

US building impacts

72% electricity consumption

39% energy use

38% CO₂ emissions

40% raw materials

30% waste output

14% potable water use

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72% electricity consumption

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BLUPATH

INSPIRING DESIGN
FOR PLACES TO THRIVE



LAURA BLAU AIA LEED BD&C® AP

CPHC (Certified Passive House Consultant)

CPHB (Certified Passive House Builder)

CPHD (Certified Passive House Designer pending)

MArch, BArts

Principal **BLUPATH**

BLUPATH is an award winning architecture and design firm focusing on high-performance building design. blupath.us





BLUPATH

INSPIRING DESIGN
FOR PLACES TO THRIVE



KEVIN DAVEY

CPHD (Certified Passive House Designer pending)

BArch

Intern Architect at [BLUPATH](#)

[BLUPATH](#) is an award winning architecture and design firm focusing on high-performance building design. blupath.us

HANSON

FINE BUILDING & PRESERVATION

CHRIS HANSON, LEED AP

CPHD (Certified Passive House Designer)

MS Ed



Hanson Fine Building & Preservation – est. 1986, is a locally-based, full-service general contracting firm that implements sustainable building practices in all of its projects – from the preservation of older homes and historic structures to the construction of new homes and structures. We look for ways to reduce waste during the construction process through adaptive re-use and to reduce operational costs after owner-occupancy by utilizing energy-efficient building technologies.



BUILDING TO A NEW STANDARD

JUAN LEVY, LEED AP

CPHD (Certified Passive House Designer)

MArch, MA Civil Engineering



Philadelphia-based design and construction firm that crafts exceptionally beautiful, comfortable and functional places to live and work, both as adaptive re-use projects and new construction. We build to exceed today's standards of sustainability and anticipate tomorrow's, applying the most effective tools and techniques building science has developed.

LEARNING OBJECTIVES

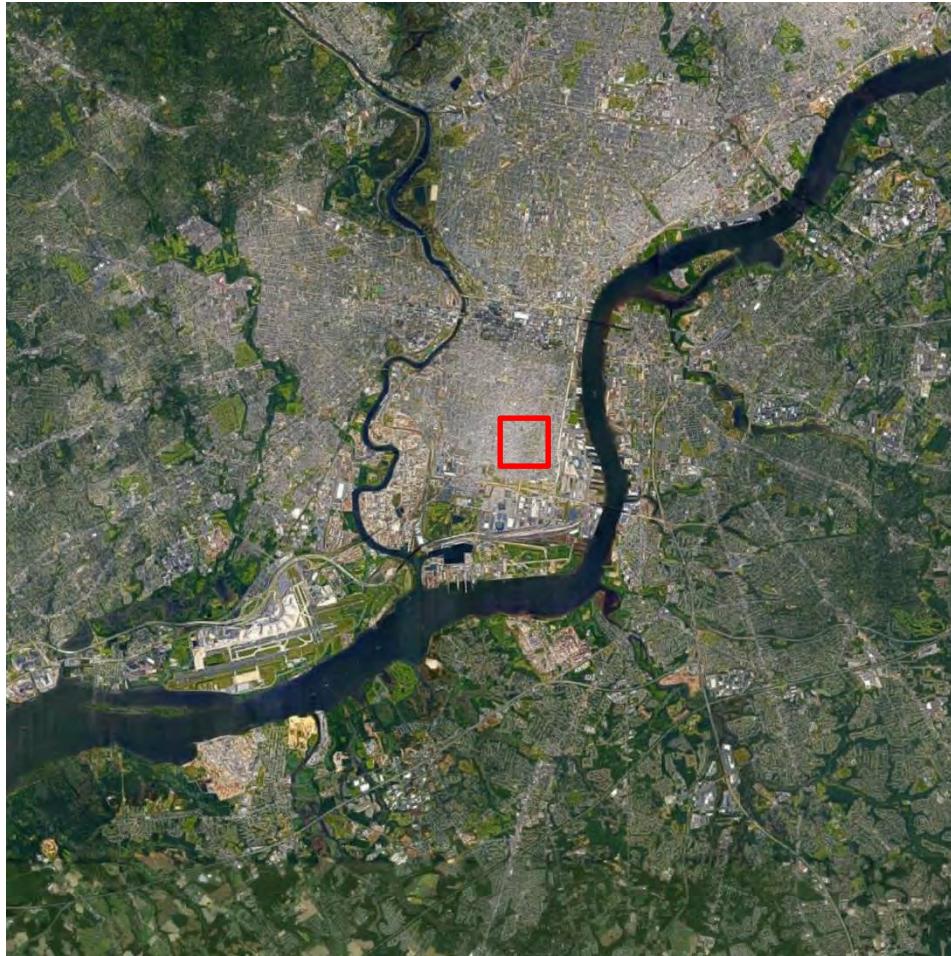
1. Learn the importance of a qualified team of Passive House trained builders, engineers and professionals.
2. Understand assets and penalties of makeup air ventilation or other energy budget design decisions.
3. Apply case study examples of best practices and lessons learned.
4. Understand the importance of problem solving during the design and built process.

AGENDA

1. Project Description: context, site, goals, program, challenges.
2. Describe the process of assembling a team and lessons learned.
3. Describe highlights and challenges and how they were resolved with case study examples.
4. Discussion and Q & A.

ITALIAN MARKET PASSIVE HOUSE

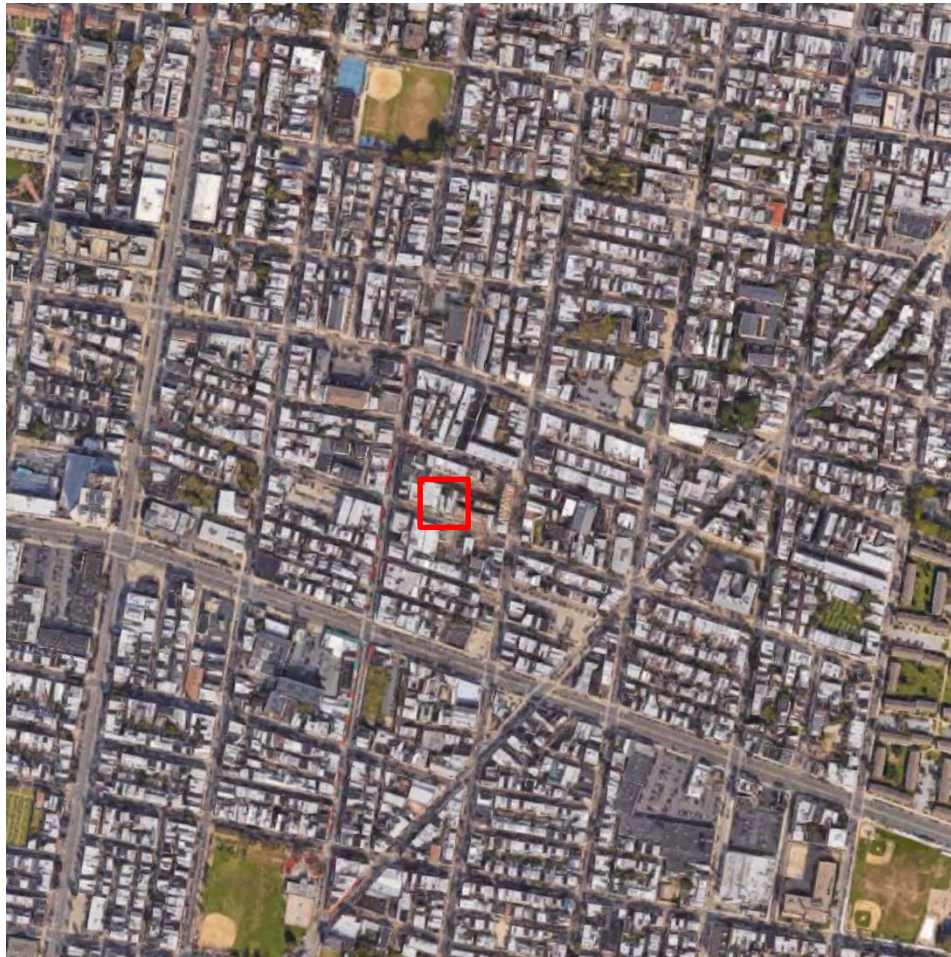
PROJECT DESCRIPTION



PHILADELPHIA, PA

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



ITALIAN MARKET, PHILADELPHIA, PA

ITALIAN MARKET PASSIVE HOUSE

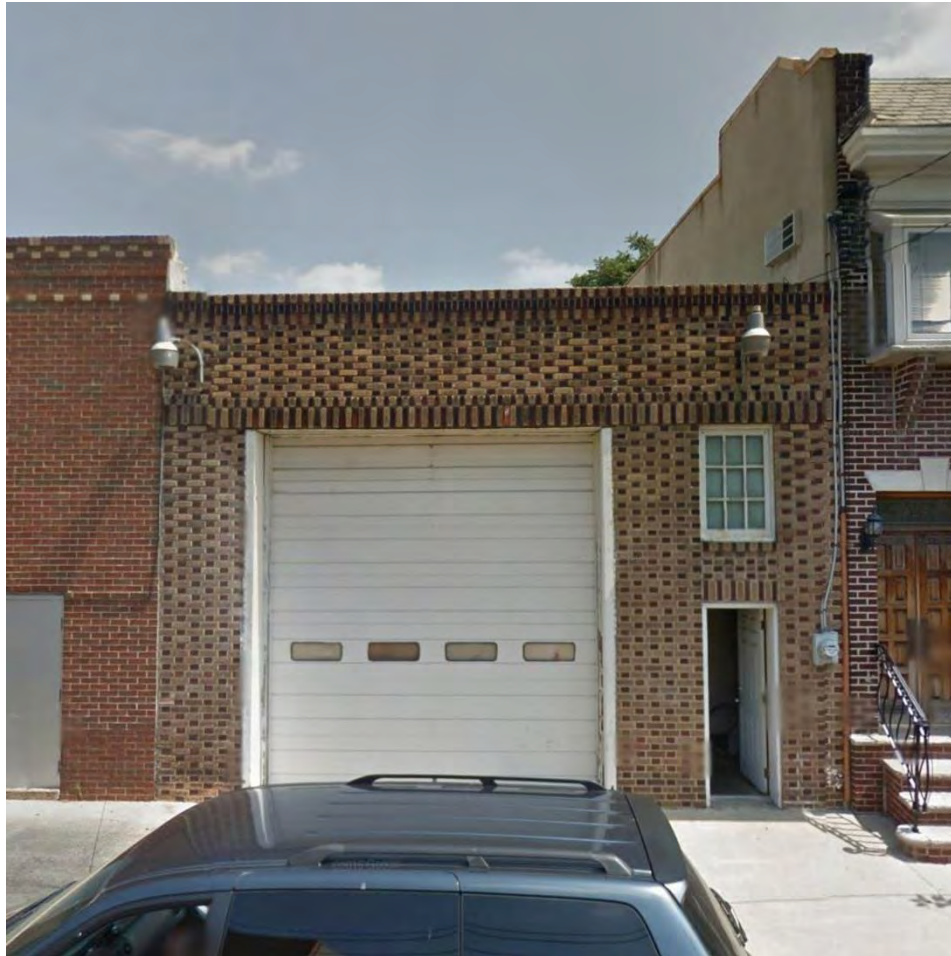
PROJECT DESCRIPTION



FORMER 7-UP WAREHOUSE

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



FORMER 7-UP WAREHOUSE

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



PROPOSED SOUTH ELEVATION

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION

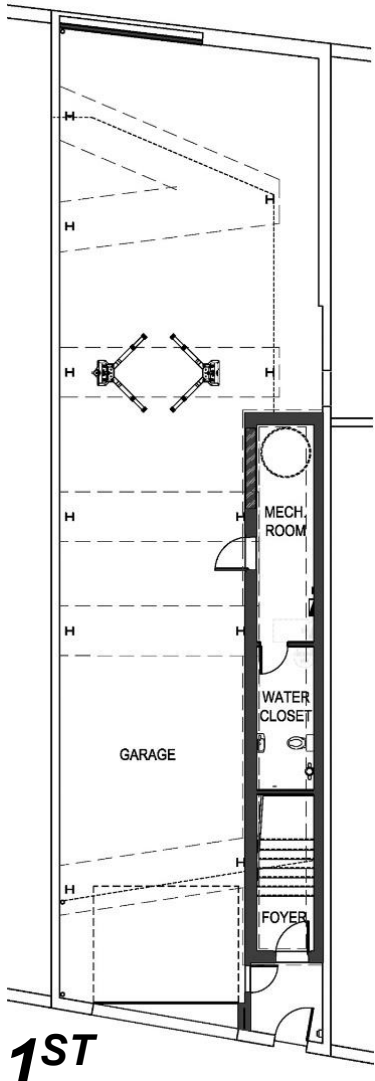


2,250 SF
3 BEDROOM
2.5 BATH
1,800 SF GARAGE
FRONT & REAR
DECKS
NET ZERO READY
HEATING DEMAND
4.37 KBTU/SF/YR
COOLING DEMAND
4.13 KBTU/SF/YR

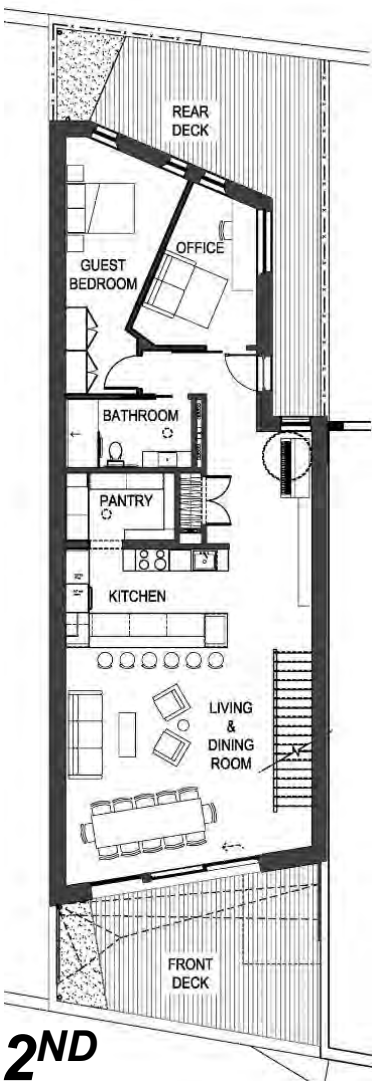
PROPOSED SOUTH ELEVATION

ITALIAN MARKET PASSIVE HOUSE

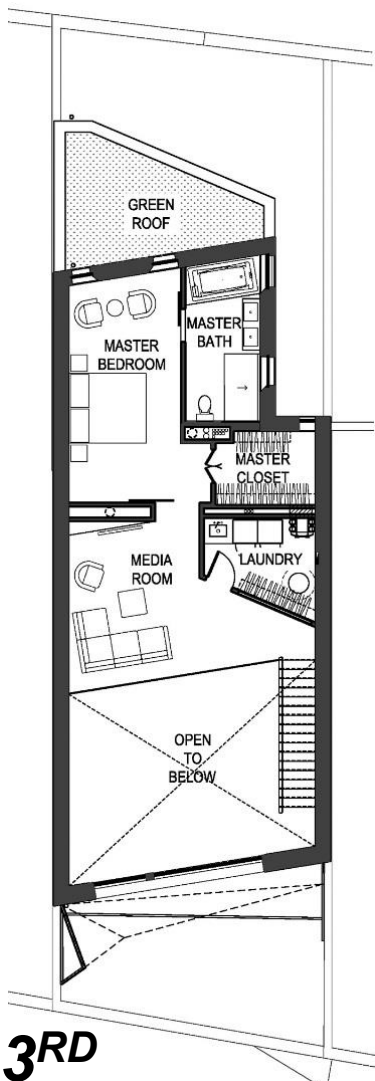
PROJECT DESCRIPTION



1ST



2ND

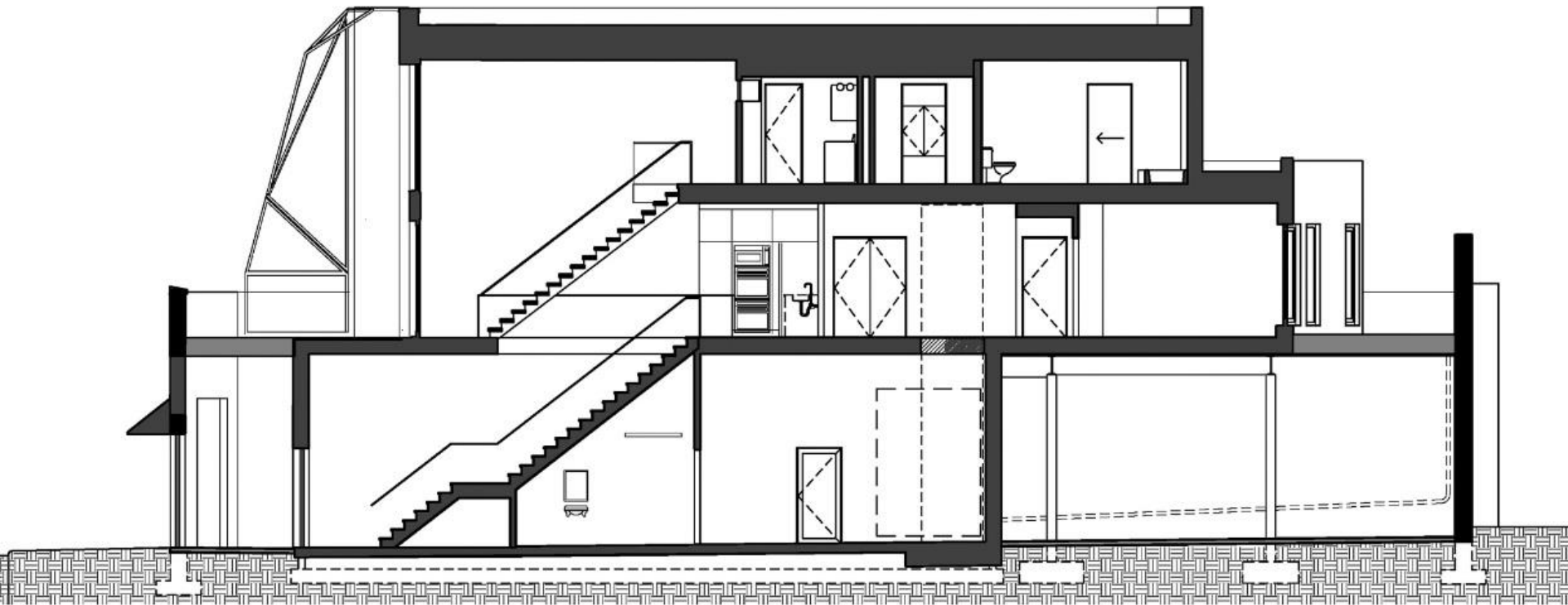


3RD

FLOOR PLANS

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



SECTION

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



AERIAL VIEW

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



DAY & NIGHT

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



LIVING ROOM FROM MEDIA ROOM BALCONY

ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



MASTER BEDROOM

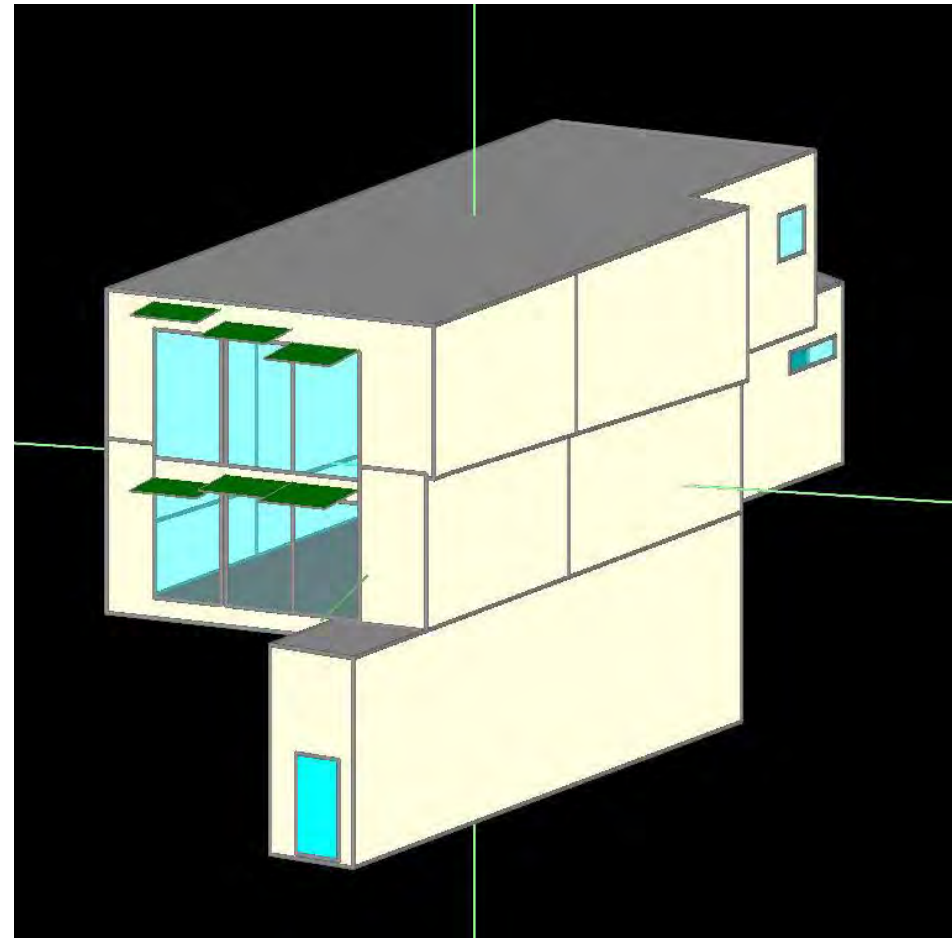
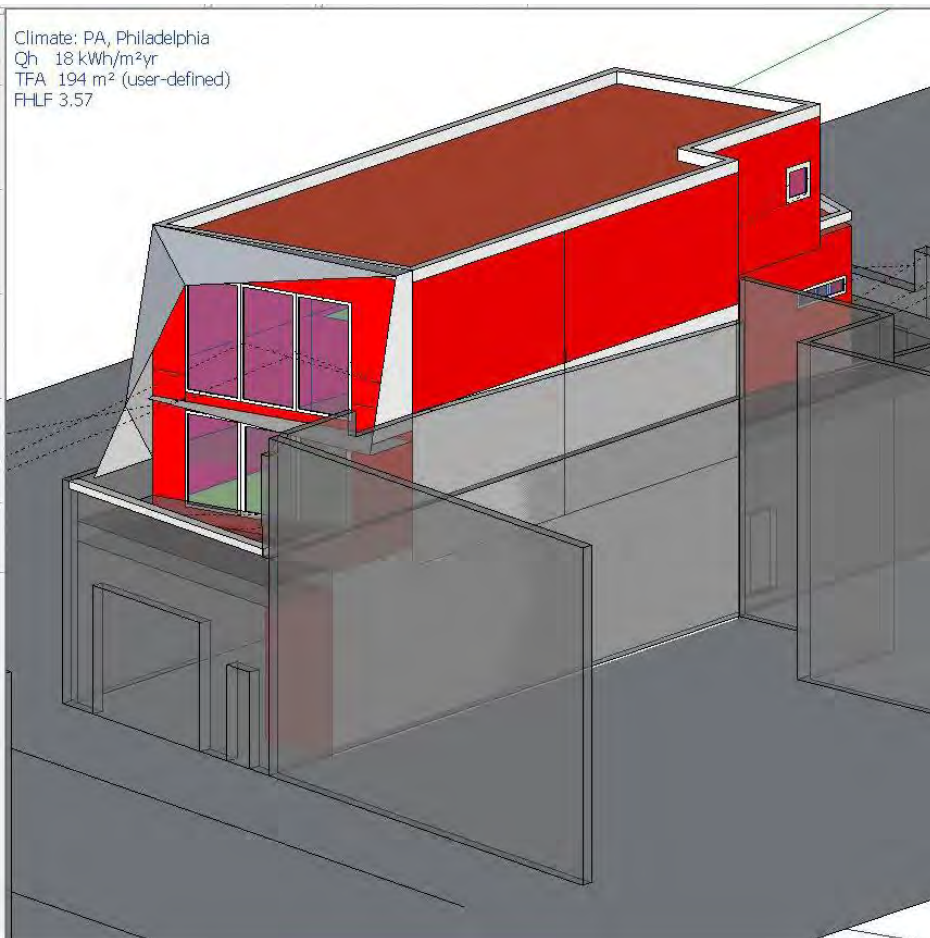
ITALIAN MARKET PASSIVE HOUSE

PROJECT DESCRIPTION



MASTER BATHROOM

ITALIAN MARKET PASSIVE HOUSE *ENERGY MODELING*



DESIGNPH VS WUFI PASSIVE

ITALIAN MARKET PASSIVE HOUSE ENERGY MODELING

Specific building demands with reference to the treated floor area				
	Treated floor area	2293	ft ²	
Space heating	Heating demand	4.63	kBTU/(ft ² ·yr)	97% of 4.75 kBTU/(ft ² ·yr) yes
	Heating load	4.09	BTU/(hr·ft ²)	129% of 3.17 BTU/(hr·ft ²) -
Space cooling	Overall specif. space cooling demand	4.12	kBTU/(ft ² ·yr)	72% of 5.71 kBTU/(ft ² ·yr) yes
	Cooling load	2.46	BTU/(hr·ft ²)	- -
	Frequency of overheating (> 77 °F)		%	28% -
Primary energy	Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances	41.9	kBTU/(ft ² ·yr)	110% of 38.0 kBTU/(ft ² ·yr) no
	DHW, space heating and auxiliary electricity	16.1	kBTU/(ft ² ·yr)	- -
	Specific primary energy reduction through solar electricity	39.9	kBTU/(ft ² ·yr)	- -
Airtightness	Pressurization test result n ₅₀	0.6	1/h	0.6 1/h yes

* empty field: data missing; '-': no requirement

PASSIVEHOUSE REQUIREMENTS

Certificate criteria: PHIUS+ 2016 Standard

Heating demand

specific: 4.37 kBTU/ff·yr
target: 4.5 kBTU/ff·yr
total: 10024.91 kBTU/yr



Cooling demand

specific: 4.13 kBTU/ff·yr
target: 5.4 kBTU/ff·yr
total: 9477.48 kBTU/yr
latent: 2.46 kBTU/ff·yr



Heating load

specific: 4.04 Btu/hr ft²
target: 4.2 Btu/hr ft²
total: 9259.29 Btu/hr



Cooling load

specific: 2.54 Btu/hr ft²
target: 4.7 Btu/hr ft²
total: 5833.06 Btu/hr



Primary energy

specific: 6593 kWh/Person yr
target: 6200 kWh/Person yr
total: 89976.51 kBTU/yr



Site energy

total: 12.64 kBTU/ff·yr
building systems: 36.27 kBTU/yr
photovoltaic savings: 0 kBTU/ff·yr



Air tightness

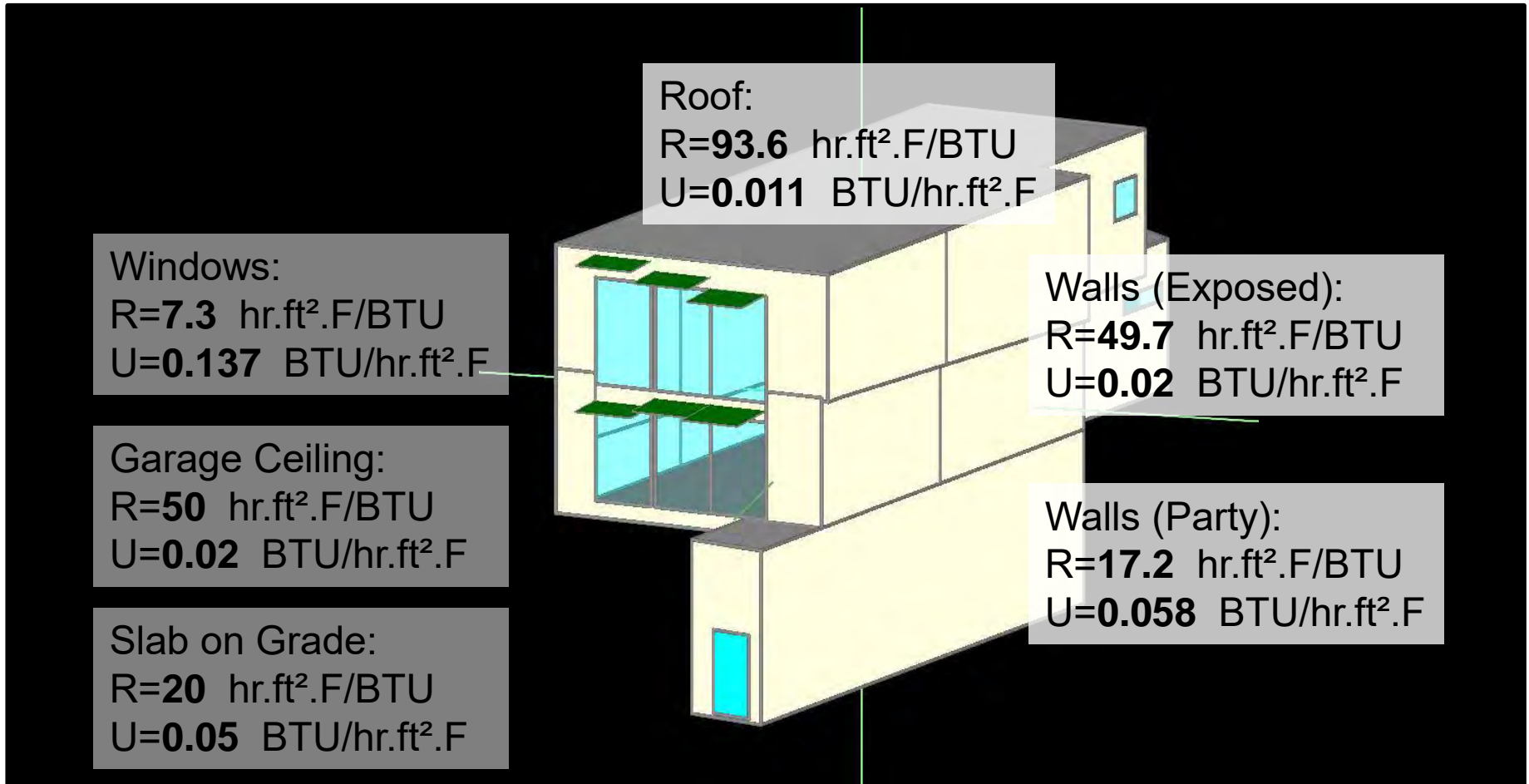
ACH50: 0.6 1/hr
target: 0.93 1/hr
CFM50 per envelope area: 0.03 cfm/ff
target: 0.05 cfm/ff



PHPP VS WUFI

ITALIAN MARKET PASSIVE HOUSE

ENERGY MODELING



AVERAGE R-VALUES

ITALIAN MARKET PASSIVE HOUSE CONSTRUCTION PROCESS 1/4



HANSON FINE BUILDING & PRESERVATION

ITALIAN MARKET PASSIVE HOUSE CONSTRUCTION PROCESS 2/4



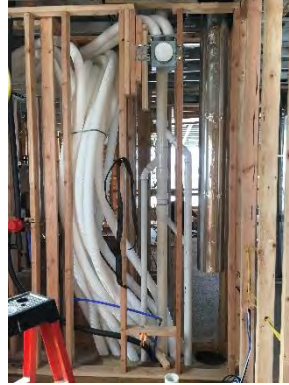
HANSON FINE BUILDING & PRESERVATION

ITALIAN MARKET PASSIVE HOUSE CONSTRUCTION PROCESS 3/4



HANSON FINE BUILDING & PRESERVATION

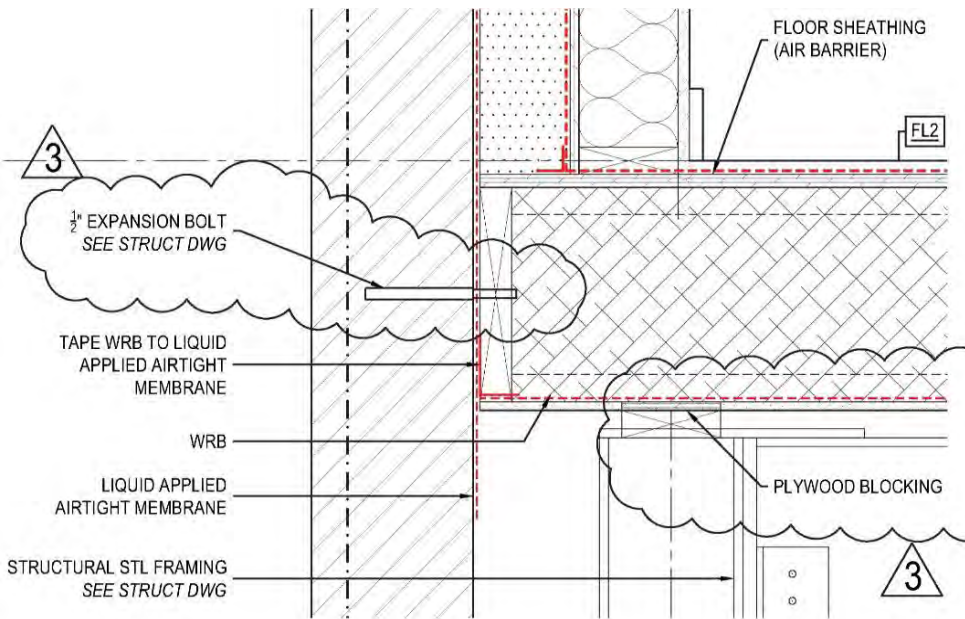
ITALIAN MARKET PASSIVE HOUSE CONSTRUCTION PROCESS 4/4



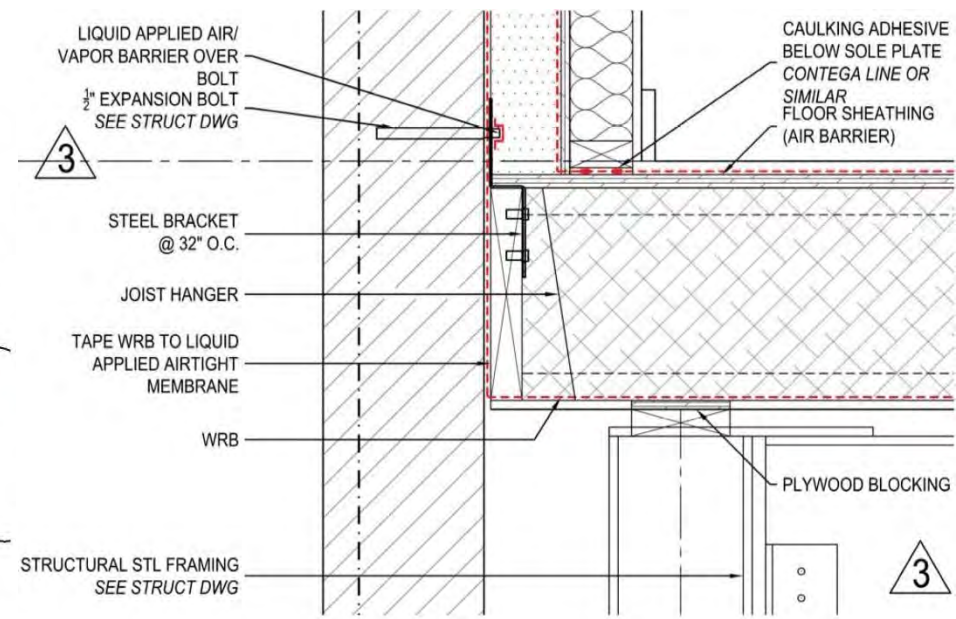
HANSON FINE BUILDING & PRESERVATION

ITALIAN MARKET PASSIVE HOUSE

SKINNING THE AIR SEALING CAT

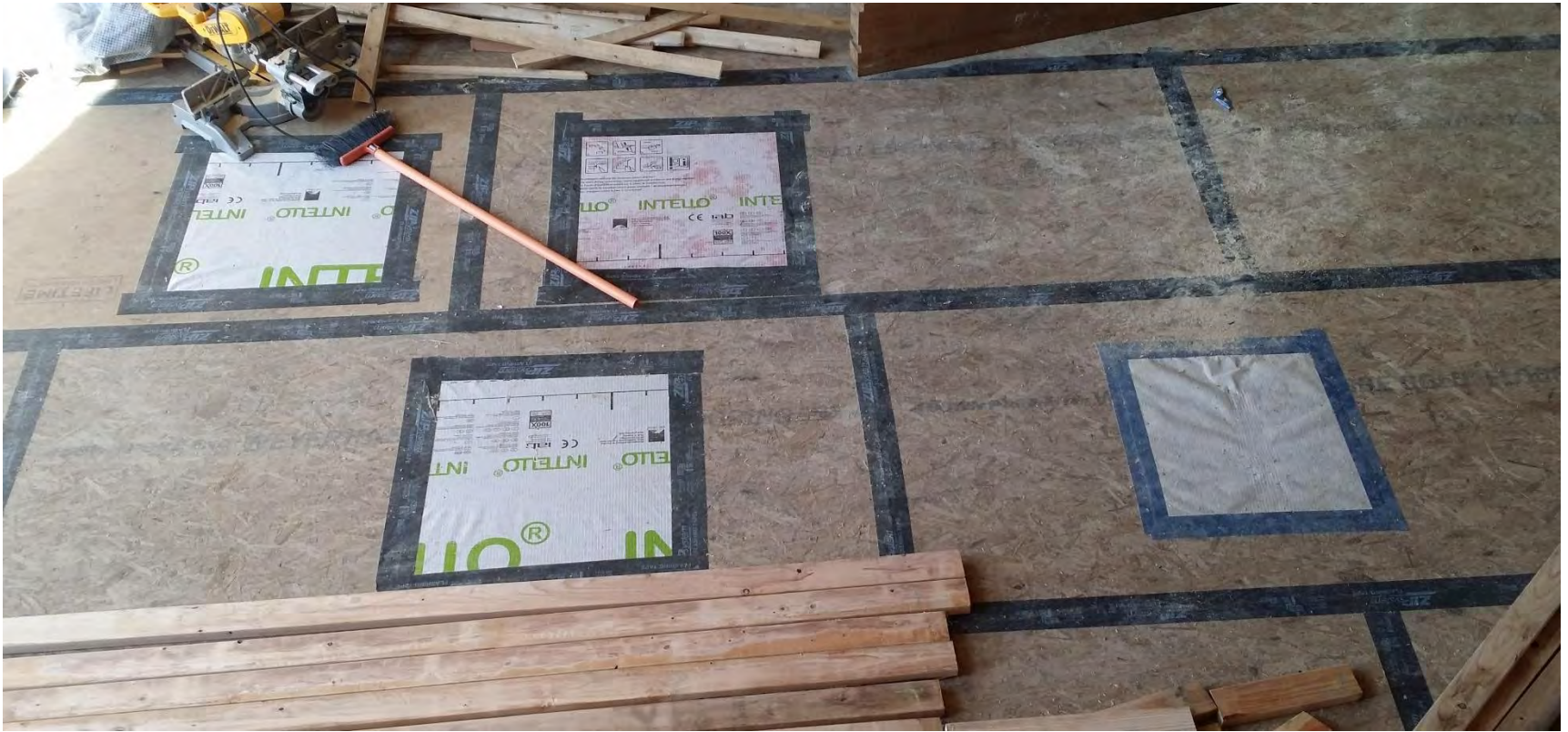


Air Barrier Detail @ Garage Ceiling & Existing Masonry Wall Before



Air Barrier Detail @ Garage Ceiling & Existing Masonry Wall After

ITALIAN MARKET PASSIVE HOUSE *SKINNING THE AIR SEALING CAT*

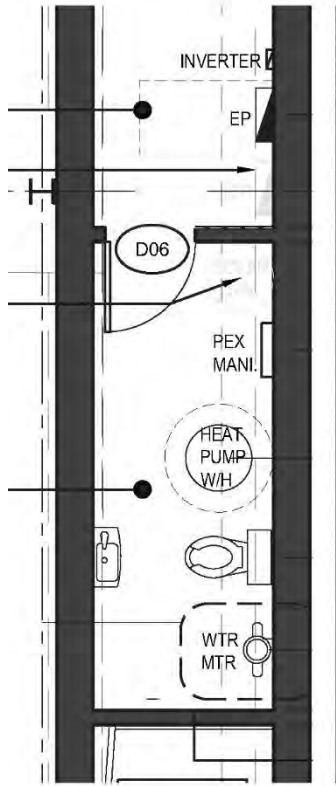


IS OSB AIRTIGHT?

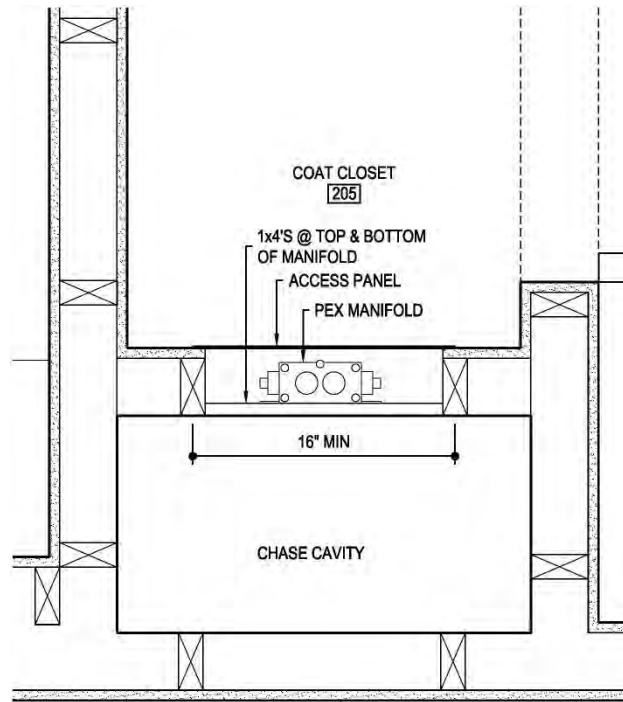
FUTURE FIT BUILDERS – AIR SEALING SPECIALISTS

ITALIAN MARKET PASSIVE HOUSE

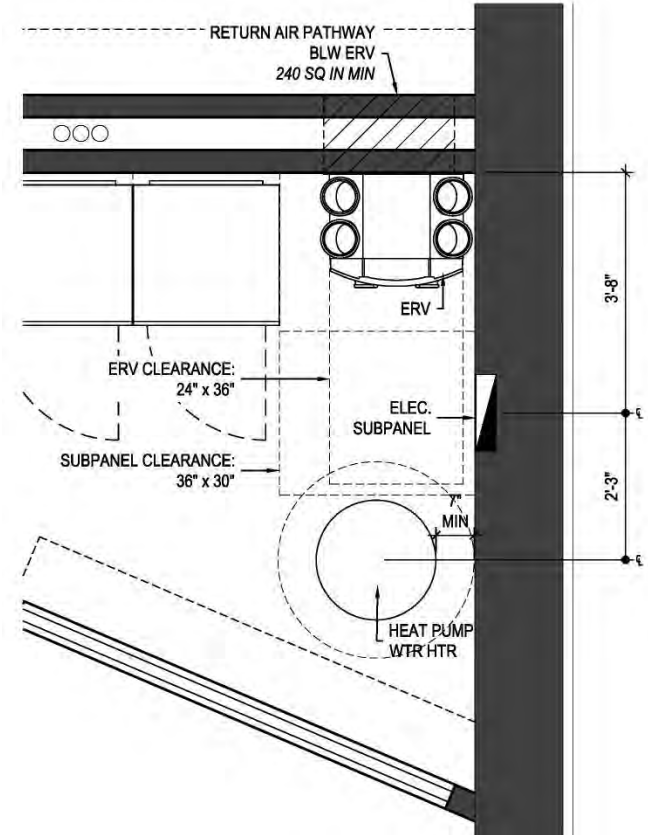
MIGRATING MANIFOLDS, SUB PANELS, WATER HEATERS



1st Floor Mech. Rm
Before



PEX Manifold relocated to
Coat Closet



HPHWH & Subpanel
relocated to Laundry Room

REDUCED PENETRATIONS & DWH PIPE LENGTHS

ITALIAN MARKET PASSIVE HOUSE

TESTING OUT

MAX Duct Leakage
allowable:
122 CFM @ 25 Pascals

Air tightness allowable:
0.6/HR @ ACH50

Test at Rough-in:
55 CFM @ 25 Pascals

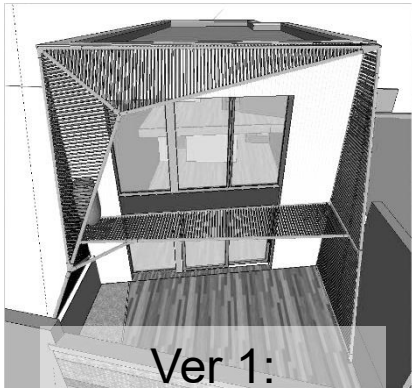
Air tightness at rough-in:
0.5 1/HR @ ACH50

David Berg Duct Tightness Test

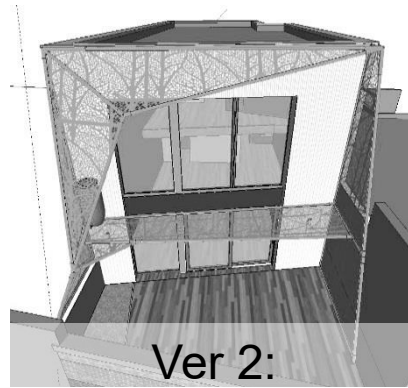
Future Fit Blower Door results

ITALIAN MARKET PASSIVE HOUSE

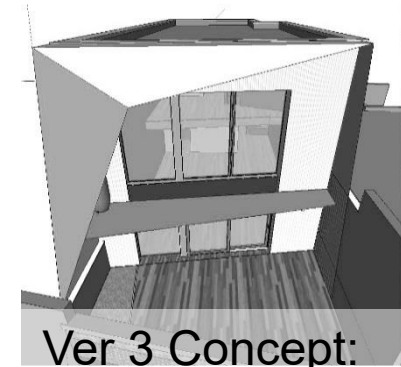
THE ART OF SHADING



Ver 1:
Steel Tubes &
Wood Slats



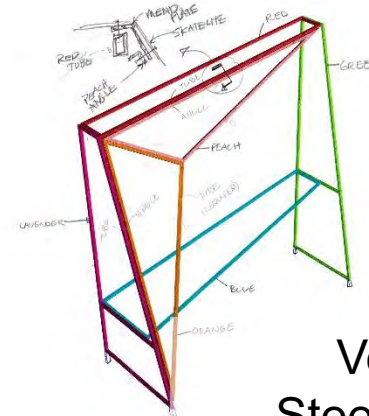
Ver 2:
Steel Tubes &
Laser cut panels



Ver 3 Concept:
Simplified
Design



Ver 3 Design:
Laser Cut Pattern using
Honeymoon Photos

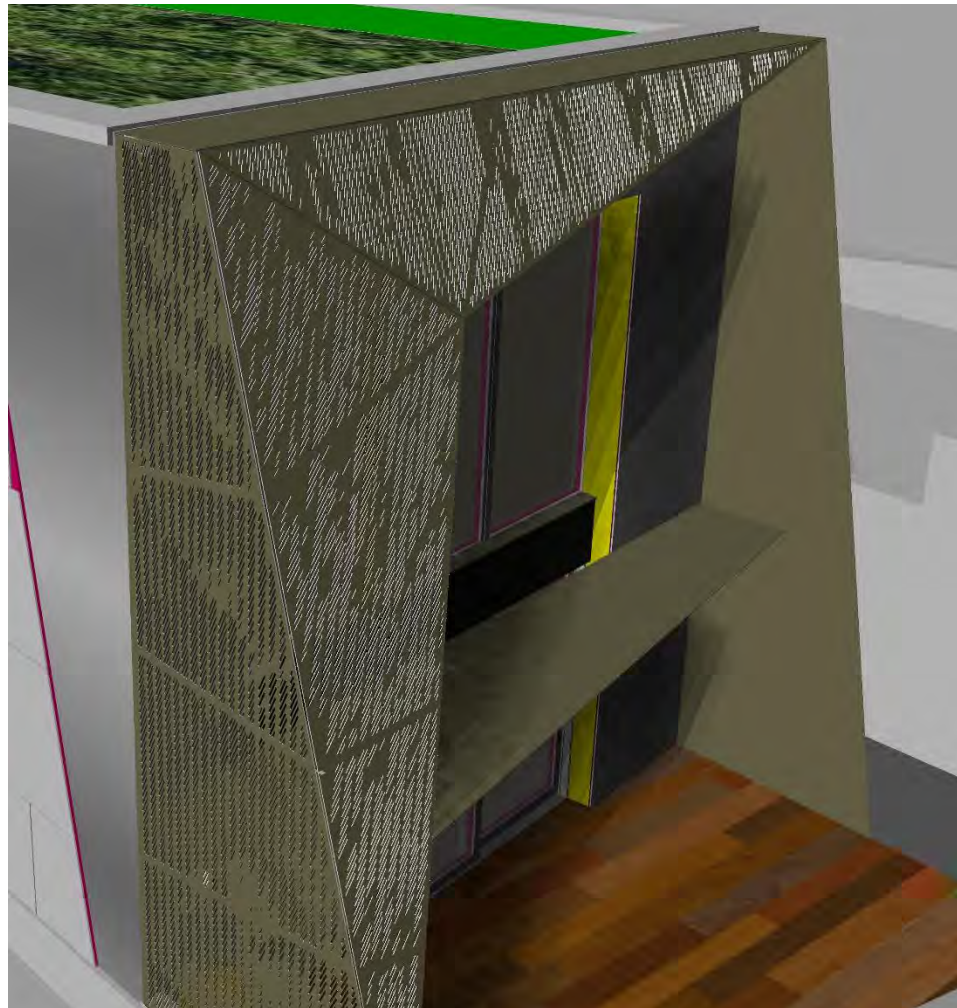


Ver 3 Structure:
Steel Tubes & Angles
attached w/ mending plates

POINT B FABRICATION & JEAN GAJARY PE

ITALIAN MARKET PASSIVE HOUSE

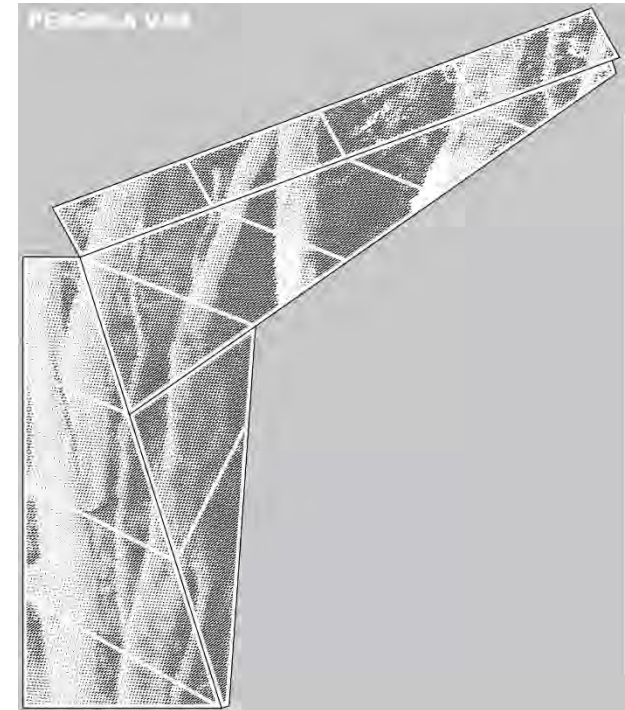
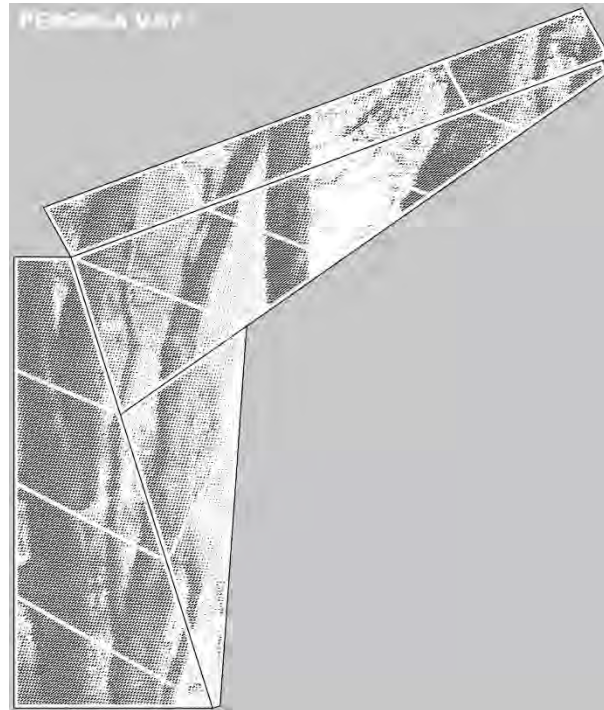
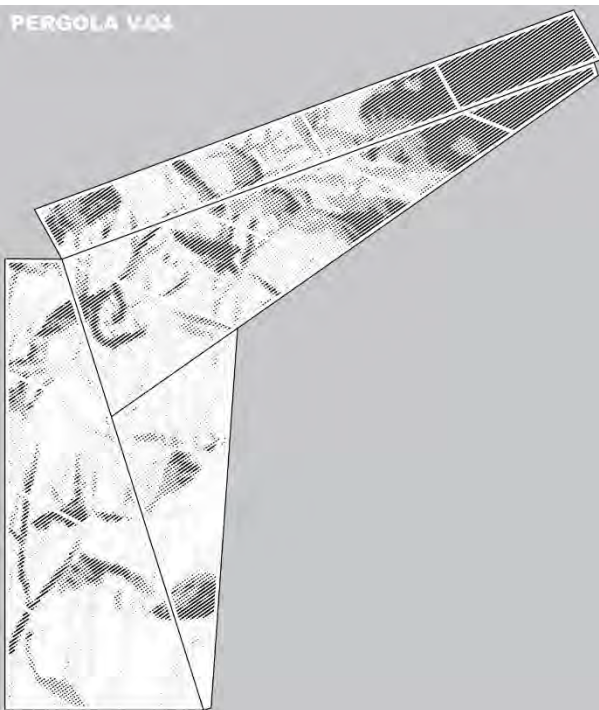
THE ART OF SHADING



POINT B FABRICATION

ITALIAN MARKET PASSIVE HOUSE

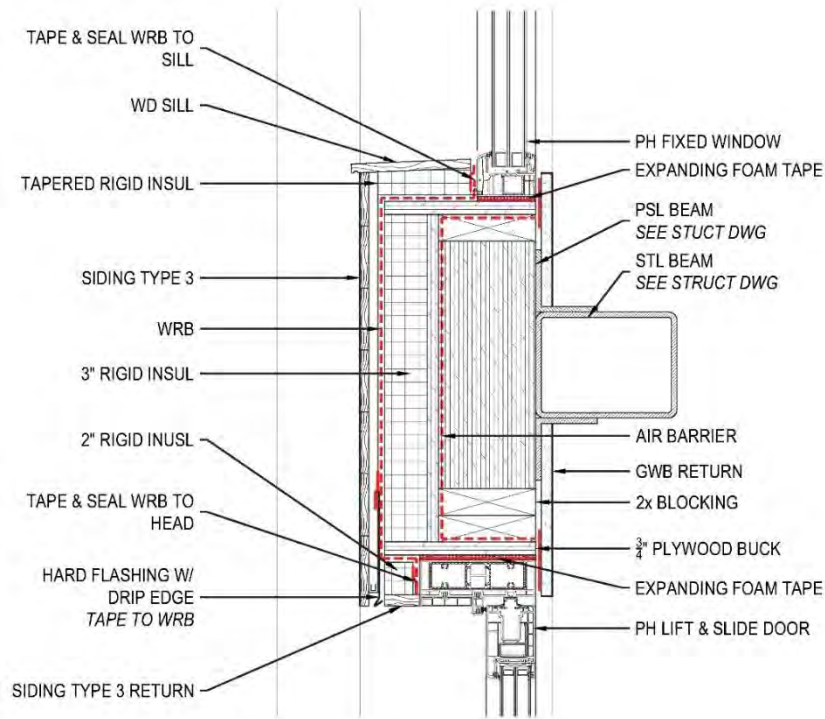
THE ART OF SHADING



Ver 3 Design Options:
Laser Cut Pattern using
Honeymoon Photos

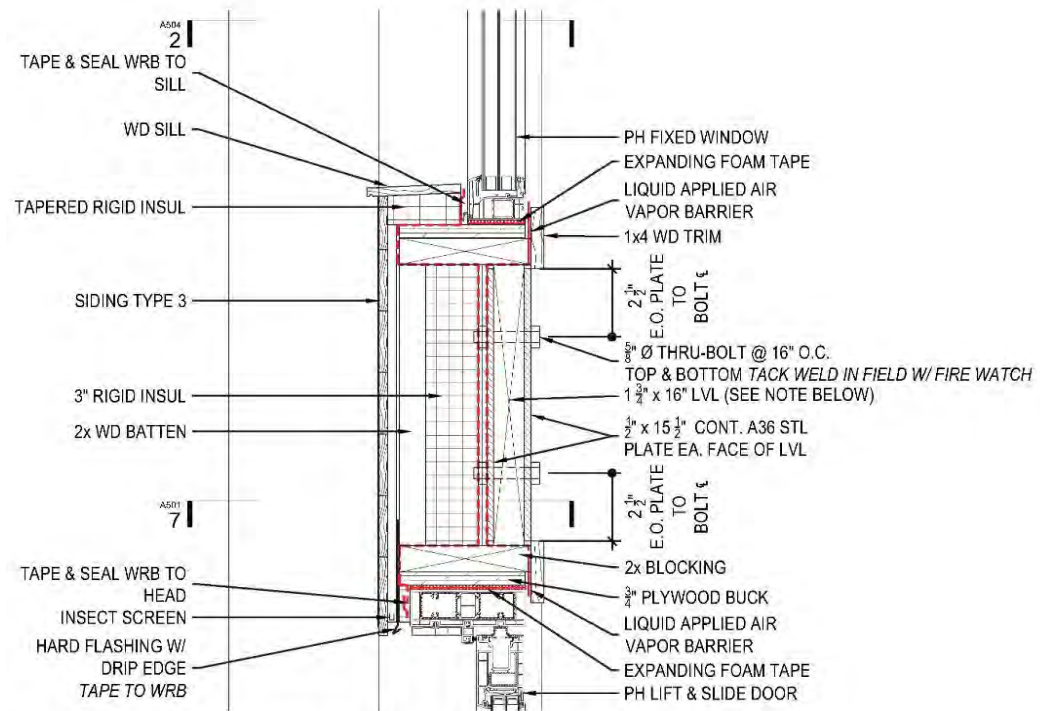
POINT B FABRICATION

ITALIAN MARKET PASSIVE HOUSE STEEL ELEGANCE @ SOUTH WINDOW WALL



Window Beam Before

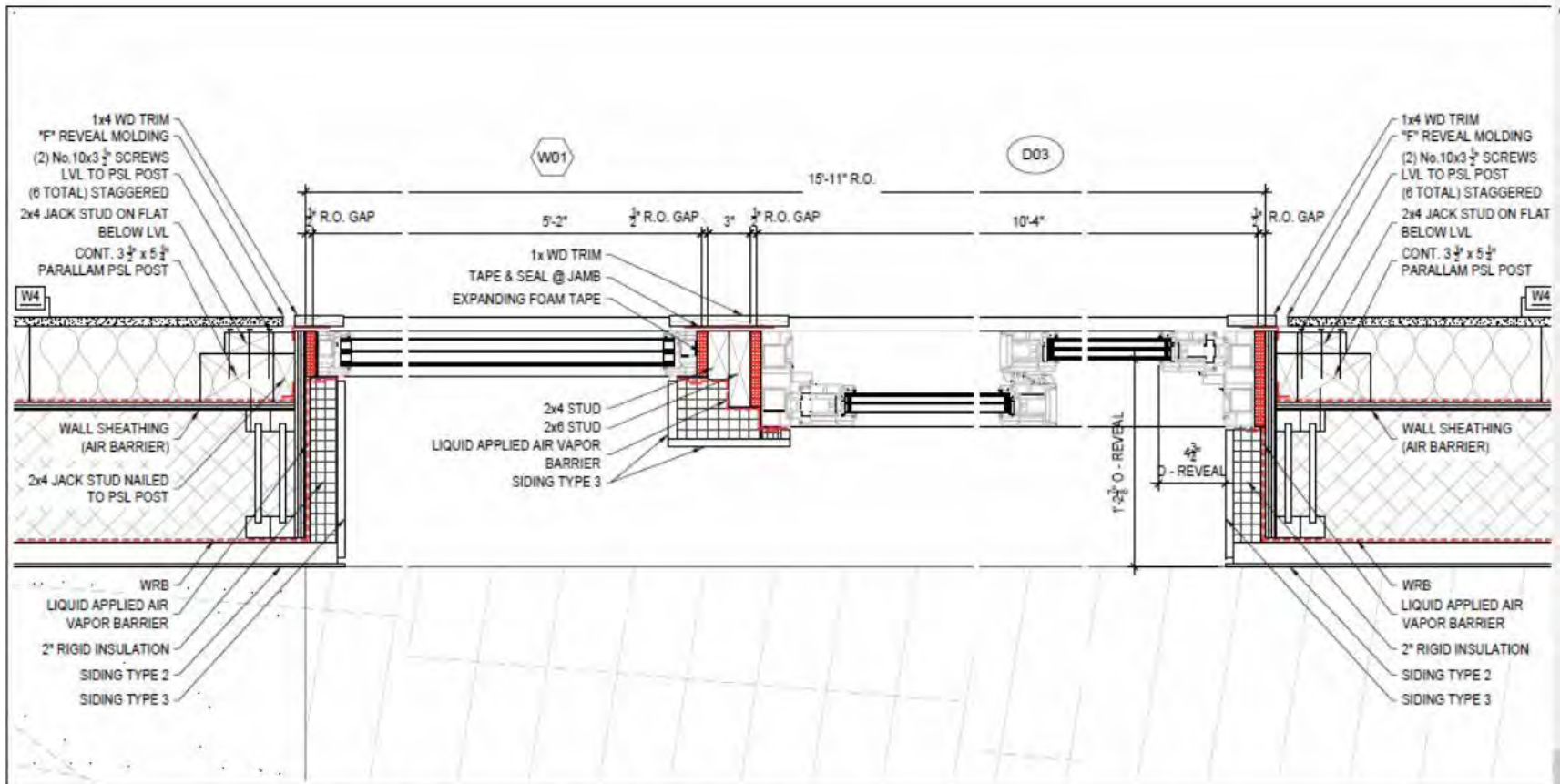
ENGINEER #1



Window Beam After

JEAN GAJARY, PE

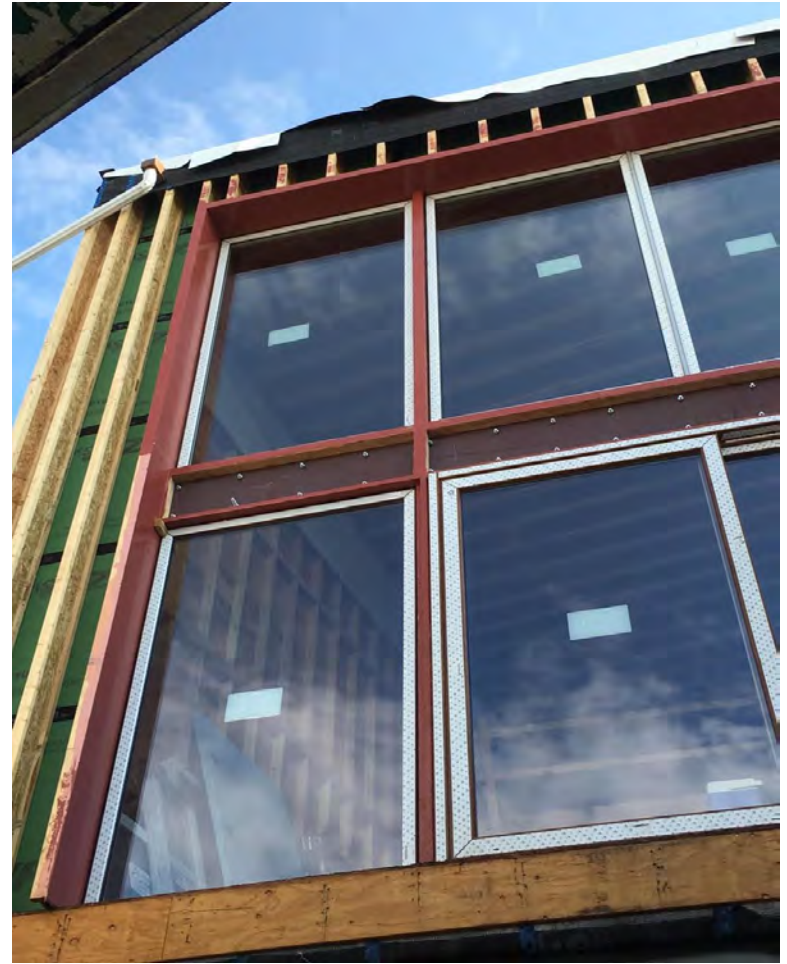
ITALIAN MARKET PASSIVE HOUSE STEEL ELEGANCE @ SOUTH WINDOW WALL



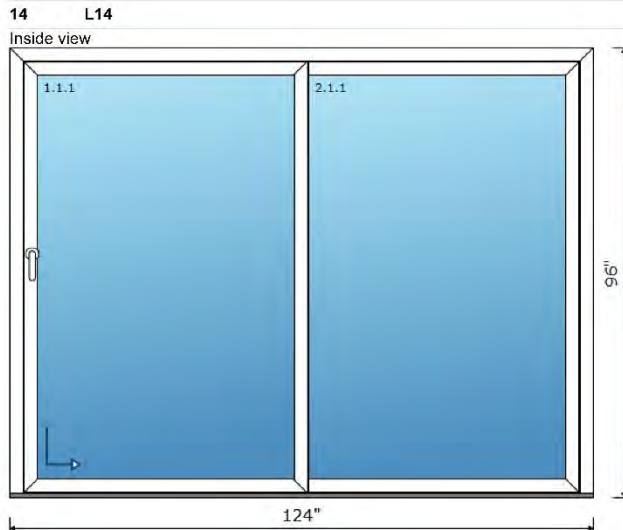
1 Window & Door Jambs @ Second Floor South Wall
1 1/2"=1'-0"

ITALIAN MARKET PASSIVE HOUSE

STEEL ELEGANCE @ SOUTH WINDOW WALL



ITALIAN MARKET PASSIVE HOUSE WINDOWS: CHECK TWICE (OR THRICE), ORDER ONCE...



Lift&slide doors

System: LIFT & SLIDE (3 PANEL)

Color: White/White

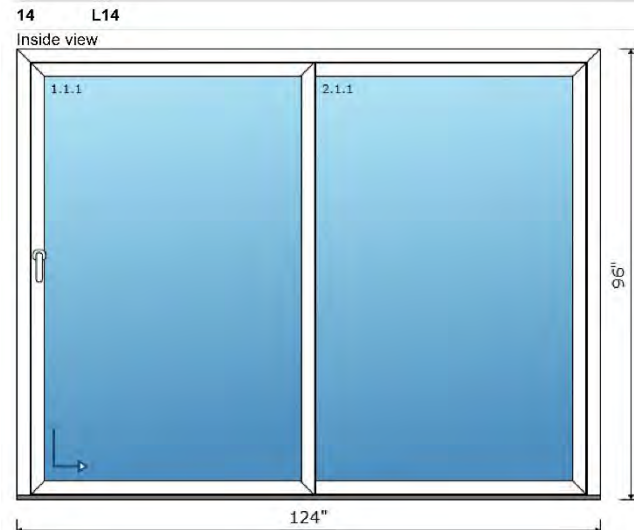
Filler:

1, 2, 3, 4: Prem4Tx14Arx4Tx14ArxPrem4T (tempered), warm edge spacer, Ug=0.106 Btu/hr sq.ft F, SHGC=0.494, VT=0.709 (4a)

Sash: 1: Single Lift-sliding

Accessories:

- Handle w/ lock in, handle w/ lock out, white/white - 2.00 set
- Glass Non High Altitude - 1.00 set



Lift&slide doors

System: LIFT & SLIDE (2 PANEL)

Fittings: -

Color: White/GoldenOak (DEC.110)

Filler:

1.1.1, 2.1.1: Prem6Tx12Arx6T, warm edge spacer, NFRC c-o-g: Ug=0.26 Btu/hr sq.ft F, SHGC=0.36, VT=0.52 (6a)

Sash: 1: Lift-sliding

Accessories:

- Handle w/ lock in, handle w/ lock out, white/white - 1.00 set
- Glass Non High Altitude - 1.00 set

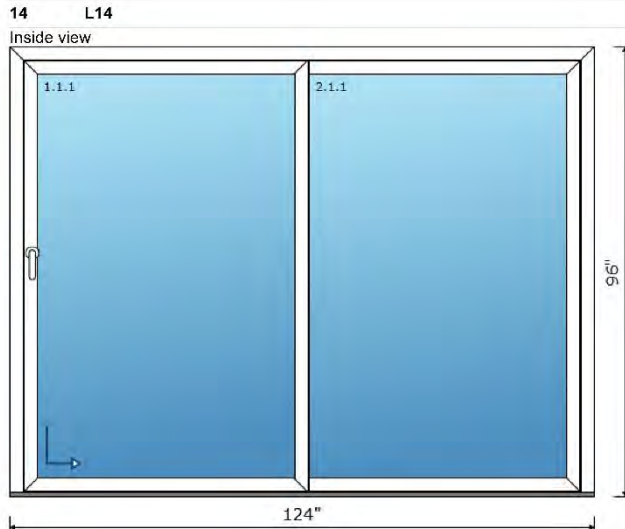
Window Order **before**

Window order **after**

DON'T RUSH IT, CHECK IT AND RECHECK IT!

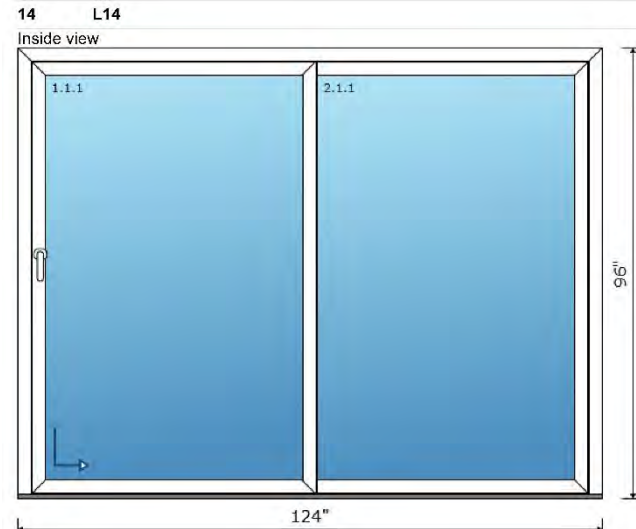
ITALIAN MARKET PASSIVE HOUSE

WINDOWS: CHECK TWICE (OR THRICE), ORDER ONCE...



Lift&slide doors

Ug = 0.106 Btu/hr/sq/ft F
SHGC = 0.494
VT = 0.709



Lift&slide doors

Ug = **0.26** Btu/hr/sq/ft F
SHGC = **0.36**
VT = **0.52**

Window Order **before**

Window order **after**

DON'T RUSH IT, CHECK IT AND RECHECK IT!

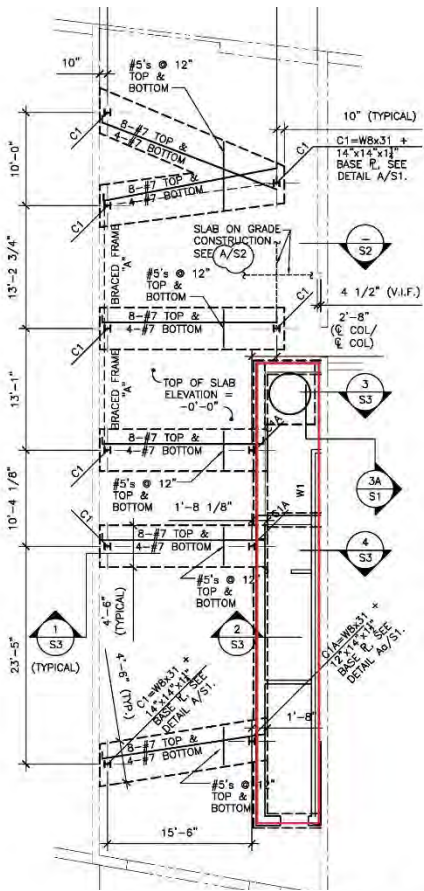
ITALIAN MARKET PASSIVE HOUSE

STEEL FRAMING

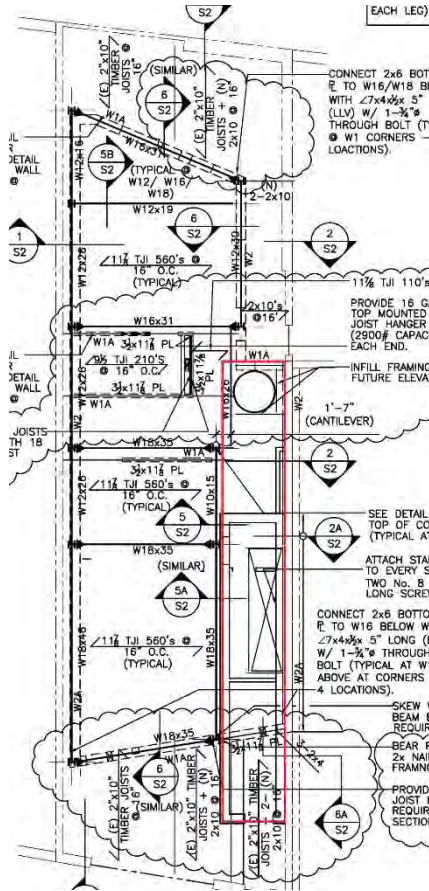


S B I STEEL WORKS

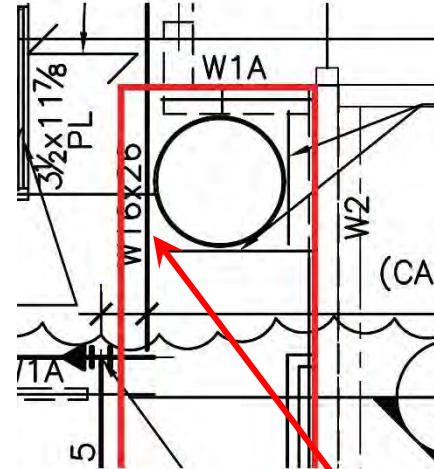
ITALIAN MARKET PASSIVE HOUSE STEEL BLOOPERS



First Floor Structure



Second Floor Structure

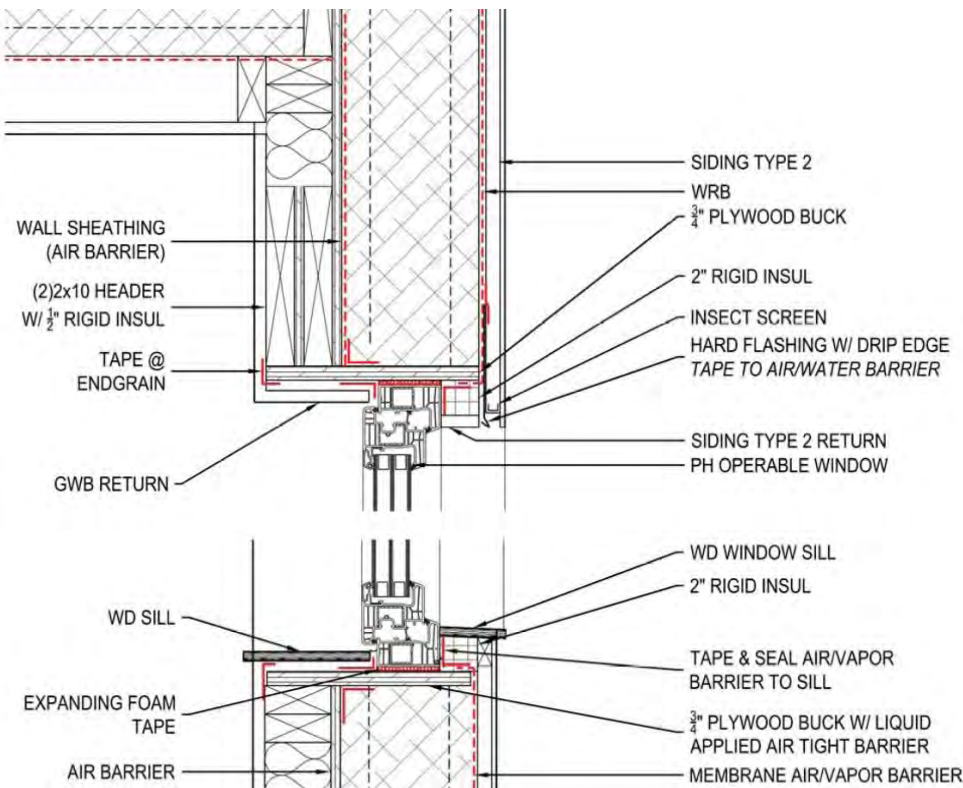


W16x26 Penetrating Thermal Envelope!



SECOND FLOOR "BACKGROUND" WAS OUTDATED

ITALIAN MARKET PASSIVE HOUSE *SEQUENCING=COST EFFECTIVE AIR SEALING*



Drawings called for plywood bucks



Carpenters installed TJI bucks, causing a 1/2" gap at each intersection

FOLLOW THE DRAWINGS – NO SUBSTITUTES

ITALIAN MARKET PASSIVE HOUSE

BENEFITS OF A PASSIVE HOUSE TRAINED TEAM

- **Engineers are conservative, thus skeptical.**
 - Untrained engineers resist basic PH strategies.
 - Inexperience with PH energy model inputs-
big problem.
- **Architects cannot train engineers, they can:**
 - Set overall goals,
 - Understand overarching principals,
 - Ask good questions,
 - Access options and direct decision-making.

ITALIAN MARKET PASSIVE HOUSE

BENEFITS OF A PASSIVE HOUSE TRAINED TEAM

- **Contractors are practical and seek clarity.**
 - Untrained contractors learn by doing and seeing.
 - First attempts = necessary learning curve.
 - Colleagues teach each other, Team Buy-in Must!
- **Architects can help train contractors, they can:**
 - Respect if a must.
 - Ask good questions, engage and listen.
 - Coordination meetings are so important.
 - Acknowledge challenges and success.

ITALIAN MARKET PASSIVE HOUSE

THE "A" TEAM



ITALIAN MARKET PASSIVE HOUSE

WHERE ARE WE NOW?



September 13 Progress

ITALIAN MARKET PASSIVE HOUSE

WHERE ARE WE NOW?



September 13 Progress

RESOURCES

PHIUS Passive House Institute US
passivehouse.us

PHAUS Passive House Alliance US
phaus.org

PHI Passive House Institute (Germany)
passiv.de/en/

iPHA International Passive House Association
passivehouse-international.org

NAPHN North American Passive House Network
northamericanpassivehousenetwork.com

ZERO ENERGY READY HOMES

energy.gov/eere/buildings/zero-energy-ready-home

RESOURCES

BEVAN LAWSON PE, STRUCTURAL

bevanlawsonpe.com/

JEAN GAJARY PE, STRUCTURAL

jgajary@hotmail.com

MARK ULRICK, PE, MEP

markulrick.com/

BAUKRAFT, PE, MEP

baukraft.com/

FOURSEVENFIVE High performance bldg supply,

foursevenfive.com

WORLD CLASS SUPPLY High performance bldg

supply, worldclasssupply.com

RESOURCES

HANSON FINE HOME BUILDING

hansonfinebuilding.com/

FUTURE FIT/ EPIPHYTE BUILDERS LLC,

futurefitbuilding.com/

BILL HENKEL CONTRACTING

bhcroofing.com/

BEST CHOICE PLUMBING,

bestchoiceplumbing.com/

ATB ELECTRICAL,

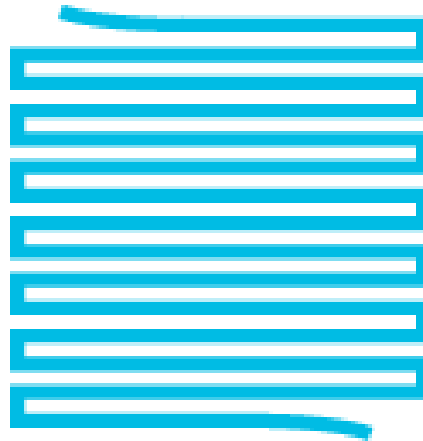
atbelectricinc@msn.com

POINT B FABRICATION

pointbdesign.com/

RESOURCES

blupath.us



BLUPATH

INSPIRING DESIGN
FOR PLACES TO THRIVE

