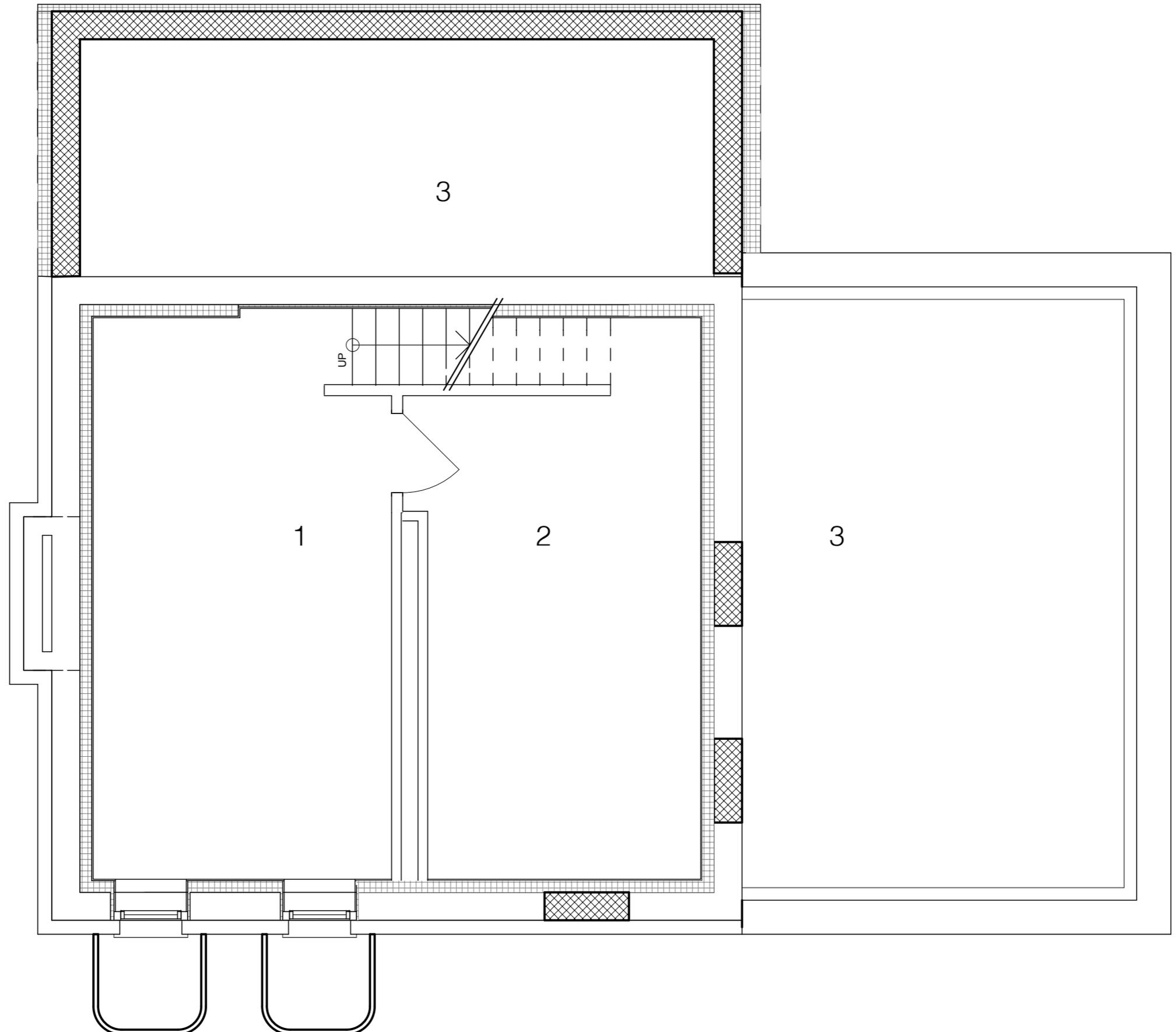
Basement



Basement



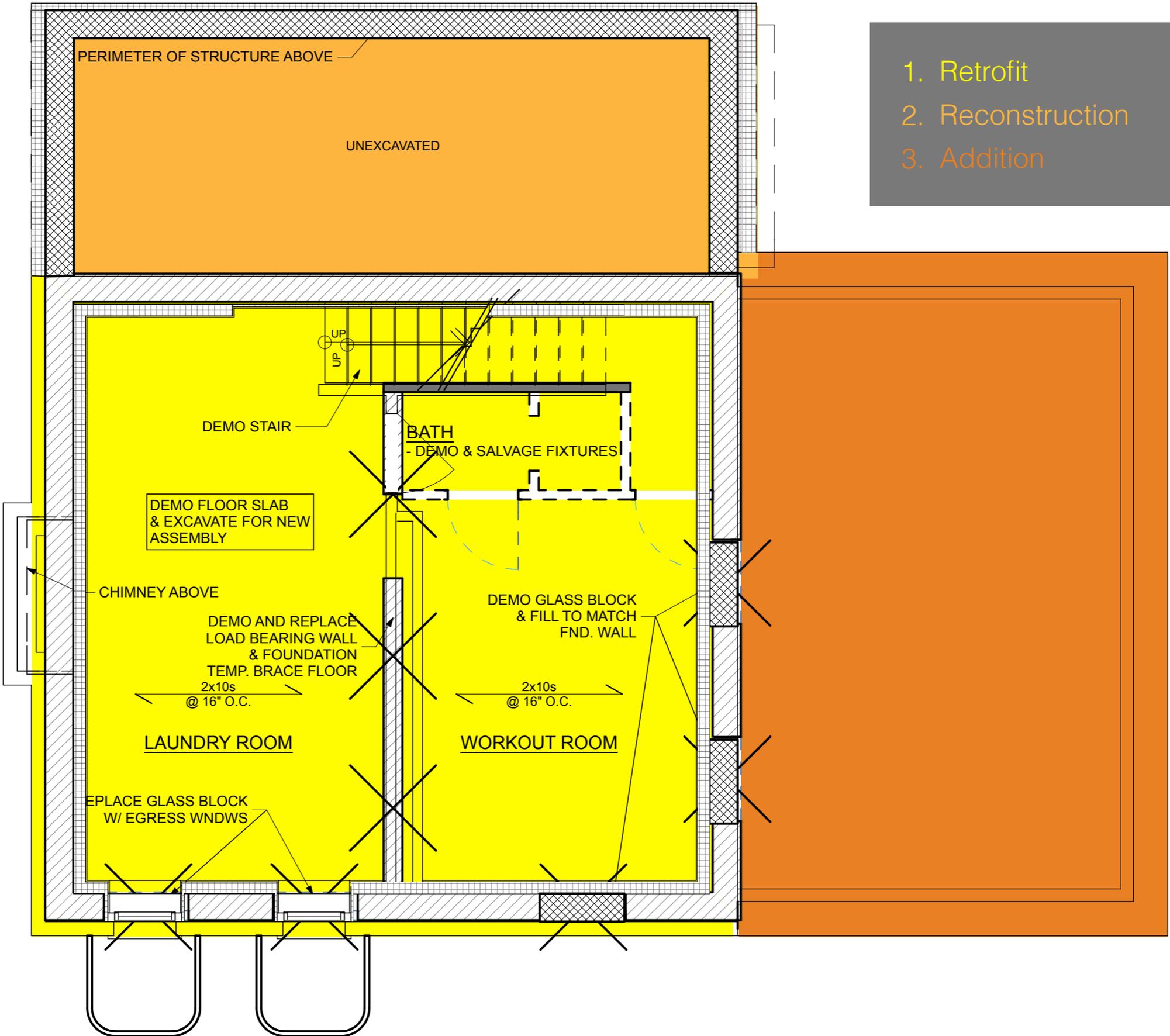
- 1. Homeschool Room
- 2. Mechanical
- 3. Unexcavated



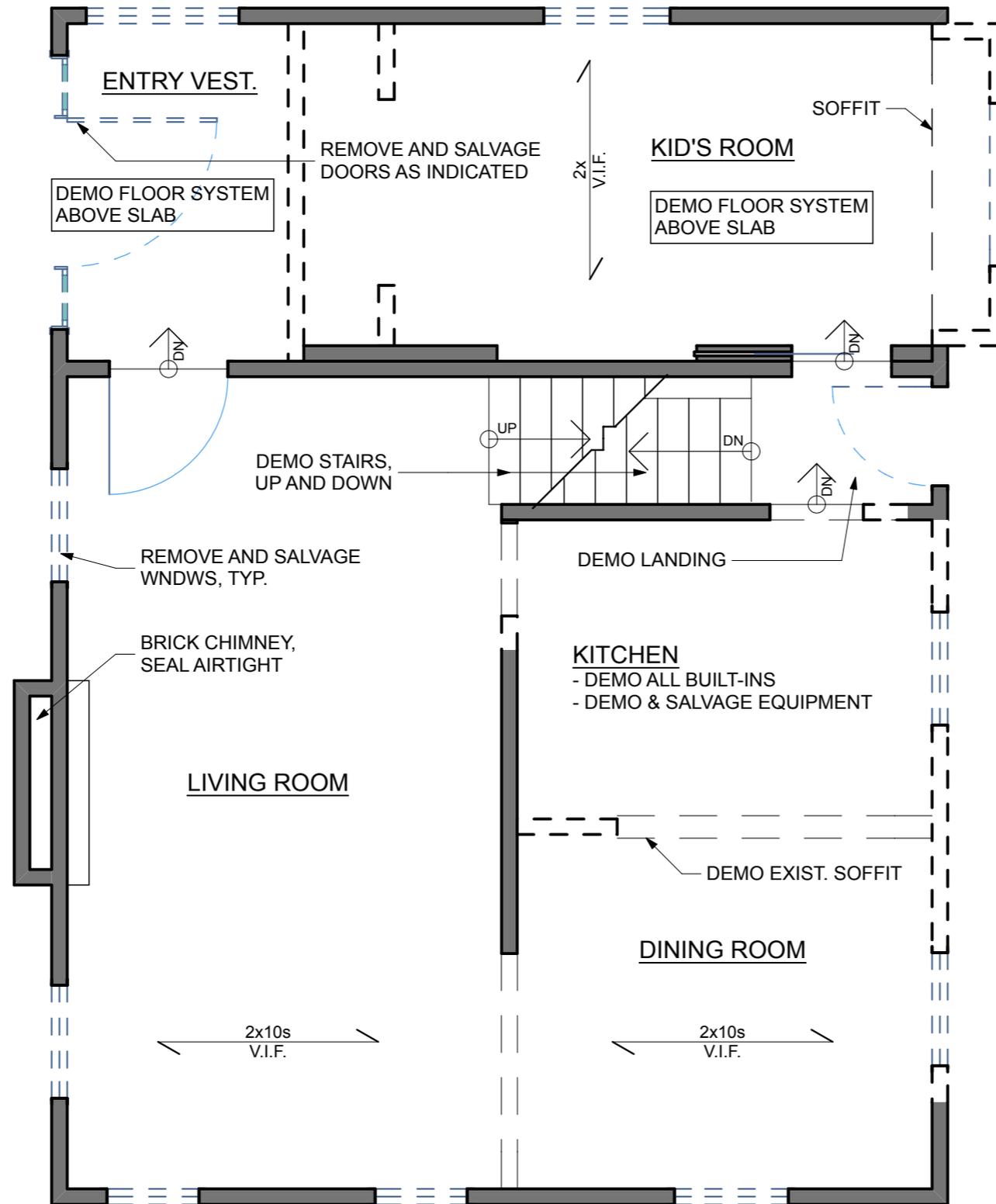
Basement



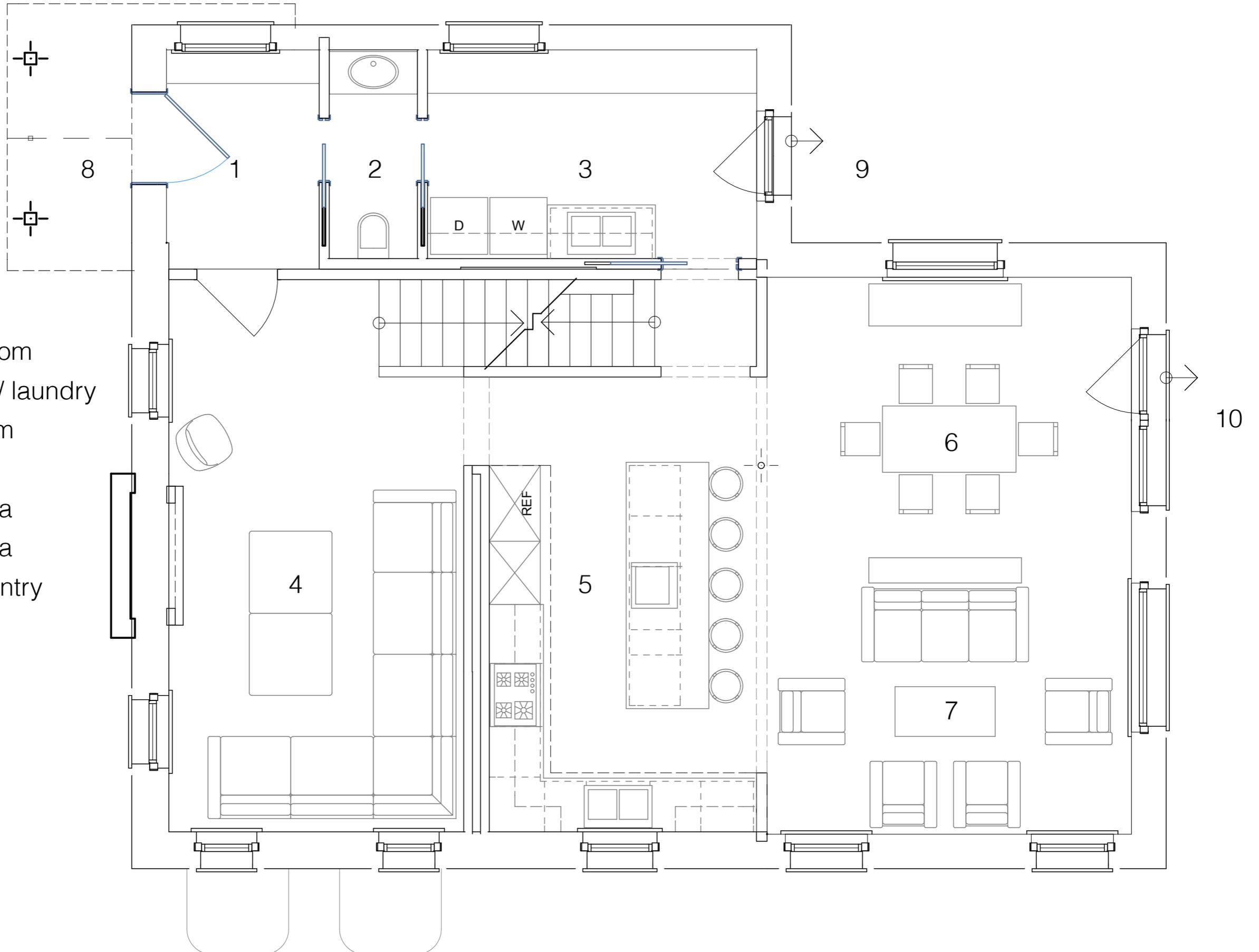
- 1. Retrofit
- 2. Reconstruction
- 3. Addition



First Floor

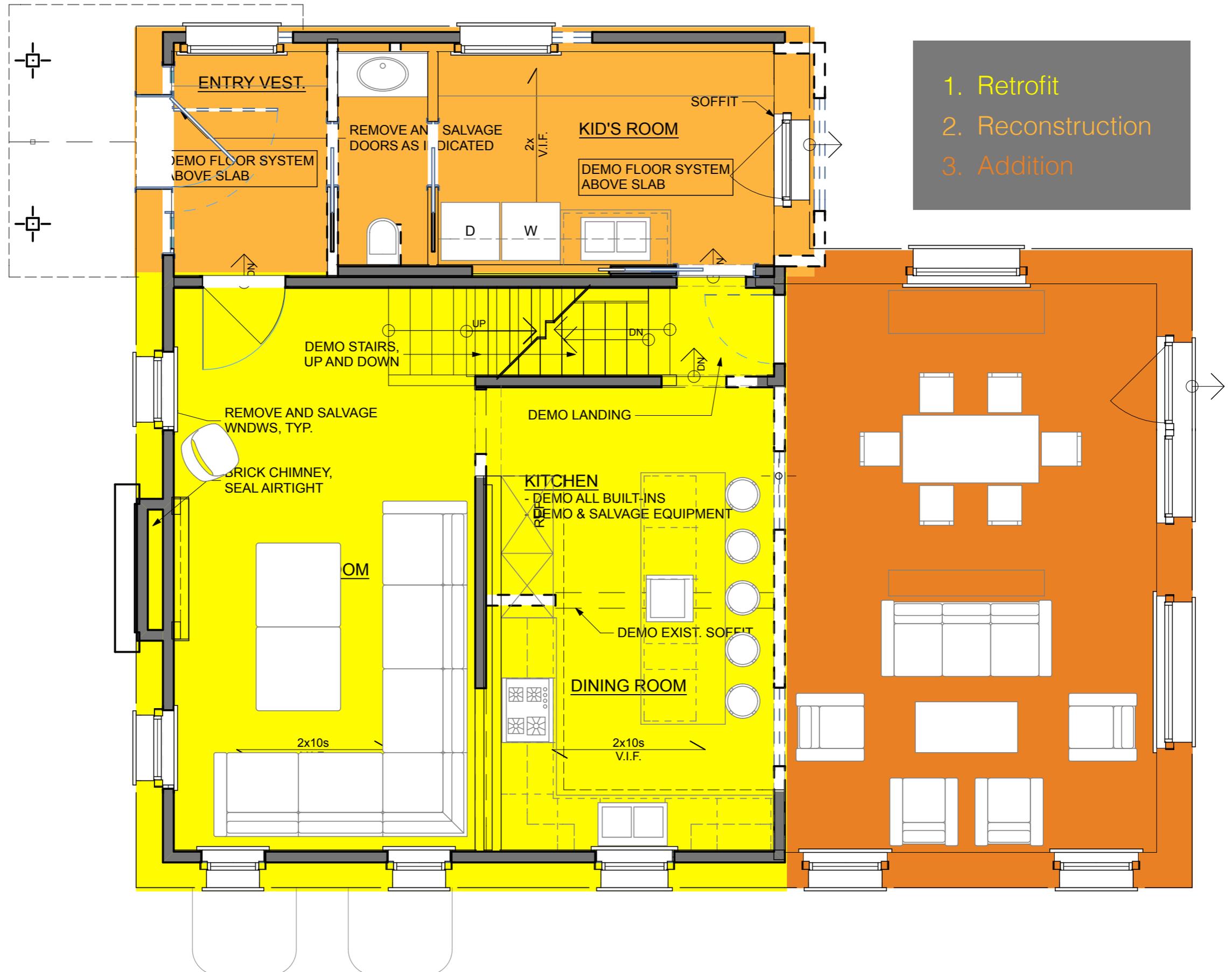


First Floor

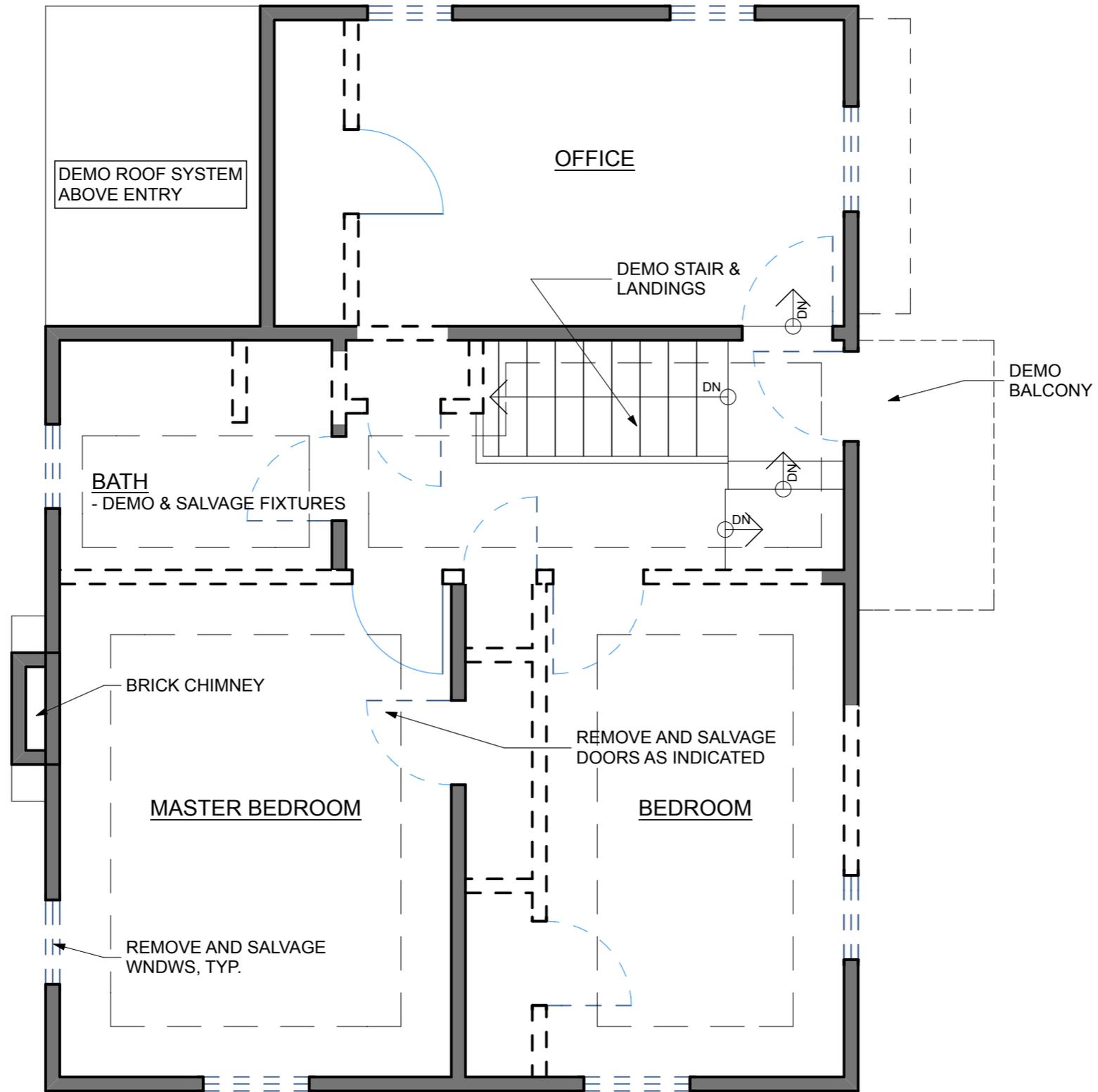


- 1. Entry
- 2. Powder room
- 3. Mud room/ laundry
- 4. Living room
- 5. Kitchen
- 6. Dining area
- 7. Family area
- 8. Covered entry
- 9. Rear entry
- 10. Patio

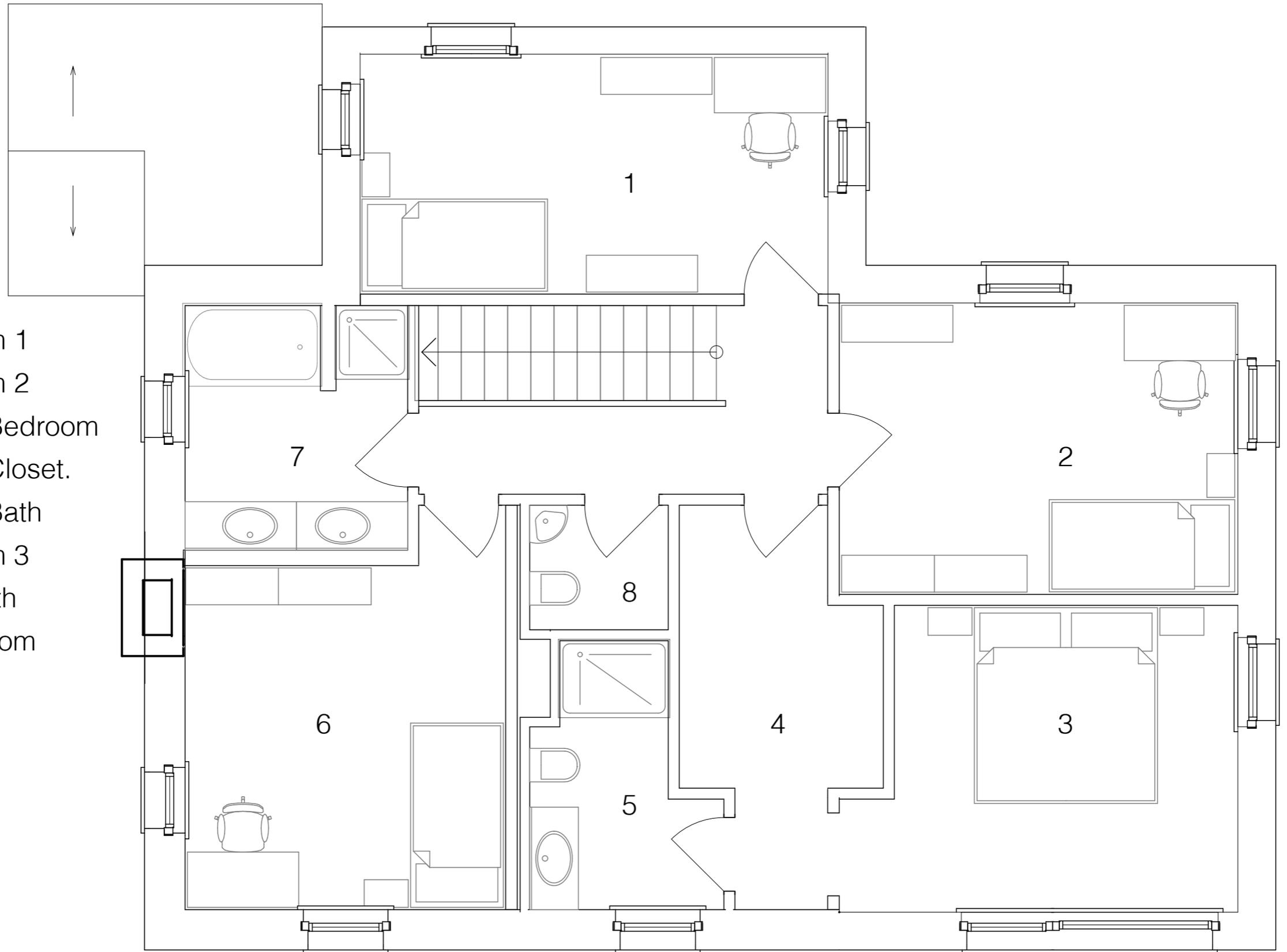
First Floor



Second Floor

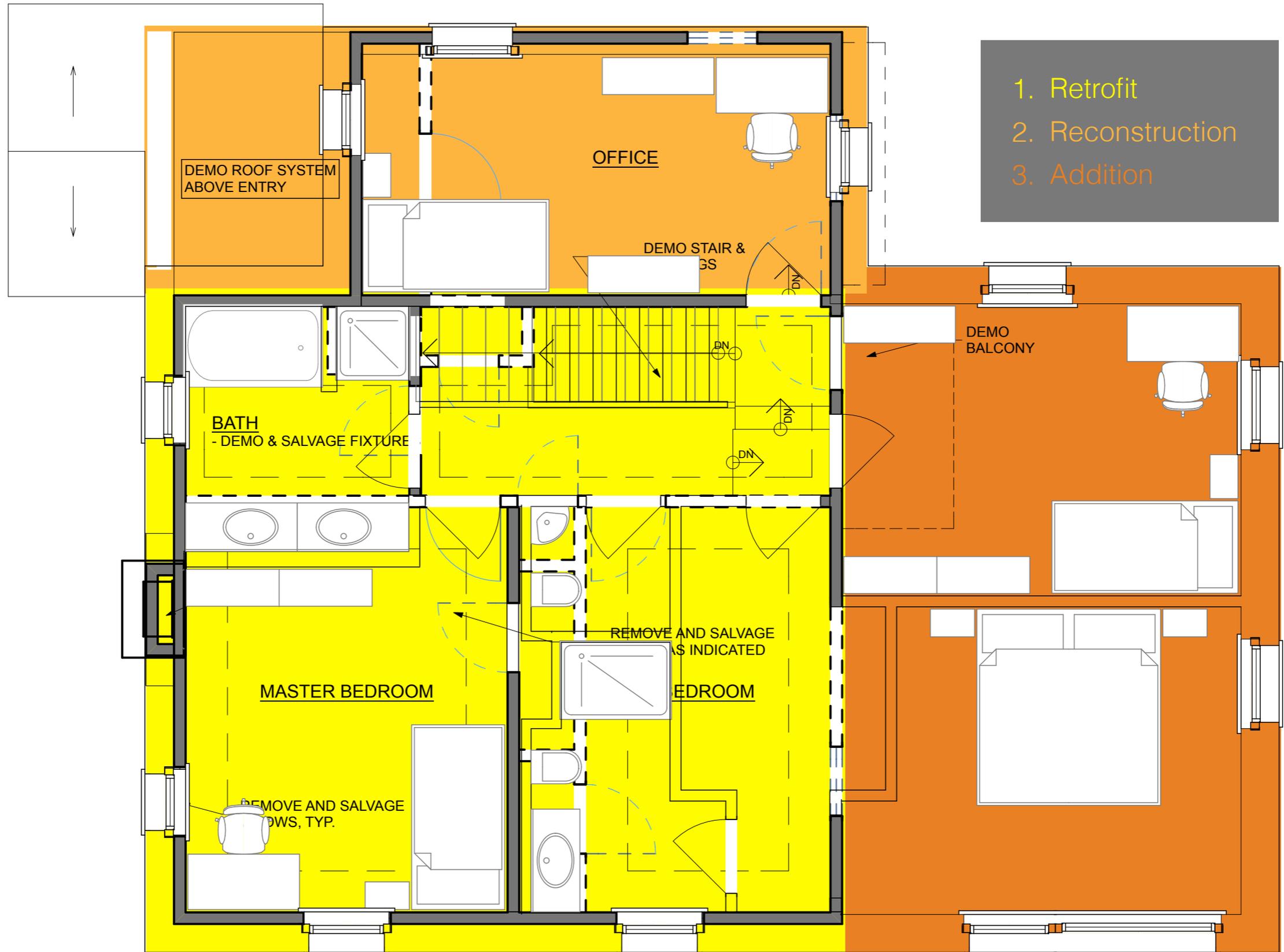


Second Floor



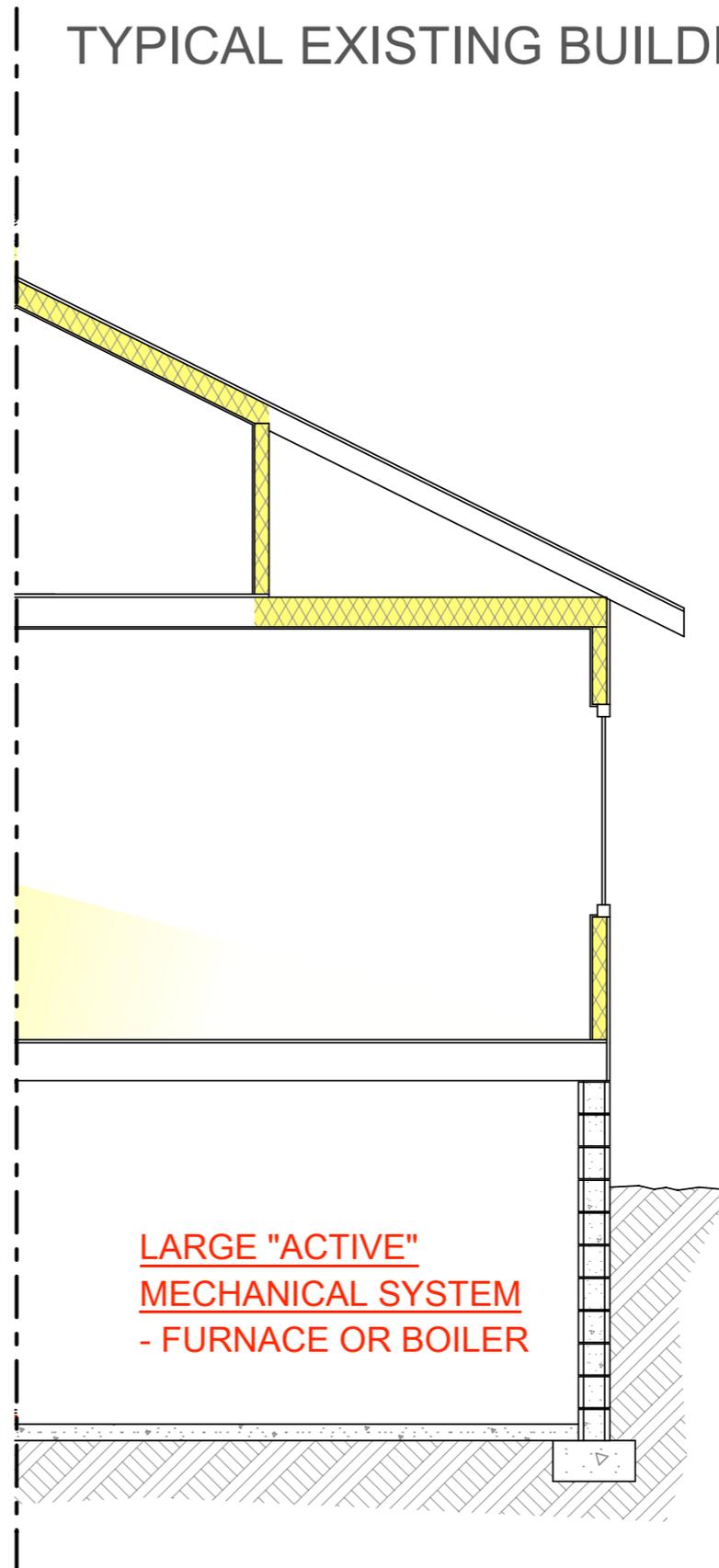
1. Bedroom 1
2. Bedroom 2
3. Master Bedroom
4. Master Closet.
5. Master Bath
6. Bedroom 3
7. Kid's Bath
8. Toilet Room

Second Floor



Retrofit Concept

TYPICAL EXISTING BUILDING (BEFORE)



EXISTING CONDITION

- INSUFFICIENT INSULATION
- LOW-PERFORMANCE WINDOWS AND DOORS
- AIR LEAKAGE
- NO VENTILATION

EXISTING CONDITION

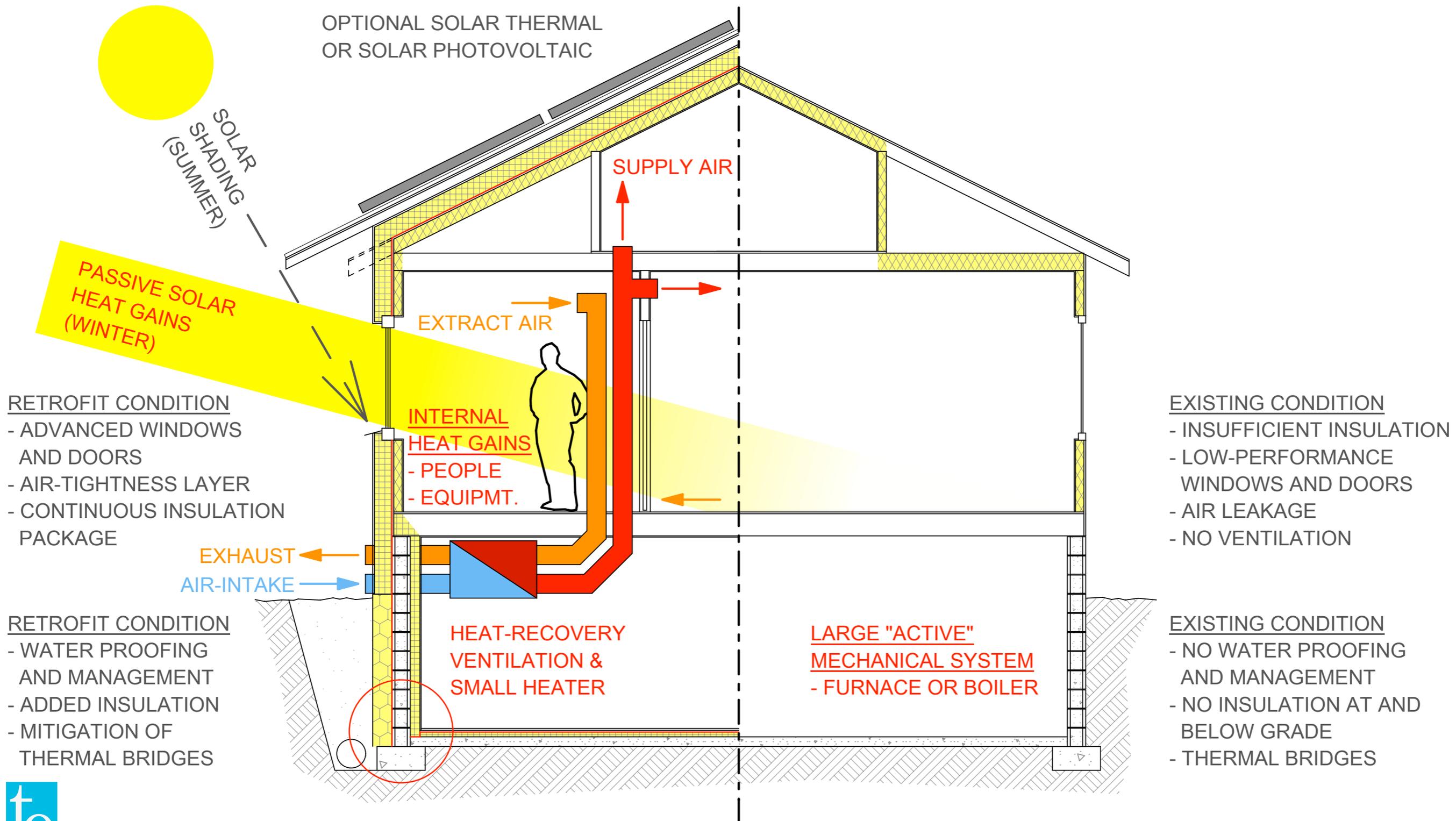
- NO WATER PROOFING AND MANAGEMENT
- NO INSULATION AT AND BELOW GRADE
- THERMAL BRIDGES

LARGE "ACTIVE"
MECHANICAL SYSTEM
- FURNACE OR BOILER

Retrofit Concept

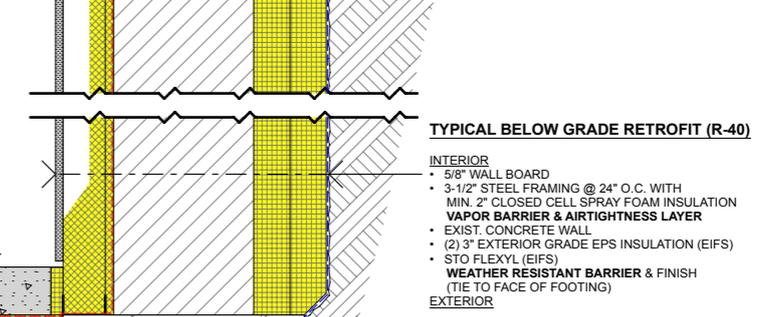
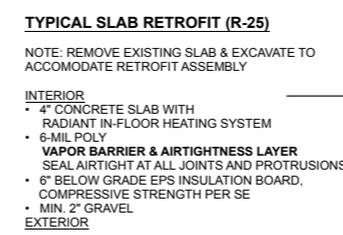
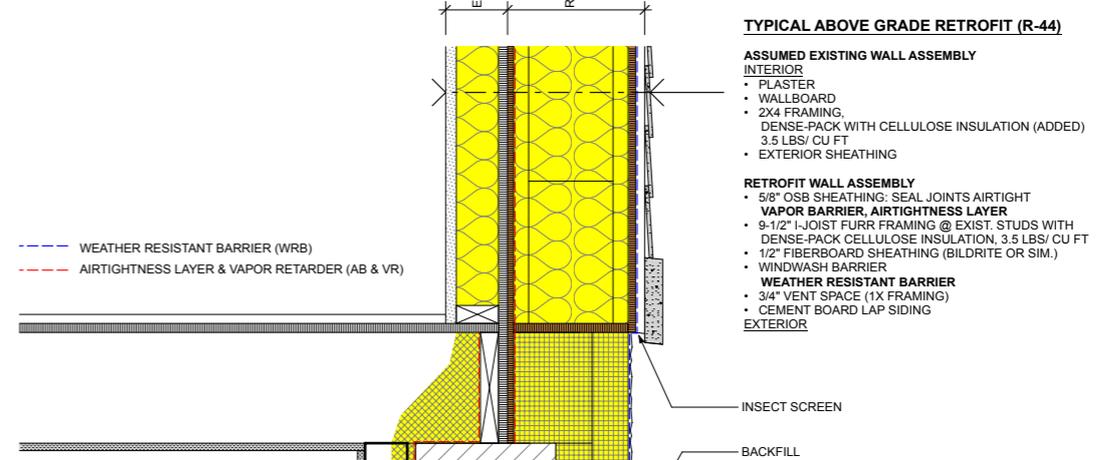
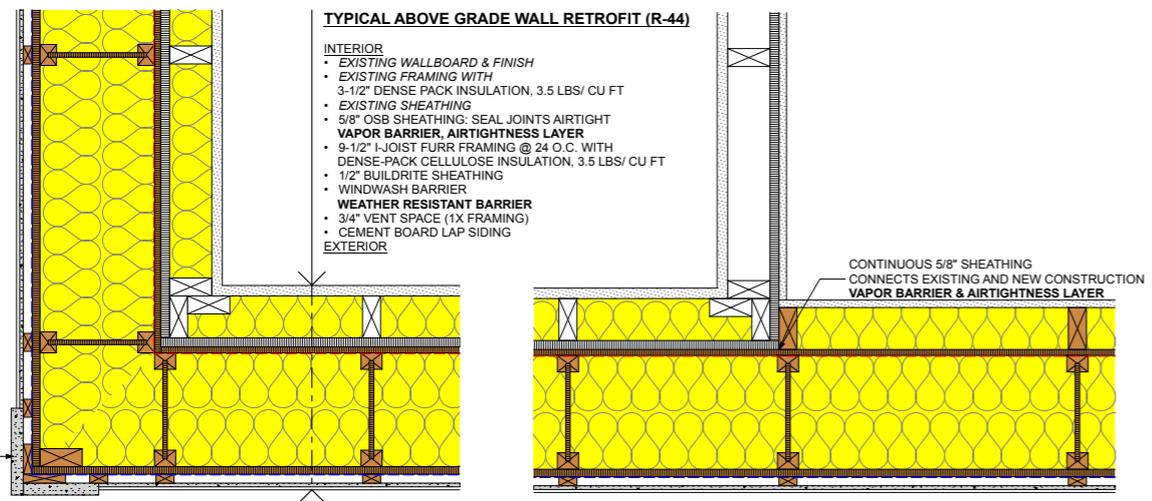
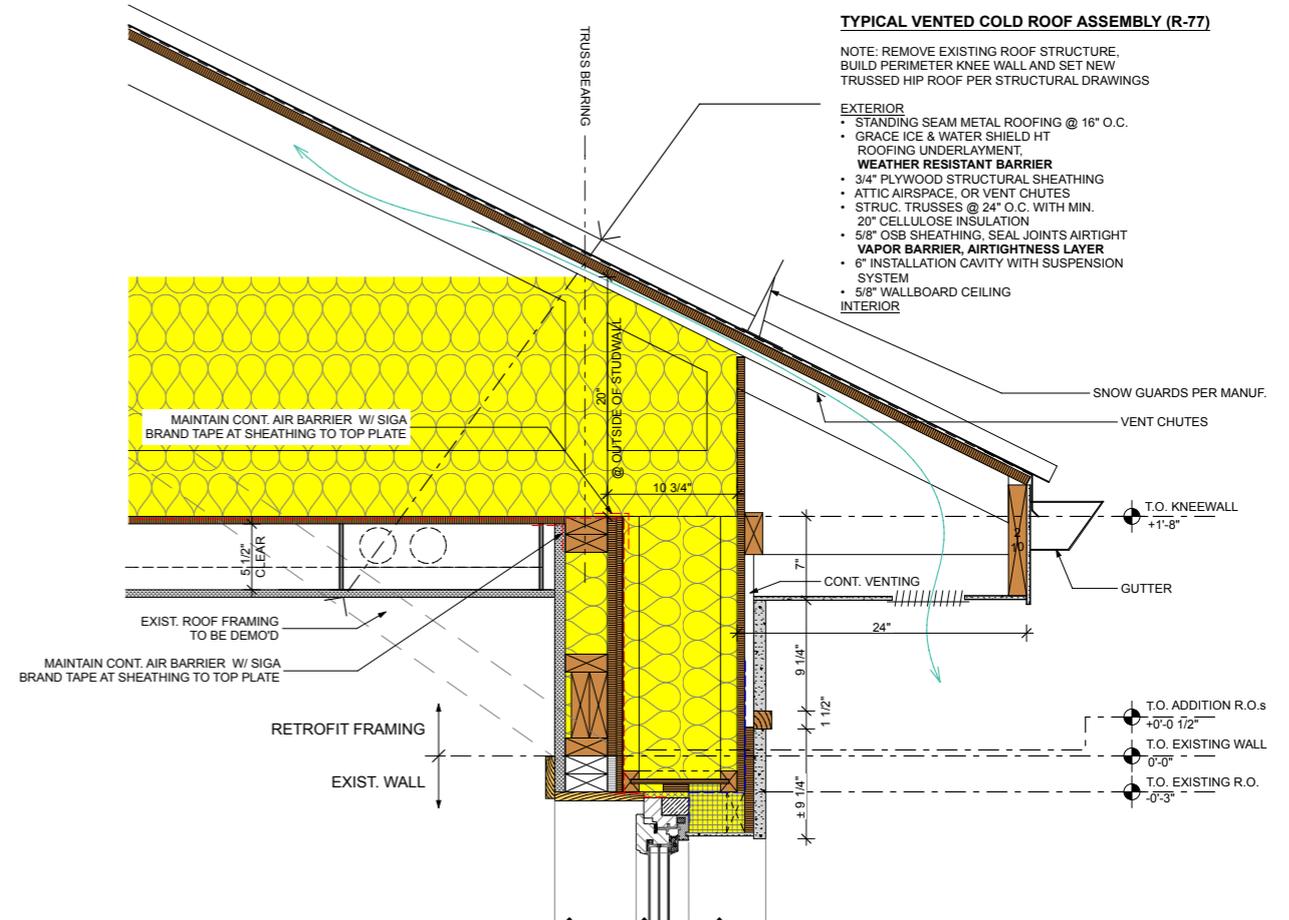
DEEP ENERGY REDUCTION RETROFIT (AFTER)

TYPICAL EXISTING BUILDING (BEFORE)



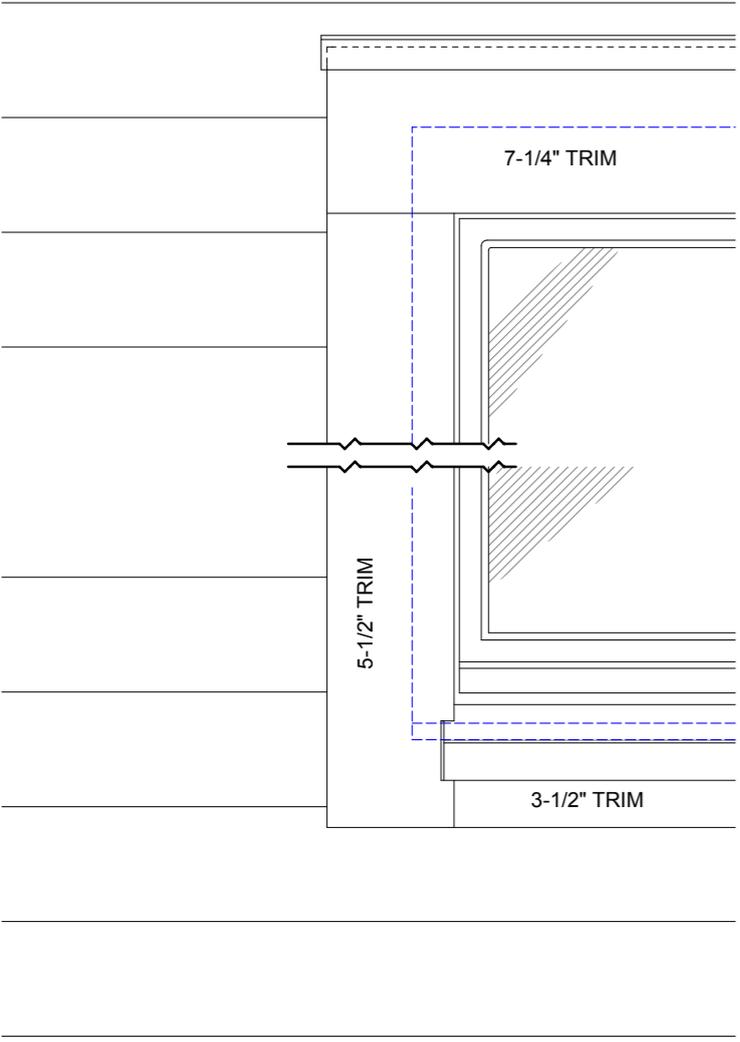
Assemblies

- Walls a/ grade: R-10 to R-44
- Walls b/ grade: R-1 to R-30+
- Roof: R-20 to R-77
- Slab: R-1 to R-25

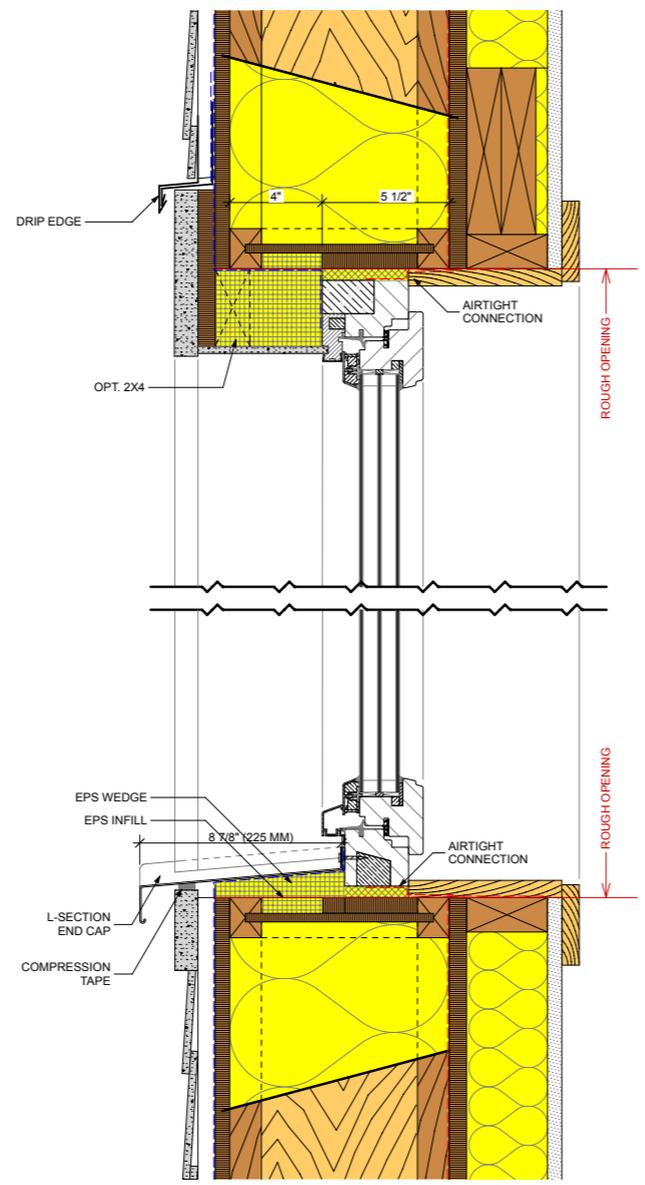


--- WEATHER RESISTANT BARRIER (WRB)
 --- AIRTIGHTNESS LAYER & VAPOR RETARDER (AB & VR)

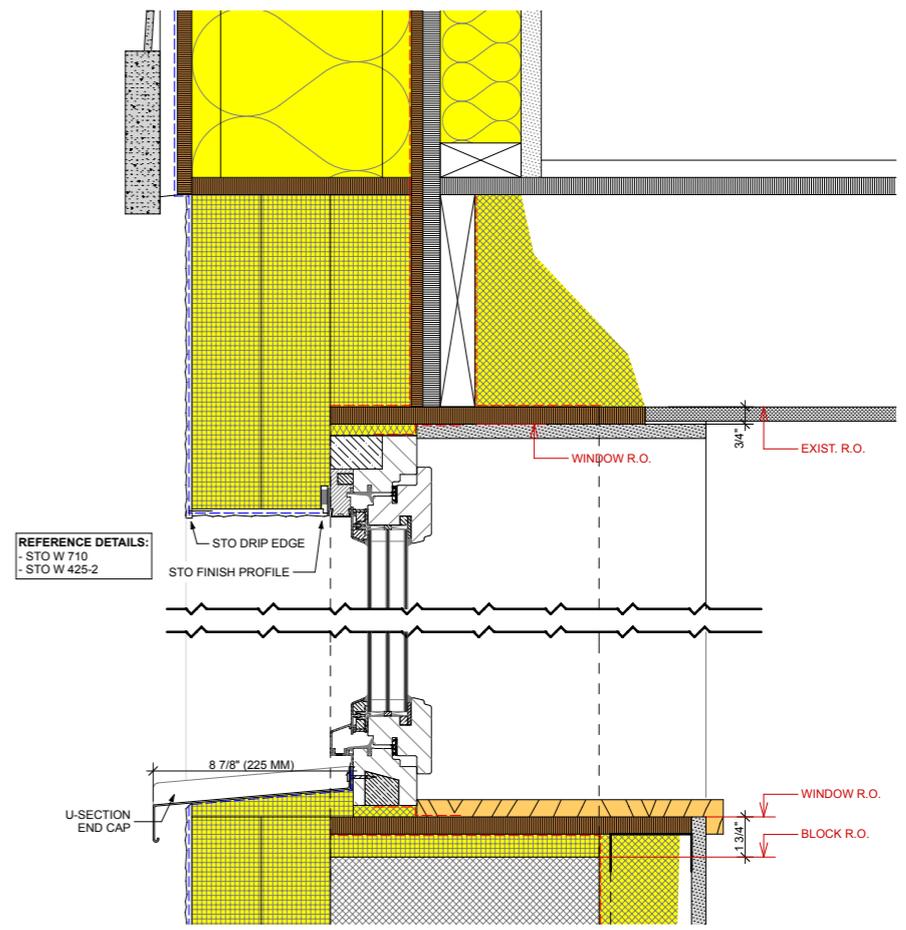
Details



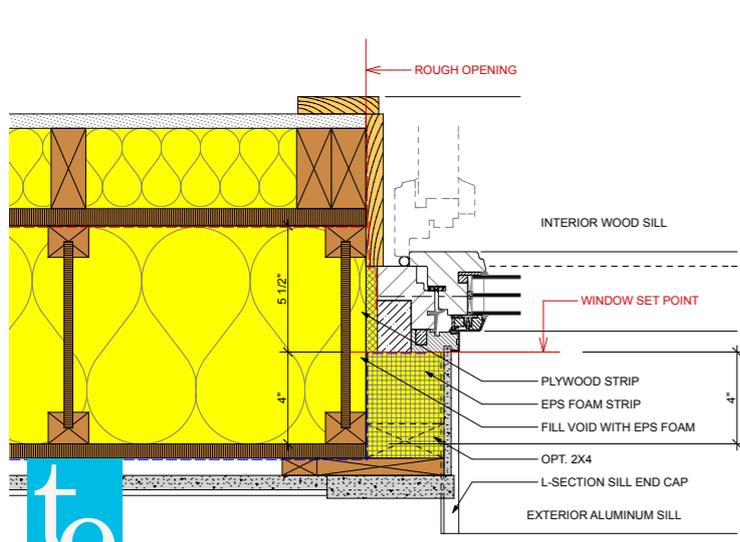
1 TYPICAL EXTERIOR WINDOW ELEVATION
 SCALE: 3" = 1'-0"



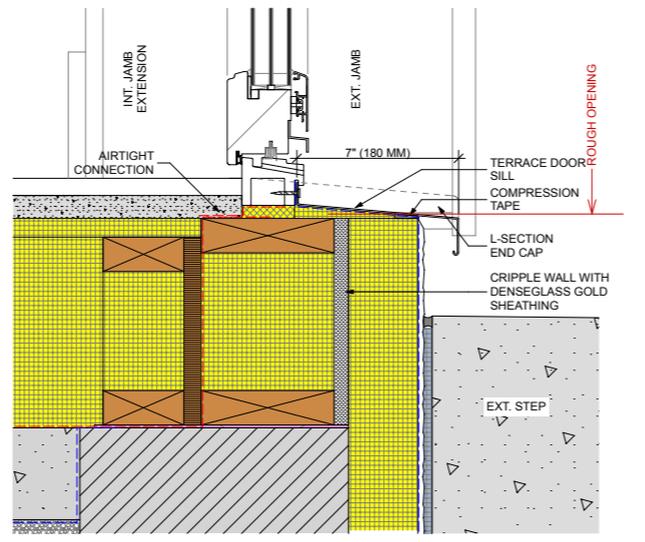
2 TYPICAL WINDOW HEAD & SILL
 SCALE: 3" = 1'-0"



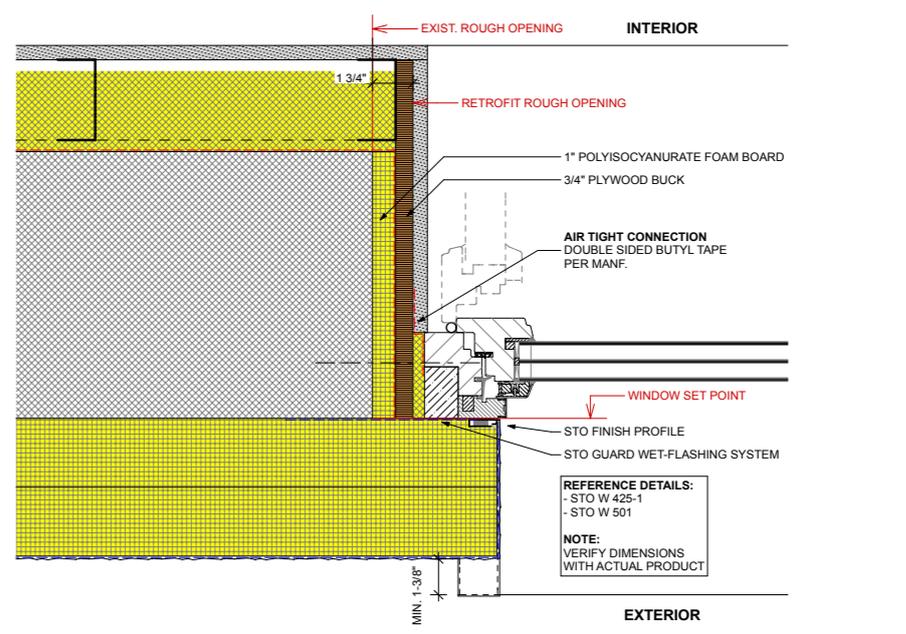
5 TYPICAL WINDOW HEAD & SILL, BASEMENT
 SCALE: 3" = 1'-0"



3 TYPICAL WINDOW JAMB
 SCALE: 3" = 1'-0"



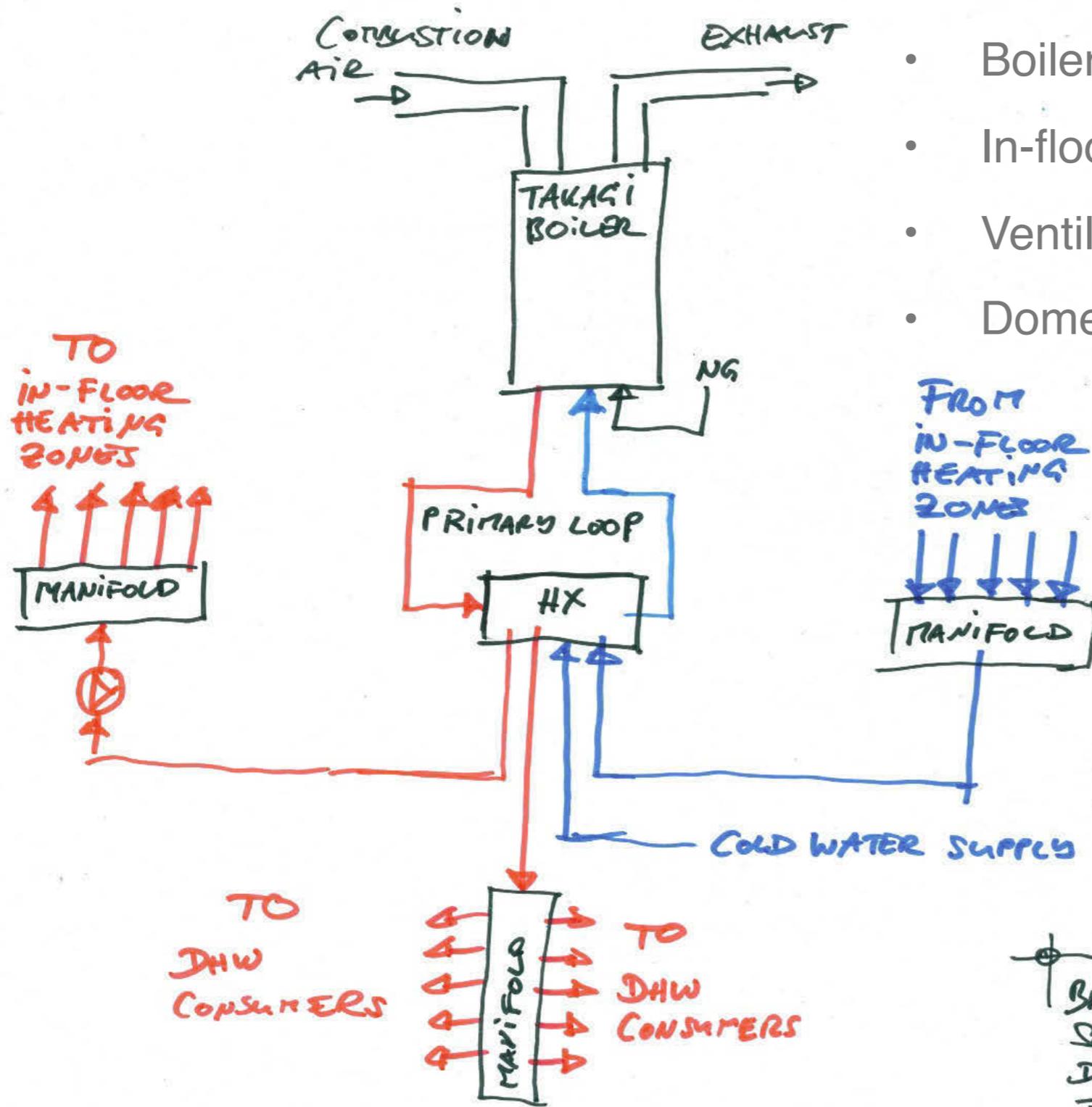
4 TYP. TERRACE DOOR SILL
 SCALE: 3" = 1'-0"



6 TYPICAL WINDOW JAMB, BASEMENT
 SCALE: 3" = 1'-0"



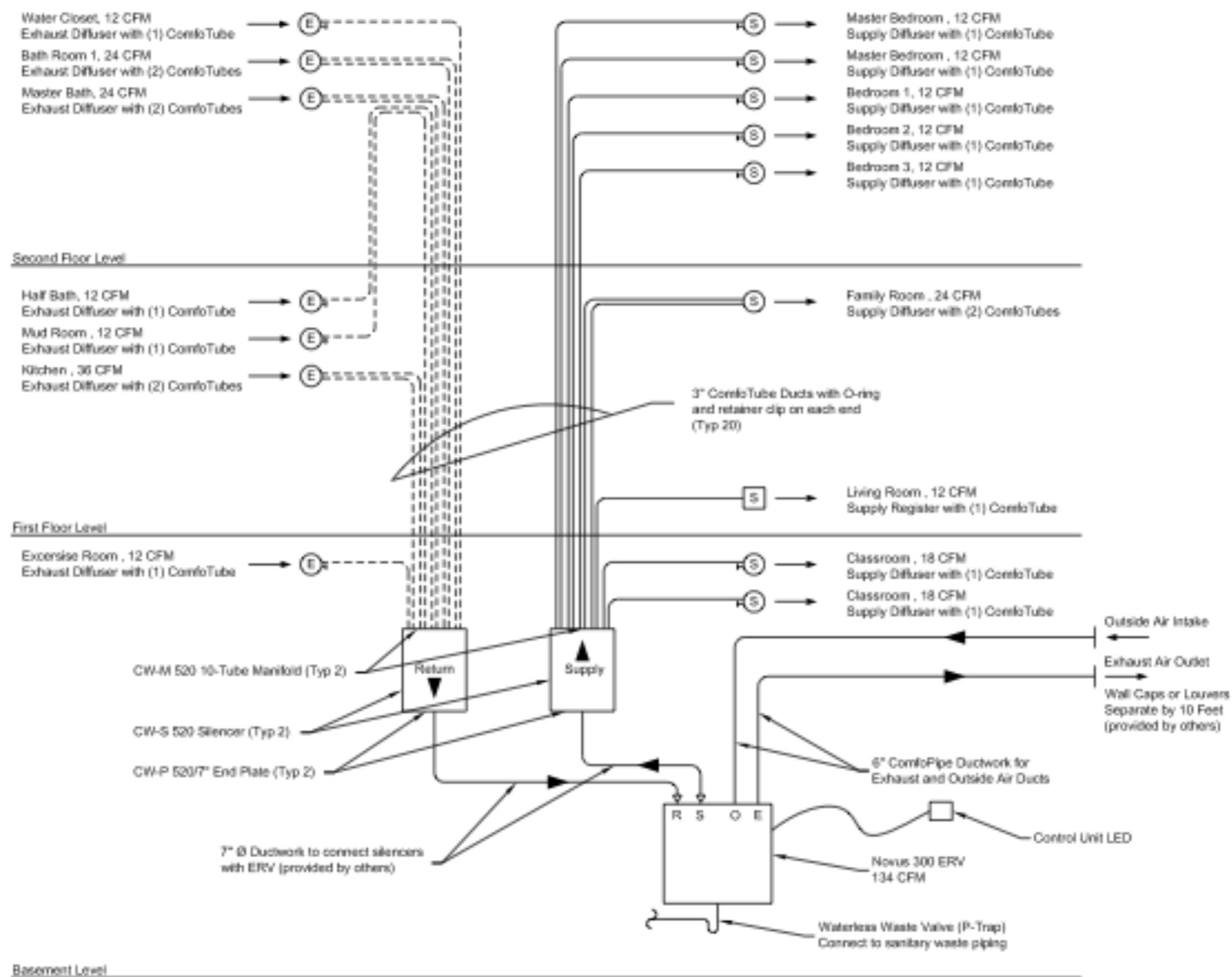
MEP Systems



- Boiler (existing, replaced)
- In-floor heat (existing, reused and expanded)
- Ventilation system (new)
- Domestic hot water system (new plumbing)




 BRAZELTON RESIDENCE
 SCHEMATIC HEATING &
 DHW SYSTEM.
 TDE/TE STUDIO, LTD.



Ventilation System Schematic Diagram

Project: Brazelton Residence

Number: 3-0003-6.11

July 29, 2011

Designed By: Aubrey Gewehr



always
around you

zehnder

Construction Project





PC75UU
KOMATSU

VEIT

S208054

S208054

PLEASE
RECYCLE
CONTAINER

