

US building impacts

73% electricity consumption

41% energy use

38% CO₂ emissions

40% raw materials

30% waste output

14% potable water use

US building impacts

73% electricity consumption

41% energy use

38% CO₂ emissions

40% raw materials

30% waste output

14% potable water use



1722 PINE STREET: FROM MAZE TO MATRIX

Laura Blau AIA

Paul Thompson AIA

LAURA BLAU AIA LEED BD&C® AP

CPHC (Certified Passive House Consultant)

CPHB (Certified Passive House Builder)

CPHD (Certified Passive House Designer-pending)

Principal **BLUPATH**

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

blupath.us



PAUL THOMPSON AIA LEED BD&C® AP

CPHC (Certified Passive House Consultant)

Principal **IEI ARCHITECTS**

IEI ARCHITECTS is part of IEI Group, a nationally recognized interior design and architecture firm.

ieigroup.com

PROJECT TEAM

BluPath	Architect and PH Consultant
GreenSteps	General Contractor
Kent Lessly	WUFI, THERM Modeling
Zero Energy Design	HVAC Design
Jean Gajary	Structural Design
Buckminster Green	Demolition
FutureFit / Epiphyte	Air Seal / Insul / ERV
Bill Henkel	Roofing
Best Choice	HVAC / Plumbing
Dave Simpson	Electrician

PRODUCTS

World Class Supply

Building Products

475 Building Supply

Building Products

KlearWall

Front windows and doors

Intus

Rear windows

Zehnder

ERV

Mitsubishi + Daikon Mini-split

GE GeoSpring

Heat pump HWH

Stiebel Eltron

On-demand HWH

LEARNING OBJECTIVES

1. Learn how science-based, conservation-first strategies and the 'whole-building' approach can be implemented to achieve energy efficiency, durability and health benefits in historic buildings.
2. Apply passive conservation phasing strategies for building envelope and mechanical systems design for historic buildings.
3. Apply case study examples of best practices and lessons learned, including hygrothermal issues particular to masonry walls in historic residences.
4. Understand potential municipal approval, design and construction challenges when renovating historic properties.

1722 PINE STREET PHILADELPHIA PA
4 story, 4 unit rowhouse, built 1845
Brick front and rear





Rittenhouse – Fidler Historic District



Pine Street



1722 Pine Street



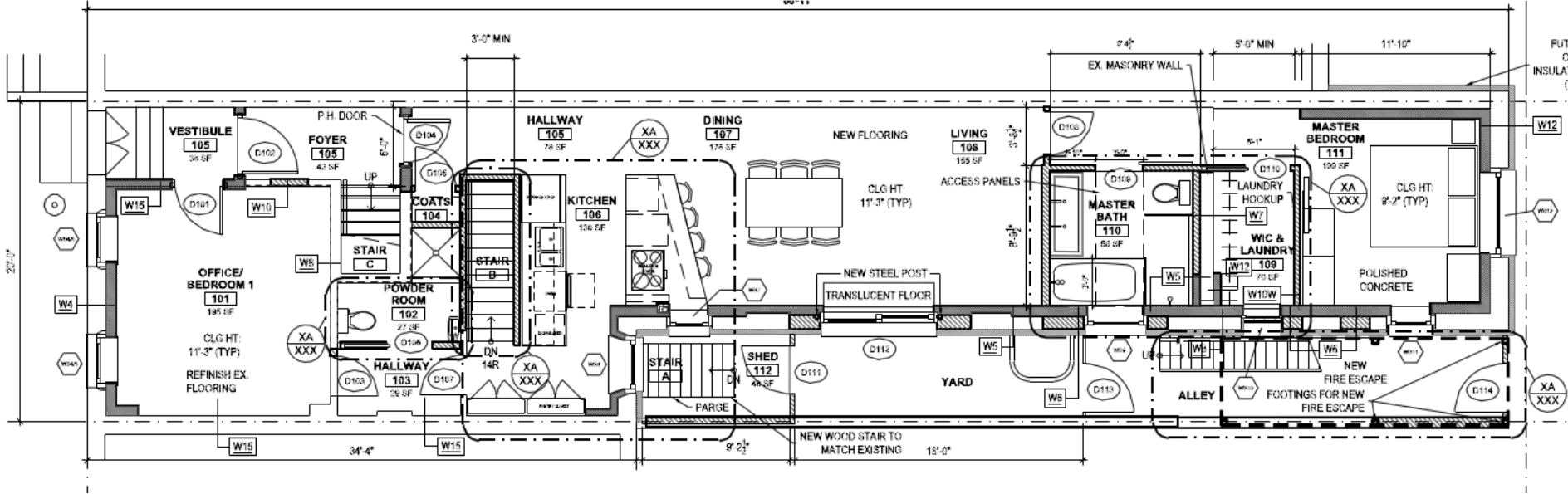
Waverly Street

1722 PINE STREET RENOVATION PROJECT GOALS

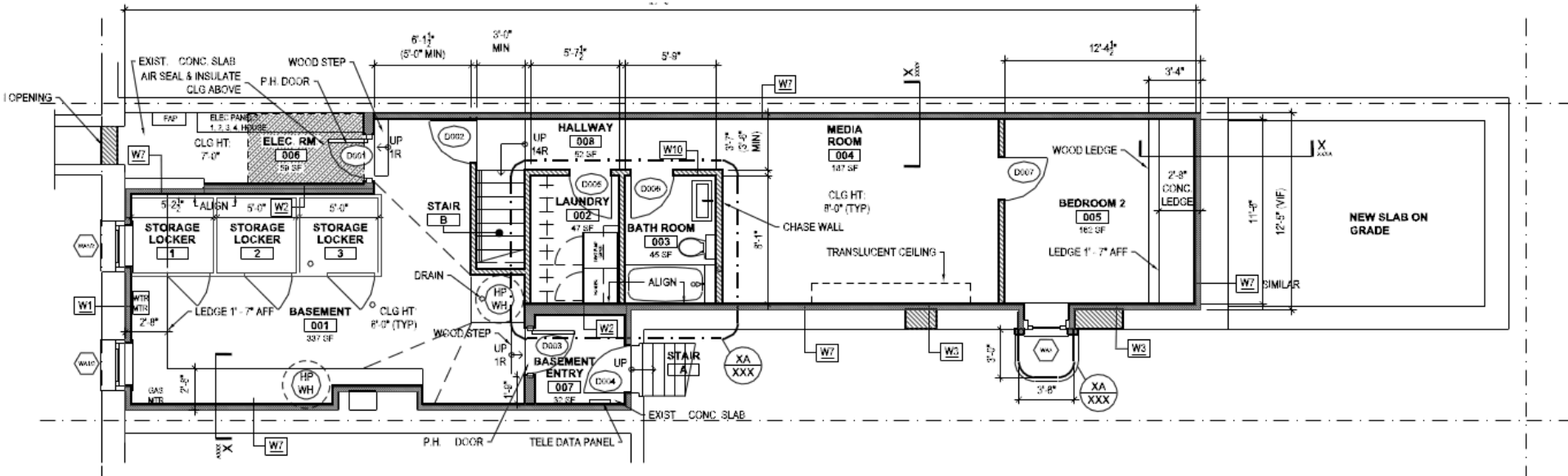
1. Change building from mixed use to all residential
2. Modernize the property
3. Improve the property value and increase rents
4. Renovate with tenants in place
5. Create a new home for our family

1722 PINE STREET RENOVATION PROJECT GOALS

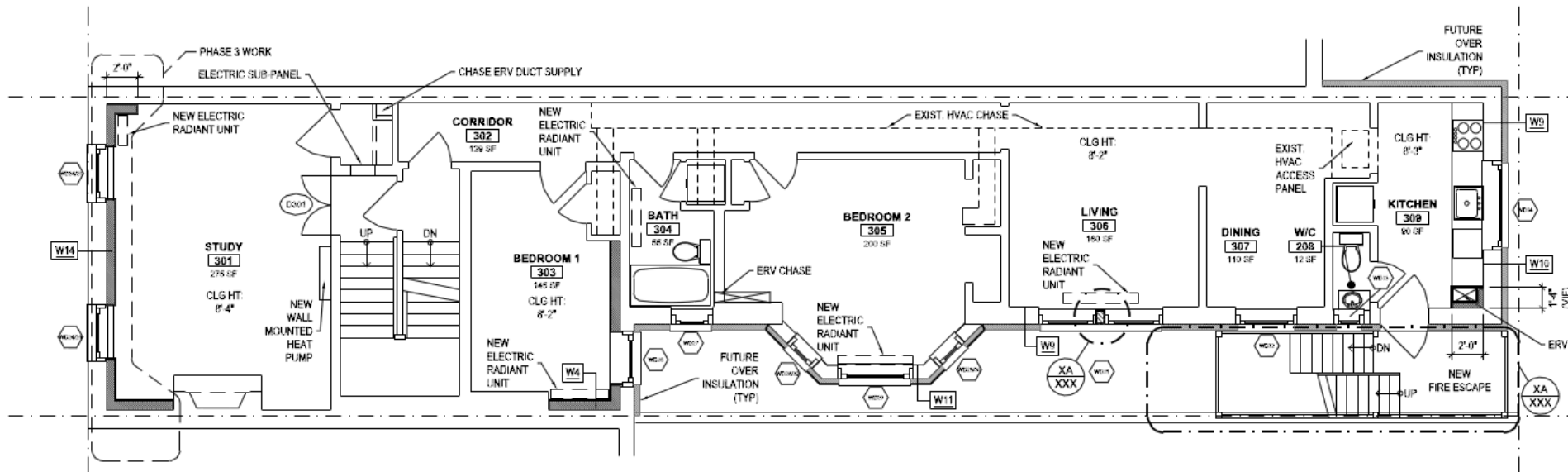
6. Renovate to near zero-energy
 - Eliminate natural gas
 - Include on-site renewable energy
 - Monitor real time energy use
 - EnerPHit certification at Unit 1
 - Step-By-Step EnerPHit at Units 2, 3 and 4
 - Use building science analysis and solutions
7. Raise expectations and establish a precedent for historic renovations in Philadelphia
8. Contribute to Architecture 2030, Achieving 80x50 and Philadelphia Greenworks goals



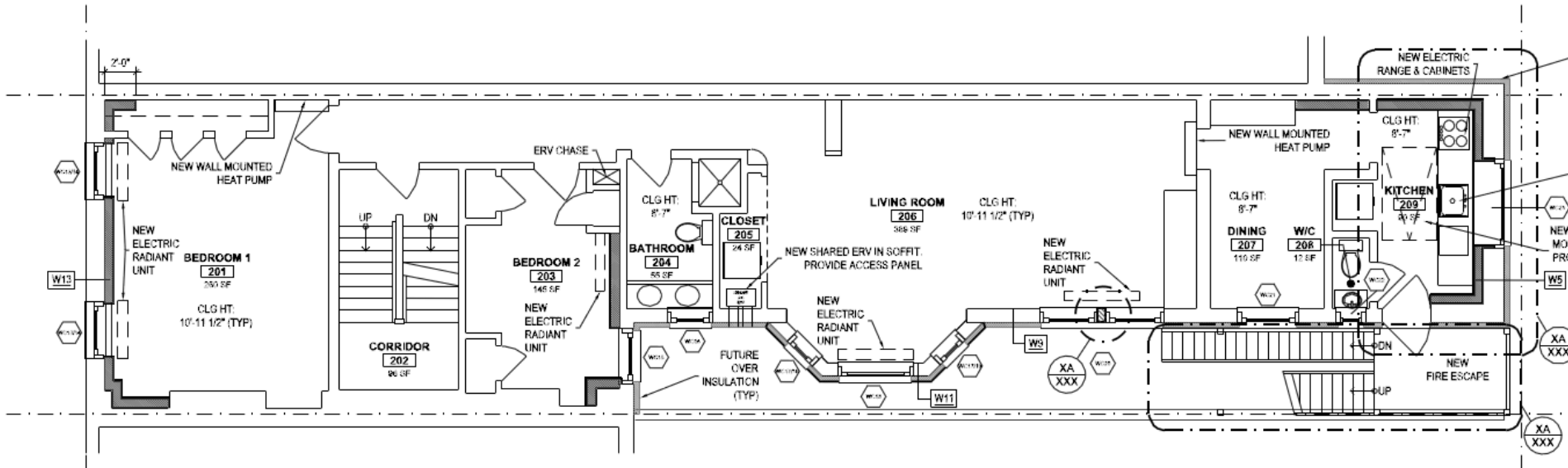
1st Floor



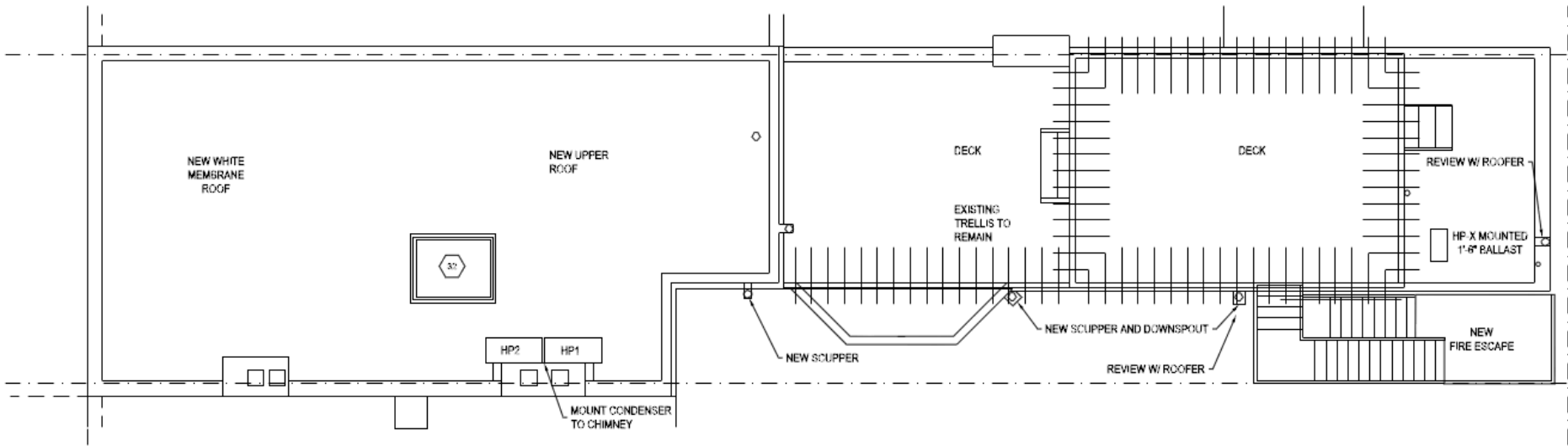
Lower Level



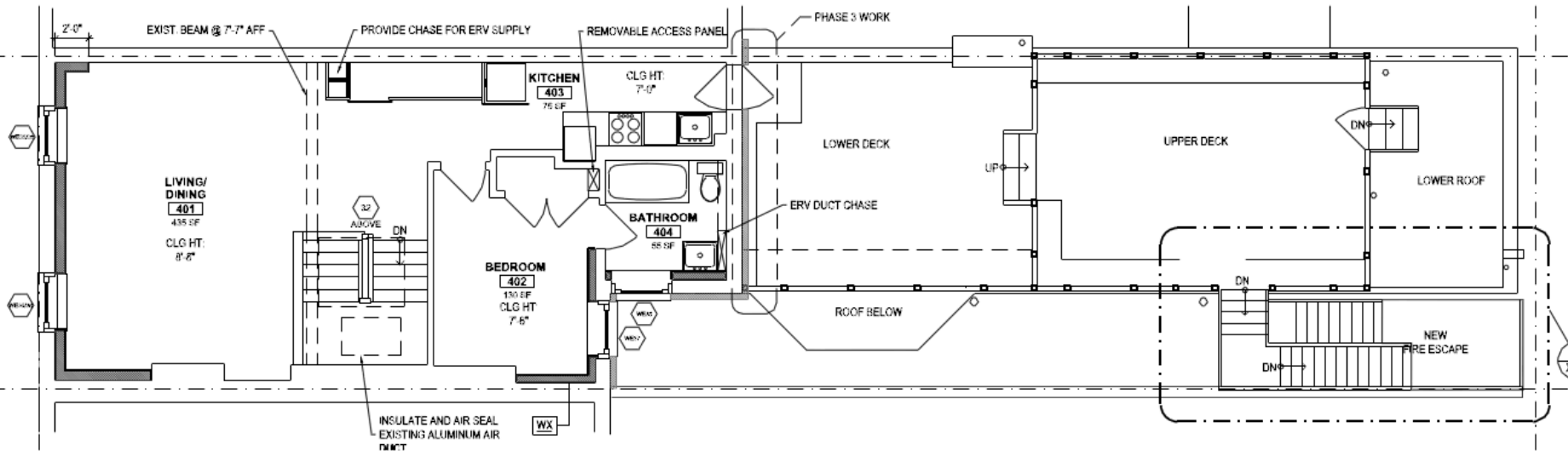
3rd Floor



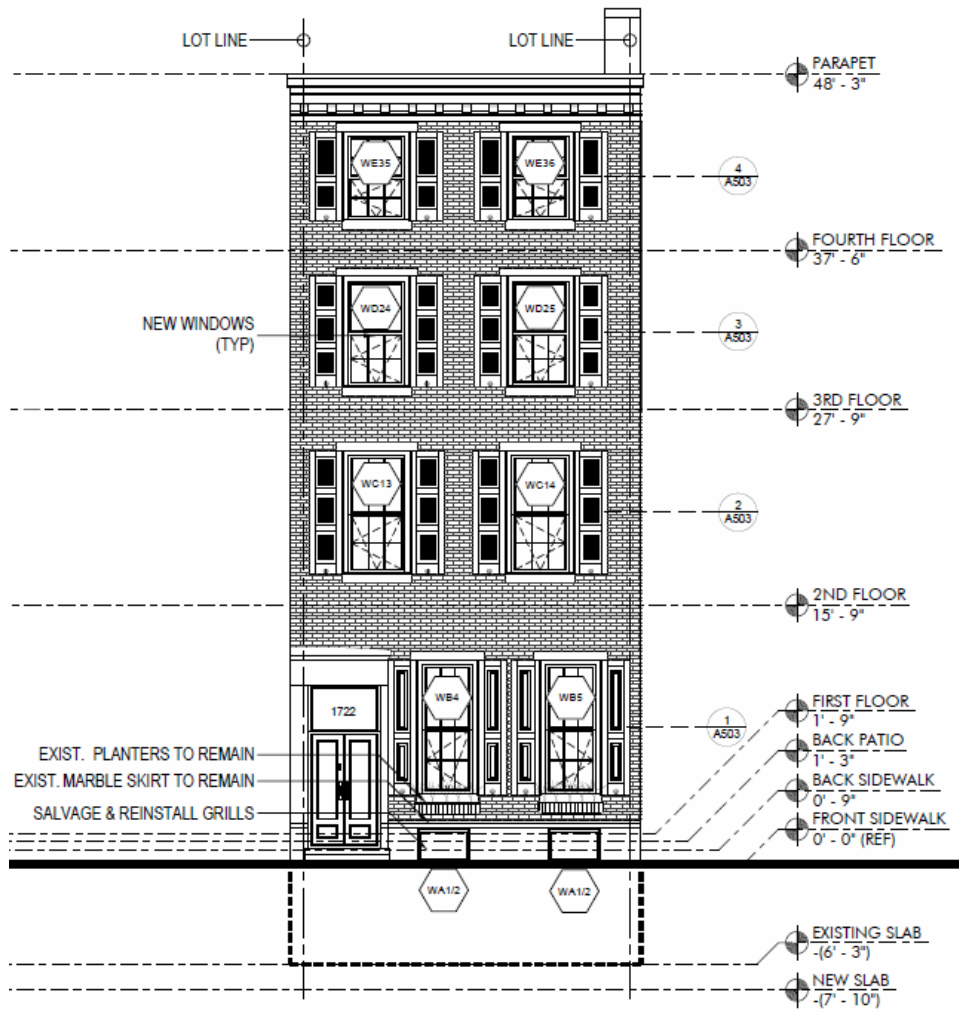
2nd Floor



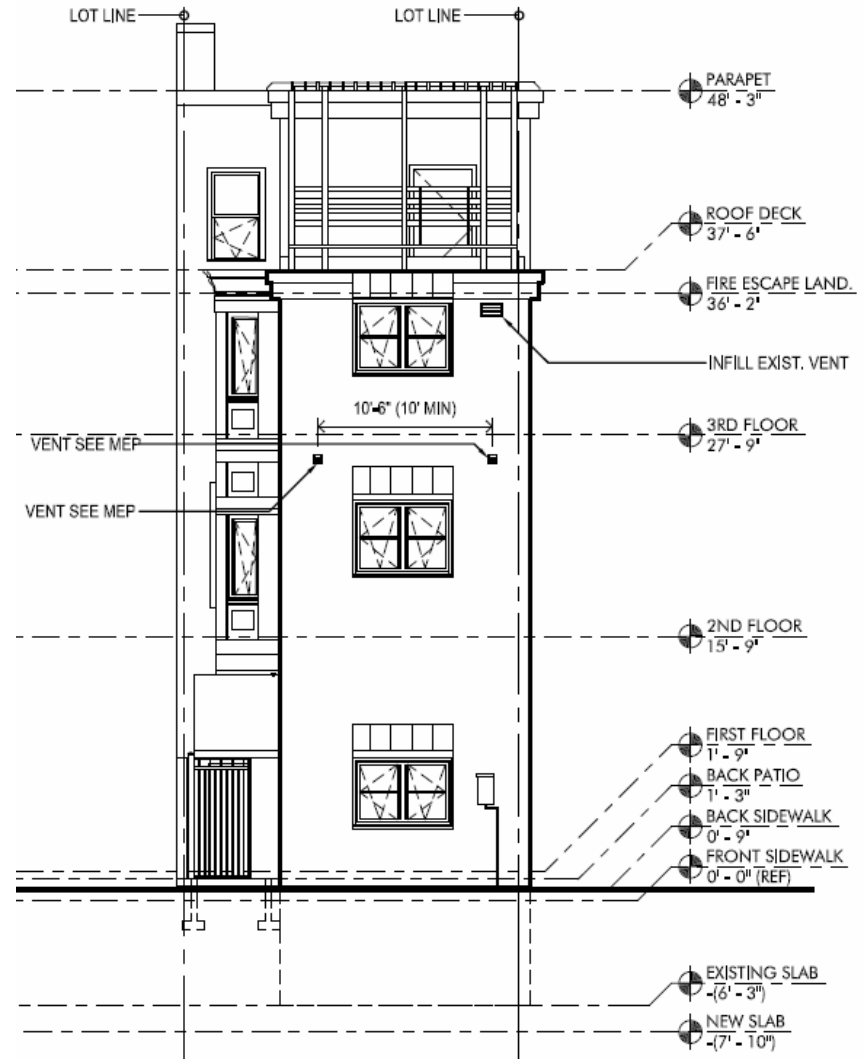
Roof



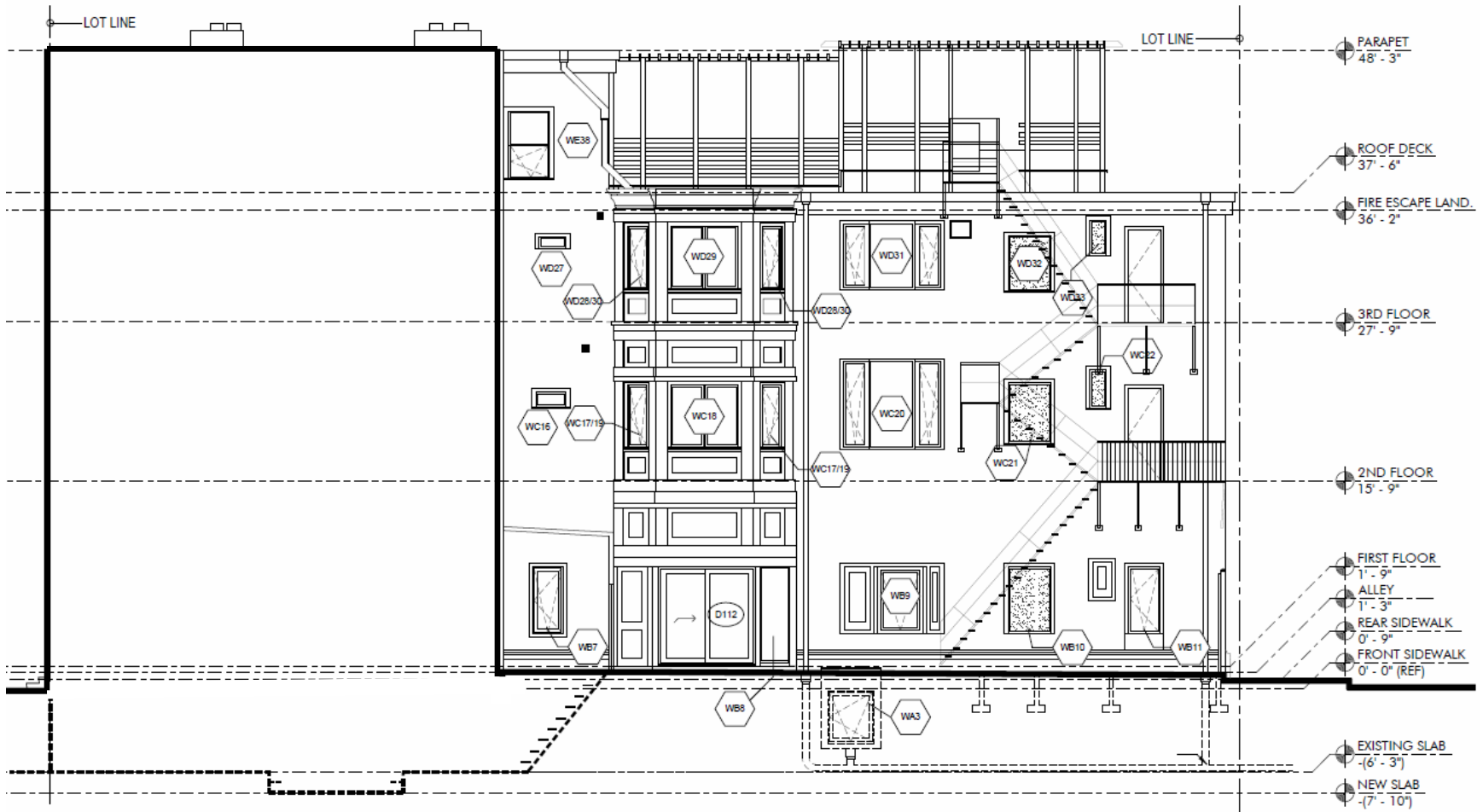
4th Floor



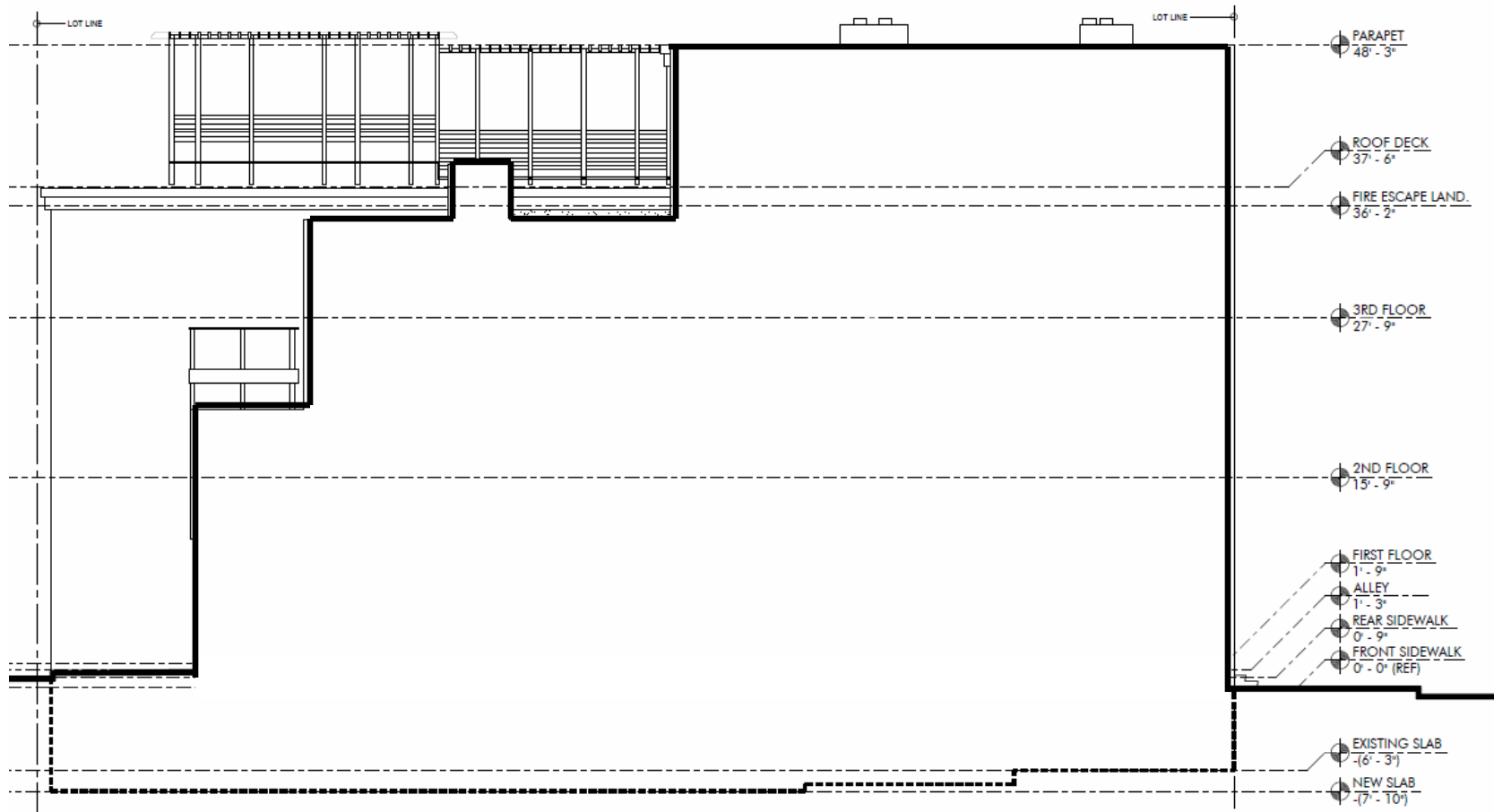
North (Pine St.)



South (Waverly St.)



West



East

1722 PINE STREET RENOVATION HISTORICAL COMMISSION APPROVAL

1. Submit proposed work to Historical Commission
2. HC Architectural Committee Presentation
Rear Insulation, PH Windows NOT APPROVED
3. Historical Commission Hearing May 13, 2016
Rear Insulation DENIED (but allowed to represent with more science-based information)
PH windows and rear bay APPROVED with Staff Review
4. Resubmit proposed work
5. Historical Commission Hearing July 8, 2016
Rear Insulation DENIED

THE SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION (1976)

The Standards (Department of Interior regulations, 36 CFR 67), written in 1976, pertain to historic buildings of all materials, construction types, sizes, and occupancy and encompass the exterior and the interior ... **The Standards are to be applied to specific rehabilitation projects in a reasonable manner, taking into consideration economic and technical feasibility.**

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.



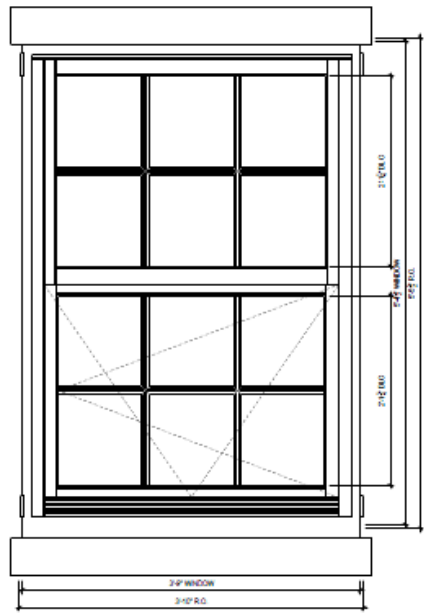
THE ENVIRONMENT RIGHTS AMENDMENT TO THE PENNSYLVANIA CONSTITUTION (1971)

Article 1, Section 27 of the Pennsylvania Constitution reads:

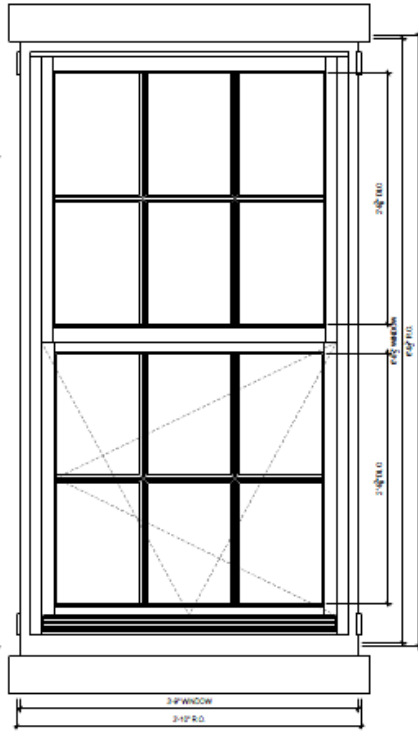
"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic, and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all of the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people."



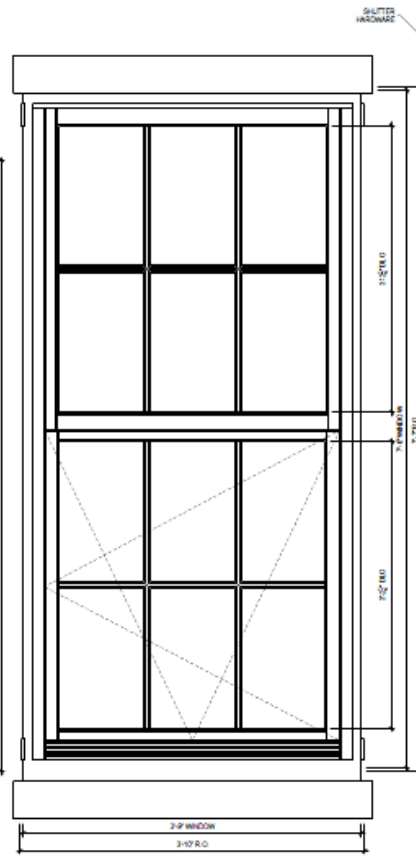
Existing Window Frame



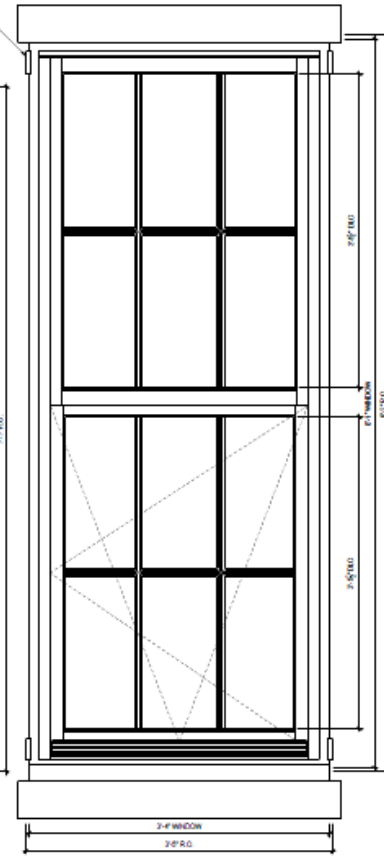
Elevation - Fourth Floor North - Window WE35/36
1'10 1/2" x 1'0"



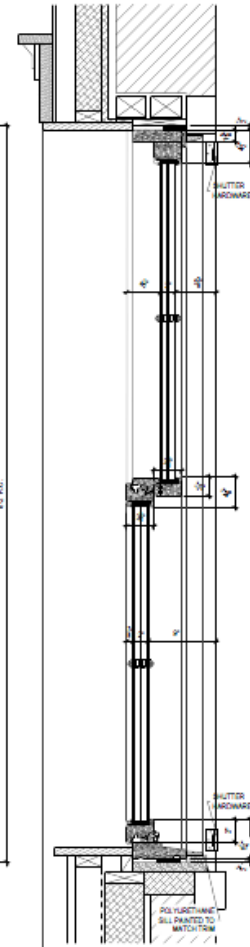
Elevation - Third Floor North - Window WD24/25
1'10 1/2" x 1'0"



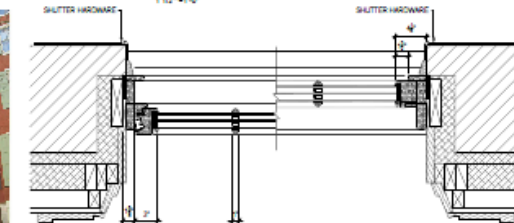
Elevation - Second Floor North - Window WC13/14
1'10 1/2" x 1'0"



Elevation - First Floor North - Window WB4/5
1'10 1/2" x 1'0"



1B Sill & Head
1'10 1/2" x 1'0"



- NEW FRAME TO MATCH ORIGINAL WINDOW FRAME MATERIAL: WOOD
 - WINDOW FRAME COLOR: RAL 5011 - STEEL BLUE
 - POLYURETHANE SILL: ARMATHERM 500-150
 - ARMATHERM 500-150: PAINTED RAL-5011-STEEL BLUE
- NOTE:
R.O. IS NOT EQUAL TO M.O.

Historical Commission Window Submission

1722 PINE STREET RENOVATION PROJECTS

1. Interior Demolition – Unit 1
2. Window and Bay Replacement – front and rear
(HC received)
3. HVAC Improvements – Unit 2, 3, 4
4. Roof Replacement, including PH skylight (HC
pending)
5. Interior Renovations – Unit 2, 4
6. Interior Renovations – Unit 1
7. Insulate Exterior, New Fire Escape - rear (HC ???)
8. Addition and Solar Panels – Unit 4 (In Design)
(HC)

HC = Requires Historical Commission approval



Get Rid of the Gas!!



Basement Demolition



1st Floor Demolition





Deteriorating Stone Walls



Deteriorating Brick Walls

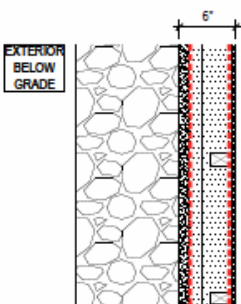


Deteriorating Brick Walls

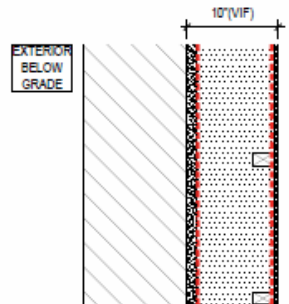


Rear West Façade: Conduit and Fire Escape

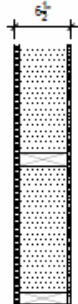




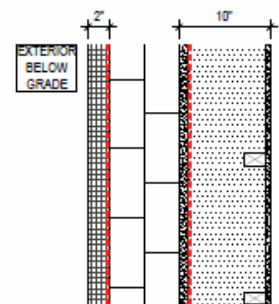
- WALL TYPE W1A (@ RUBLE WALL)**
- 1" EXISTING RUBLE WALL
 - 1" SALT ABSORBING PLASTER (VAPOR BARRIER)
 - 1" MINERAL WOOL DRAINBOARD
 - 3 1/2" MINERAL WOOL INSUL.
 - 2X3 P.T. STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1/2" A/B PLYWOOD - EXT. GRADE



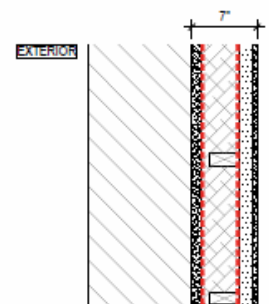
- WALL TYPE W1B (ABOVE RUBLE WALL)**
- 1" EXIST. TRIPLE WYTHE BRICK
 - 1" SALT ABSORBING PLASTER (VAPOR BARRIER)
 - 8 1/2" MINERAL WOOL INSUL (VIF)
 - 2X3 P.T. STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1/2" A/B PLYWOOD - EXT. GRADE



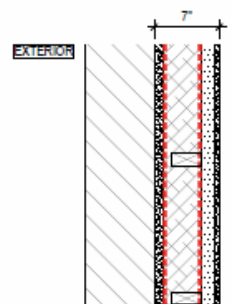
- WALL TYPE W2**
- 1/2" PLYWOOD
 - 5 1/2" 2X6 STUDS @ 16" O.C.
 - MINERAL WOOL INSUL.
 - 1/2" GWB



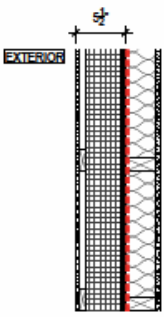
- WALL TYPE W3**
- 2" RIGID INSUL.
 - 1" MOISTURE BARRIER
 - 8" DOUBLE WYTHE BRICK INFILL (SALVAGED)
 - 1" SALT ABSORBING PLASTER (AIR BARRIER)
 - 9" MINERAL WOOL INSUL (VIF)
 - 2X3 P.T. STUDS @ 16" O.C.
 - 1/2" GWB



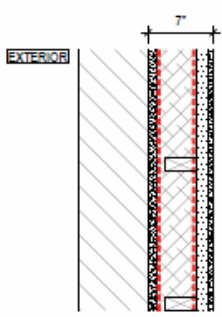
- WALL TYPE W4**
- EXIST. TRIPLE WYTHE BRICK WALL
 - 1" EXIST. PLASTER (VAPOR BARRIER)
 - 4" DENSE CELL INSUL. 2X4 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - MINERAL WOOL INSUL.
 - 1/2" GWB



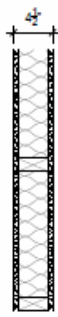
- WALL TYPE W5**
- EXIST. DOUBLE WYTHE BRICK WALL
 - 1" EXIST. PLASTER (VAPOR BARRIER)
 - 4" DENSE CELL INSUL. 2X4 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - MINERAL WOOL INSUL.
 - 1/2" GWB



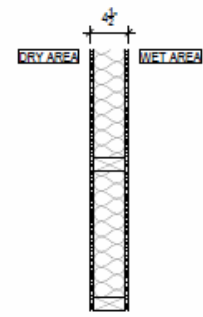
- WALL TYPE W7**
- 1/2" FIBER CEMENT RAIN SCREEN
 - 4" 1X3 BATTENS
 - 4" RIGID INSUL.
 - 1/2" SHEATHING TAPED & SEALED (AIR BARRIER)
 - 3 1/2" EXIST. 2X4 STUDS @ 16" O.C.
 - FG BATT INSUL.
 - 1/2" EXIST. GWB



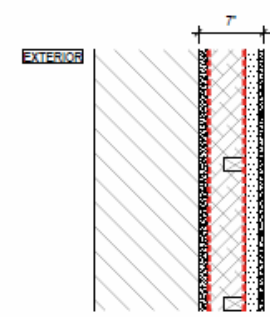
- WALL TYPE W8**
- EXIST. DOUBLE WYTHE BRICK WALL
 - 1" MASONRY AIR SEAL/BARRIER (VAPOR BARRIER)
 - 4" DENSE CELL INSUL. 2X4 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - MINERAL WOOL INSUL.
 - 1/2" GWB



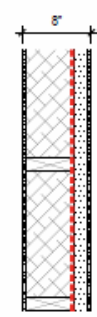
- WALL TYPE W9**
- 1/2" GWB
 - 3 1/2" 2x4 @ 16" O.C.
 - SOUND ATTENUATION BATT
 - 1/2" GWB



- WALL TYPE W10W**
- 1/2" GWB
 - 3 1/2" 2x4 @ 16" O.C.
 - SOUND ATTENUATION BATT
 - 1/2" GWB - MOISTURE RESISTANT
 - 1/2" GWB



- WALL TYPE W14**
- EXIST. TRIPLE WYTHE BRICK WALL
 - 1" EXIST. PLASTER (AIR BARRIER)
 - 4" DENSE CELL INSUL. 2X3 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - MINERAL WOOL INSUL.
 - 1/2" GWB



- WALL TYPE W15**
- 1/2" GWB
 - 5 1/2" 2X6 STUDS @ 16" O.C.
 - DENSE CELL INSUL.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 FURRING RUN HORIZ. @ 16" O.C. MAX
 - MINERAL WOOL INSUL.
 - 1/2" GWB

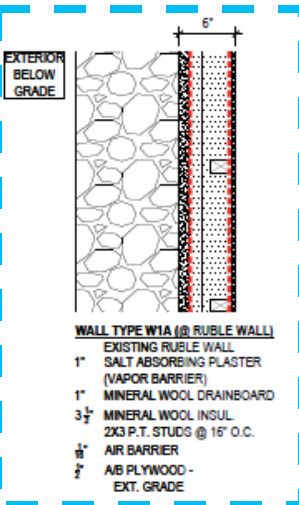
Notes:
 1- Interior walls to be Type W10, typical.
 2- Install insulation at exterior walls or where noted.
 3- Install moisture resistant GWB at all wet locations.

Legend

1hr fire rated enclosure ————

Air/Vapor Barrier - - - - -

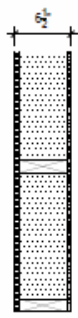
Wall Types



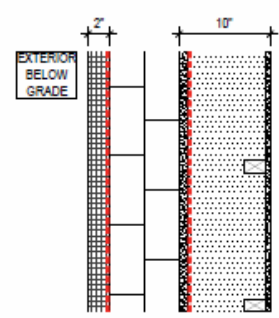
- WALL TYPE W1A (@ RUBLE WALL)**
- 1" EXISTING RUBLE WALL
 - 1" SALT ABSORBING PLASTER (VAPOR BARRIER)
 - 1" MINERAL WOOL DRAINBOARD
 - 3 1/2" MINERAL WOOL INSUL.
 - 2X3 P.T. STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1/2" A/B PLYWOOD - EXT. GRADE



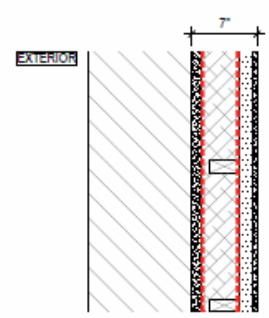
- WALL TYPE W1B (ABOVE RUBLE WALL)**
- 1" EXIST. TRIPLE WYTHE BRICK
 - 1" SALT ABSORBING PLASTER (VAPOR BARRIER)
 - 8 1/2" MINERAL WOOL INSUL. (VIF)
 - 2X3 P.T. STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1/2" A/B PLYWOOD - EXT. GRADE



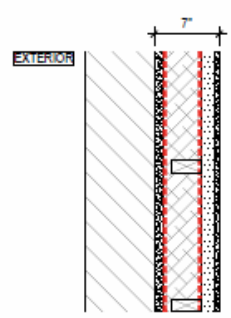
- WALL TYPE W2**
- 1/2" PLYWOOD
 - 5 1/2" 2X6 STUDS @ 16" O.C.
 - 1/2" MINERAL WOOL INSUL.
 - 1/2" GWB



- WALL TYPE W3**
- 2" RIGID INSUL.
 - 1 1/2" MOISTURE BARRIER
 - 8" DOUBLE WYTHE BRICK INFILL (SALVAGED)
 - 1" SALT ABSORBING PLASTER (AIR BARRIER)
 - 9" MINERAL WOOL INSUL. (VIF)
 - 2X3 P.T. STUDS @ 16" O.C.
 - 1/2" GWB

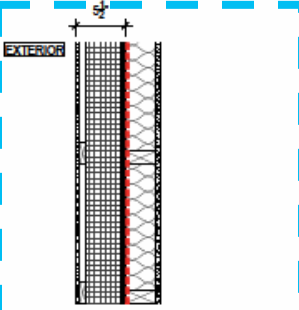


- WALL TYPE W4**
- EXIST. TRIPLE WYTHE BRICK WALL
 - 1" EXIST. PLASTER (VAPOR BARRIER)
 - 4" DENSE CELL. INSUL. 2X4 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - 1 1/2" MINERAL WOOL INSUL.
 - 1/2" GWB

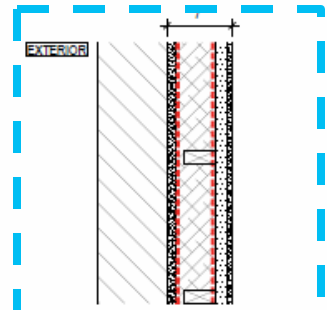


- WALL TYPE W5**
- EXIST. DOUBLE WYTHE BRICK WALL
 - 1" EXIST. PLASTER (VAPOR BARRIER)
 - 4" DENSE CELL. INSUL. 2X4 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - 1 1/2" MINERAL WOOL INSUL.
 - 1/2" GWB

Bsmt



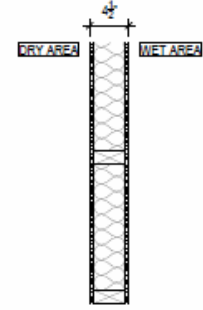
- WALL TYPE W7**
- 1/2" FIBER CEMENT RAIN SCREEN
 - 1X3 BATTENS
 - 4" RIGID INSUL.
 - 1/2" SHEATHING TAPED & SEALED (AIR BARRIER)
 - 3 1/2" EXIST. 2X4 STUDS @ 16" O.C.
 - FG BATT INSUL.
 - 1/2" EXIST. GWB



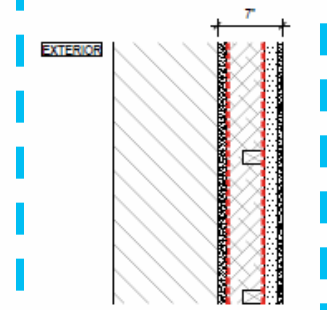
- WALL TYPE W8**
- EXIST. DOUBLE WYTHE BRICK WALL
 - 1" MASONRY AIR SEAL/BARRIER (VAPOR BARRIER)
 - 4" DENSE CELL. INSUL. 2X4 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - 1 1/2" MINERAL WOOL INSUL.
 - 1/2" GWB



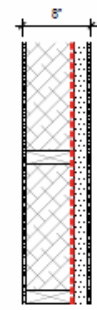
- WALL TYPE W10**
- 1/2" GWB
 - 3 1/2" 2x4 @ 16" O.C.
 - 1/2" SOUND ATTENUATION BATT
 - 1/2" GWB



- WALL TYPE W10W**
- 1/2" GWB
 - 3 1/2" 2x4 @ 16" O.C.
 - 1/2" SOUND ATTENUATION BATT
 - 1/2" GWB - MOISTURE RESISTANT



- WALL TYPE W14**
- EXIST. TRIPLE WYTHE BRICK WALL
 - 1" EXIST. PLASTER (AIR BARRIER)
 - 4" DENSE CELL. INSUL. 2X3 STUDS @ 16" O.C.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 HORIZ. WD FURRING @ 16" O.C.
 - 1 1/2" MINERAL WOOL INSUL.
 - 1/2" GWB



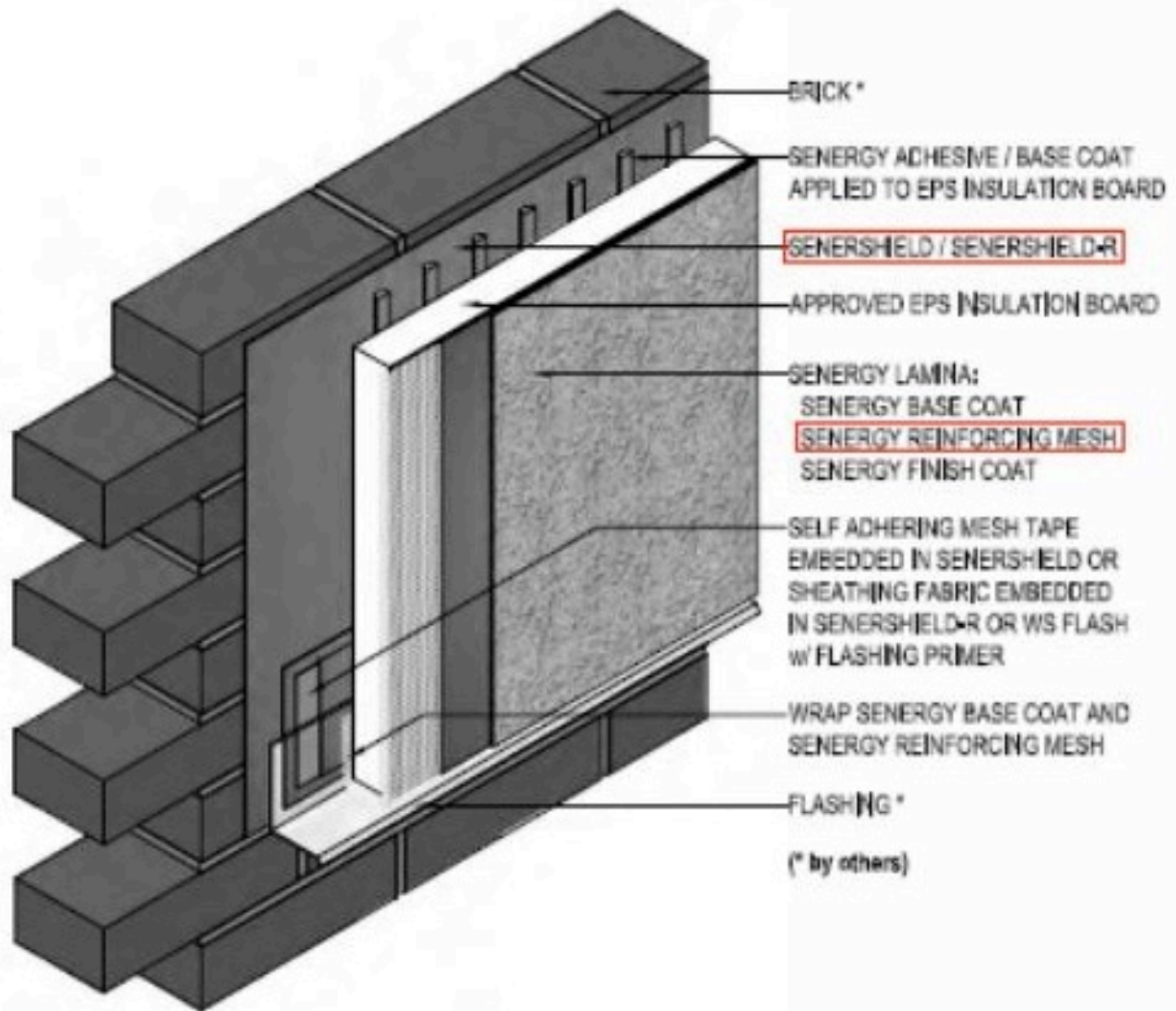
- WALL TYPE W15**
- 1/2" GWB
 - 5 1/2" 2X6 STUDS @ 16" O.C.
 - 1" DENSE CELL. INSUL.
 - 1/4" AIR BARRIER
 - 1 1/2" 2X3 FURRING RUN HORIZ. @ 16" O.C. MAX
 - 1 1/2" MINERAL WOOL INSUL.
 - 1/2" GWB

Bay

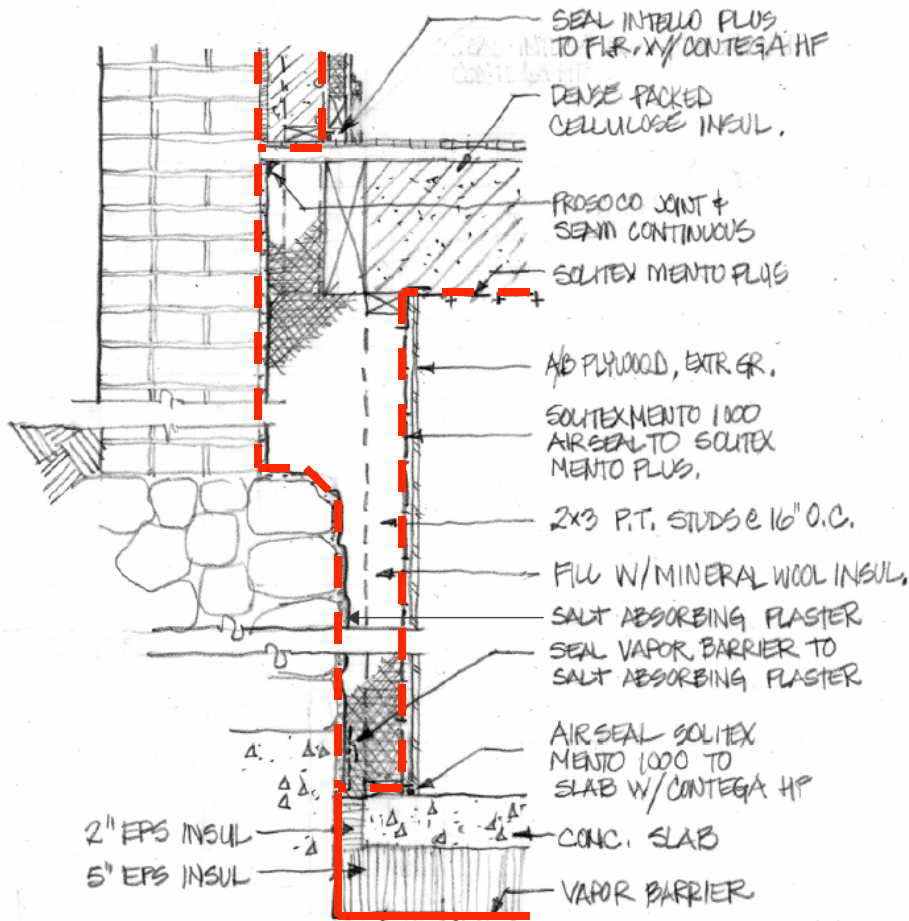
Rear

Front

Wall Types

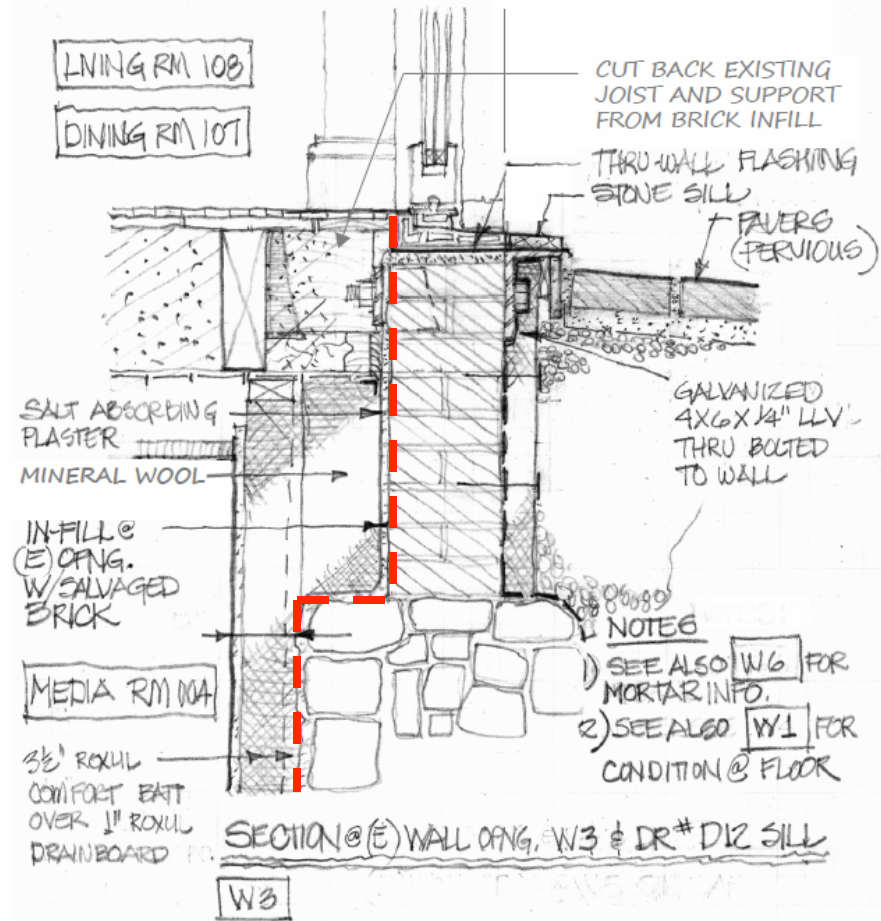


Rainscreen (Drained) Insulated Synthetic Stucco system (EIFS)



W1 SECTION @ N. BASEMENT WALL
 1/2" = 1'-0"

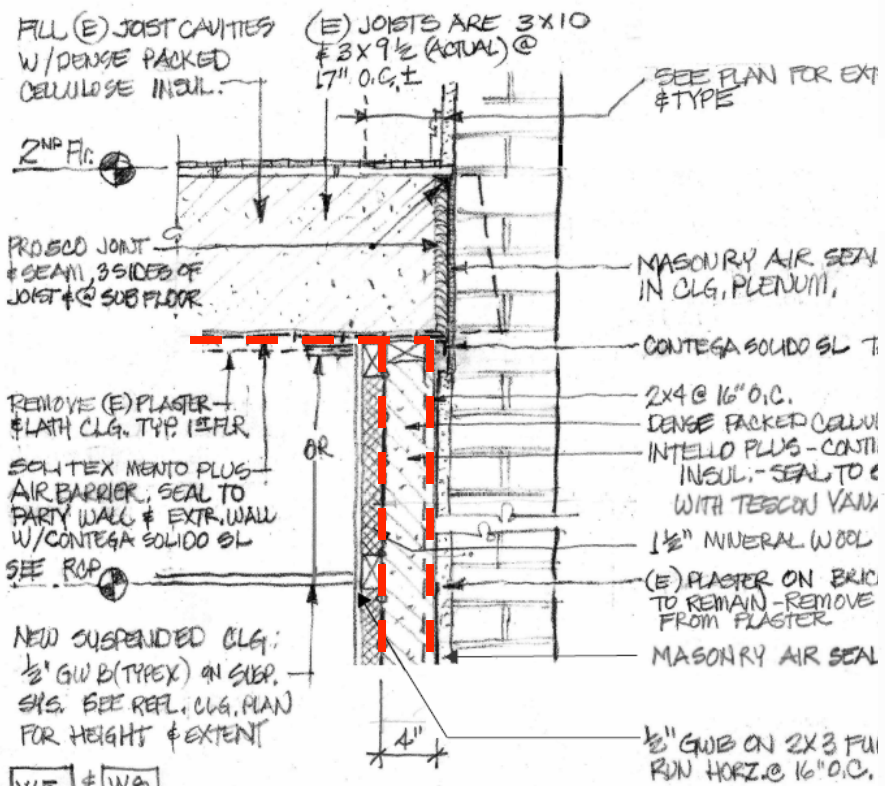
Basement Party Wall



SECTION @ (E) WALL OF NG. W3 @ DR# D12 SILL
W3

NOTES
 1) SEE ALSO **W6** FOR MORTAR INFO.
 2) SEE ALSO **W1** FOR CONDITION @ FLOOR

Basement Exterior Wall

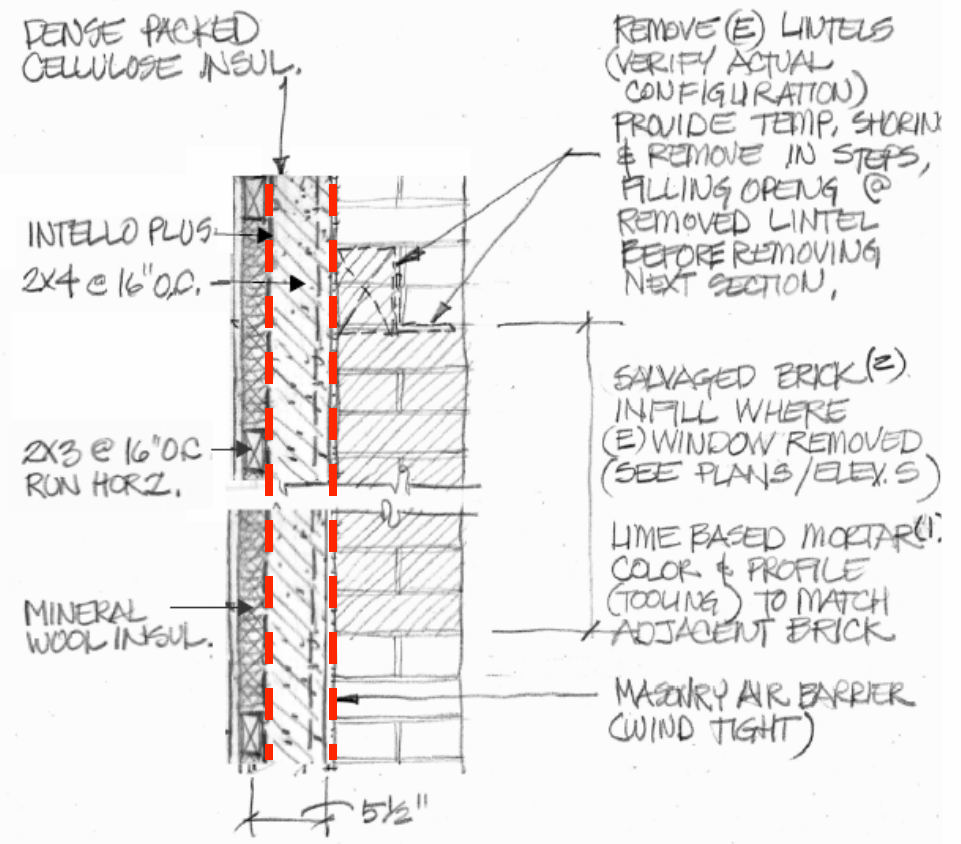


W5 # W6
1ST FLR. E.W.#S EXTERIOR WALL

1/2" = 1'-0" (±)

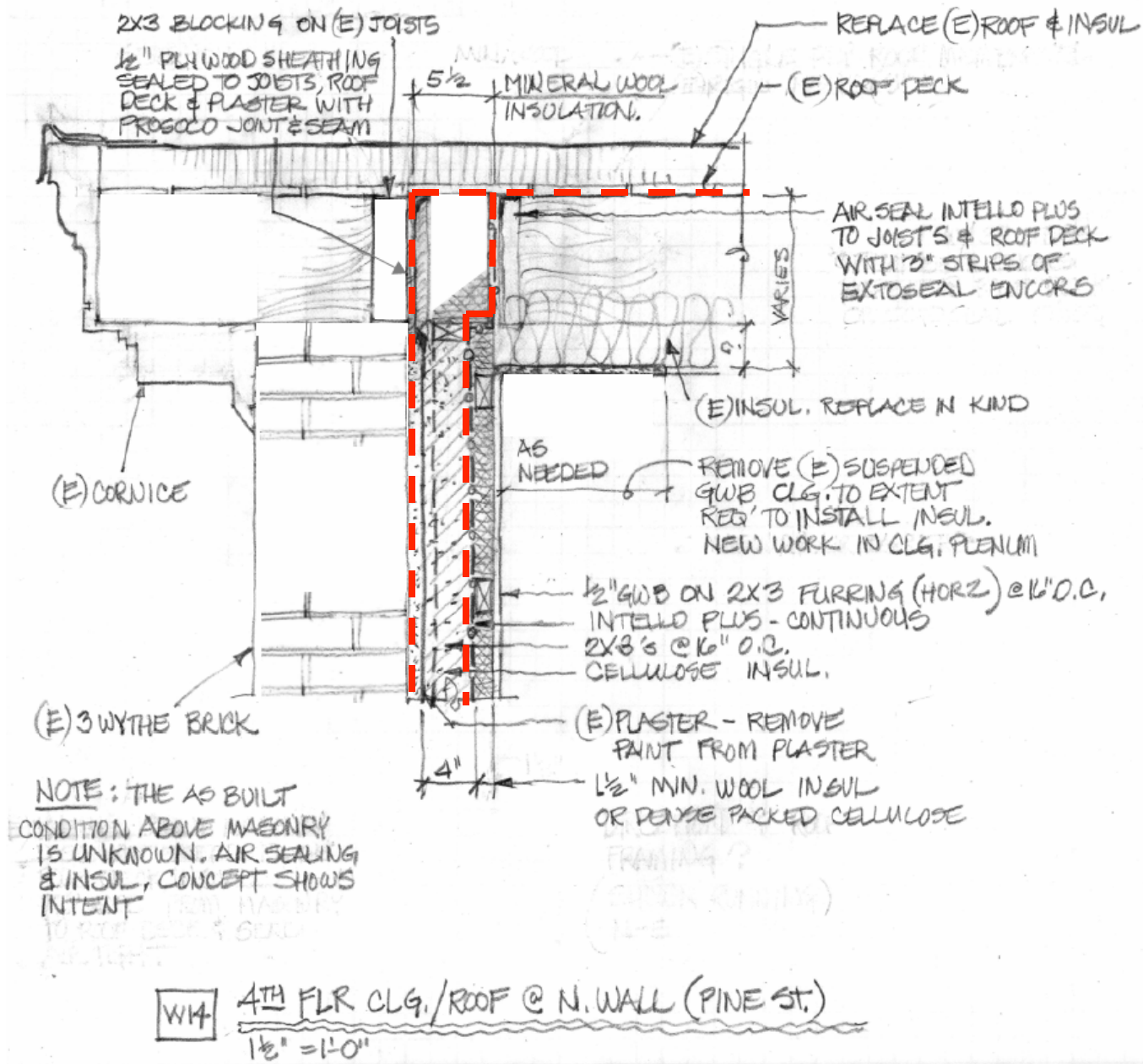
NOTE 1) NEW CLG TO FORM 1 HR. FIRE SEPARATION @ 1ST FLR. CLG.

Unit 1 Ceiling

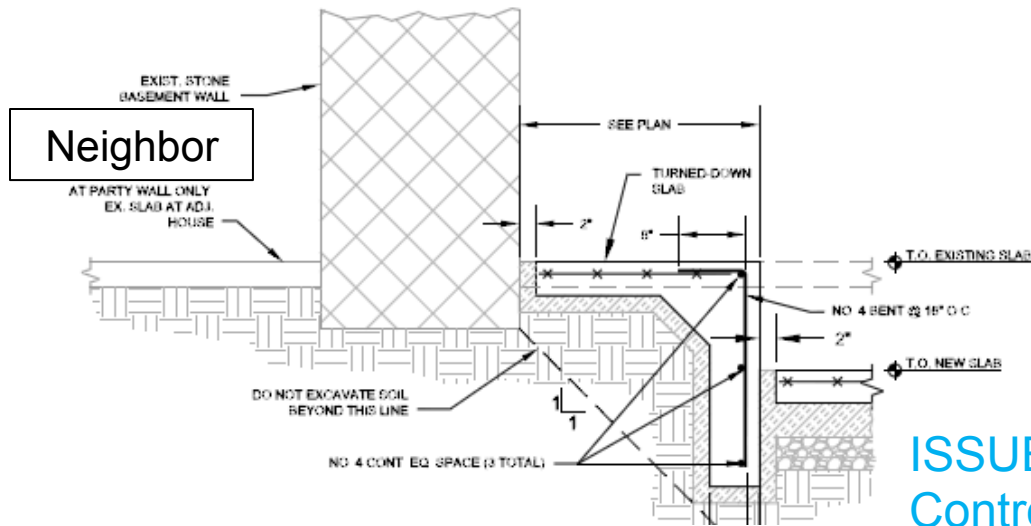


W6 SECTION @ BRICK INFILL @ REMOVED WINDOWS
1/2" = 1'-0"

Rear Wall – No Ext. Insul.



North Wall – Interior Insulation

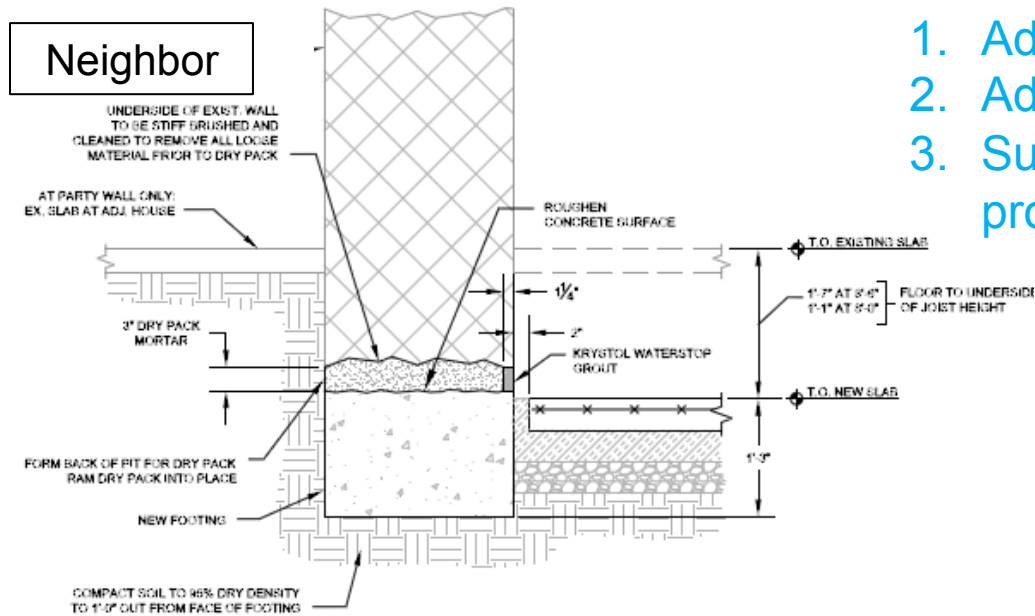


Turned Down Slab

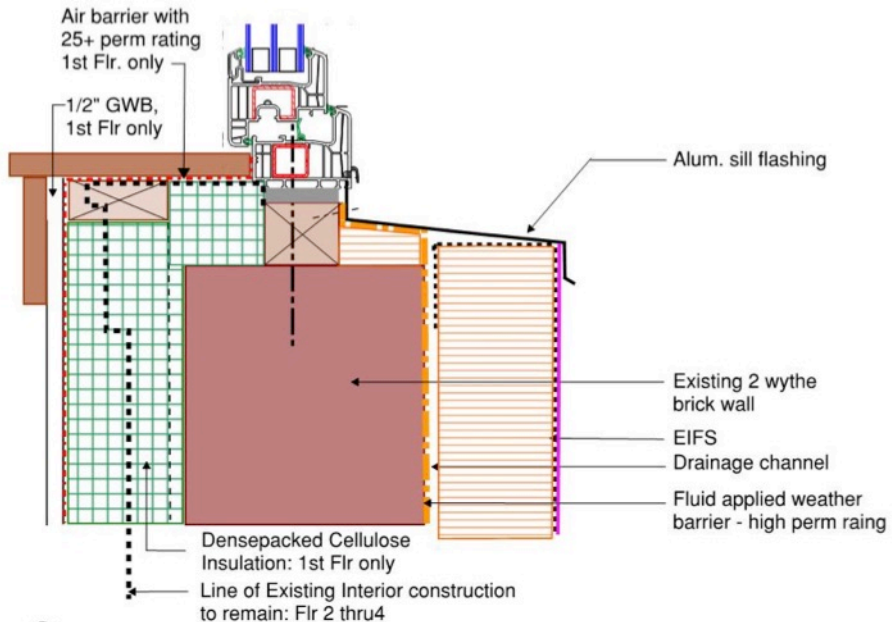
ISSUE:
Control Rising Damp

OPTIONS:

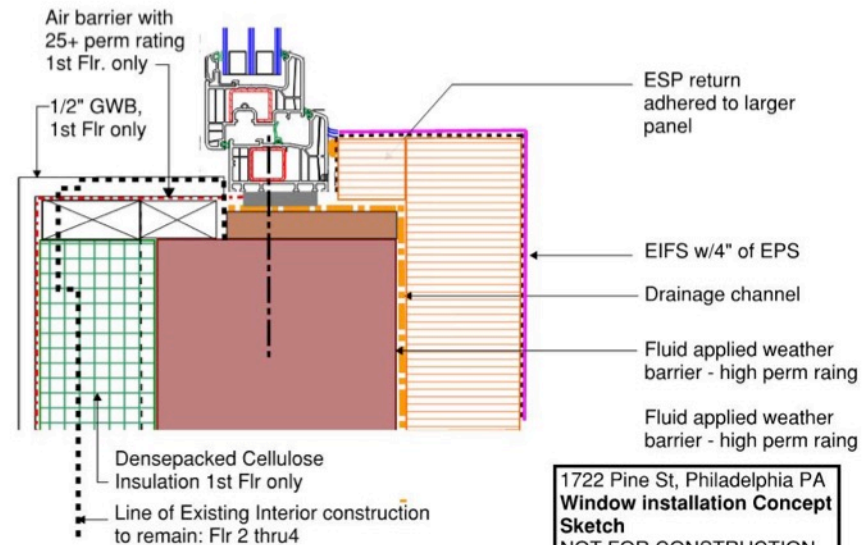
1. Admixture in concrete
2. Admixture in dry pack
3. Surface applied water proofing



Underpinned Party Wall



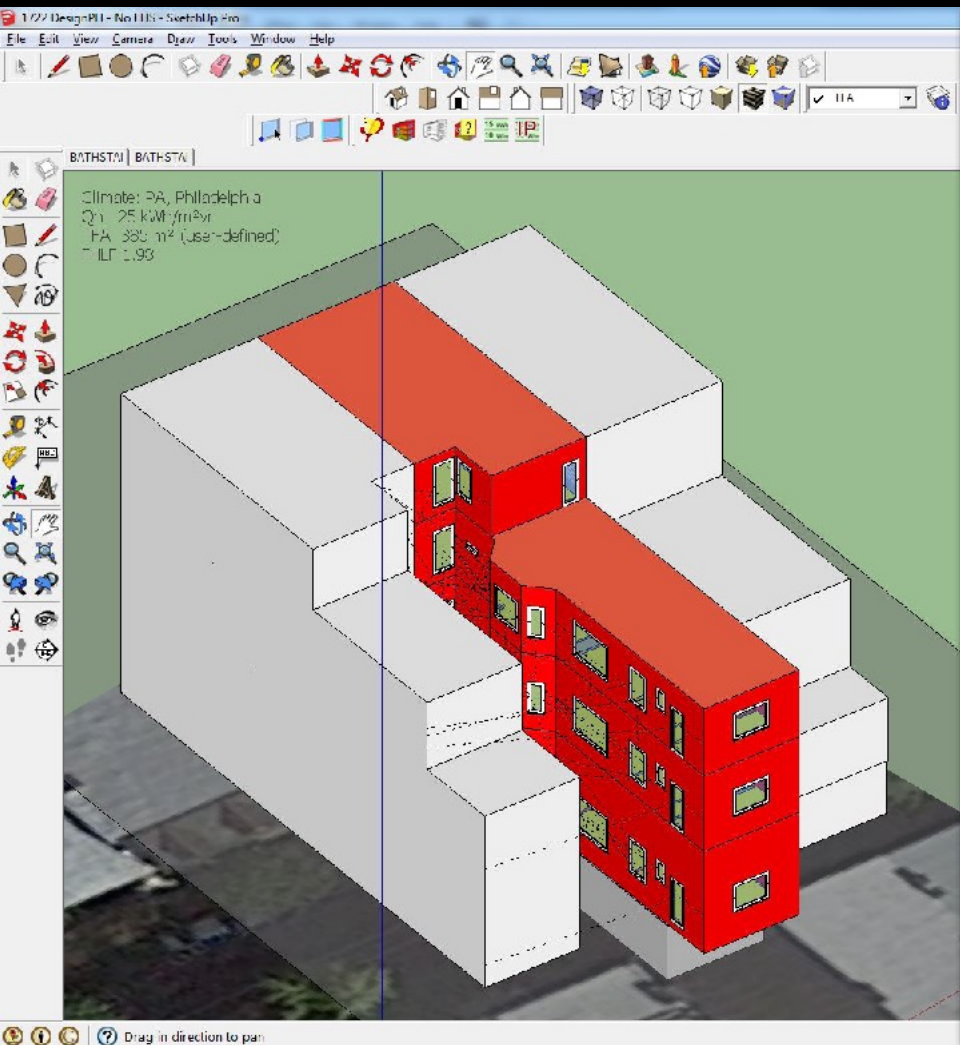
3 Typical Rear Window Sill **Phase 2**



4 Typical Rear Window Jamb **Phase 2**

1722 Pine St, Philadelphia PA
Window installation Concept Sketch
 NOT FOR CONSTRUCTION
 1 July2016

Rear Windows Details: Triple Pane, Casement / Hopper Windows with Insulated Frames and Triple Gaskets



designPH 1.0.20, registered to: blupendesign [Unregister]

Update window options Review windows

Heat Balance Areas U-value editor Assemblies Components Climate

Annual Heat Demand

▼ Annual Heat Demand

Total heat losses (kWh/a)	Total free heat gains (kWh/a)	Utilisation factor	Treated Floor Area (m²)	Ann. Heat Demand (kWh/a)	Specific Ann. Heat Demand, Q_h (kWh/m²a)
24825.60	7825.21	1.00	384.51	17011.04	44.26

▼ Transmission heat losses

Total Heat Loss Area (m²)	Area Weighted U-value (W/m²K)	Air Temp. Factor	Ann. Htg. Degree Hours (kWh)	Transmission Heat Loss (kWh/a)	Q_t (kWh/m²a)
761.00	0.41	1.00	7020	21852.60	56.31

▼ Ventilation heat loss

Treated Floor Area (m²)	Ventilation volume (m³)	1 lit. air exchange rate	Heat capacity of air	Ann. Htg. Degree Hours (kWh)	Ventilation heat loss (kWh/a)	Q_v (kWh/m²a)
384.51	951.27	0.14	0.33	70.20	3073.08	7.99

▼ Solar heat gains

Group nr.	Area Group	Win. area (m²)	Glazing area (m²)	g-value	Reduction factor	Radiation, G_s	Solar heat gain (kWh/a)	Q_s (kWh/m²a)
2	North Windows	24.05	14.85	0.50	0.37	114.41	510.57	1.33
3	East Windows	0.00	0.00				0.00	0.00
4	South Windows	18.90	10.73	0.50	0.38	570.81	1884.26	4.90
5	West Windows	37.82	24.19	0.50	0.30	251.23	2034.41	5.29
6	Horizontal Windows	0.00	0.00				0.00	0.00
		76.77	49.76				4479.24	11.57

▼ Internal heat gain

Treated Floor Area (m²)	Internal heat gain rate (W/m²)	Heating period (days/a)	Heating period (kWh)	Internal heat gain (kWh/a)	Q_i (kWh/m²a)
384.51	2.10	160.40	4.33	1648.00	4.29

DesignPH Results

EnerPHit verification



NO EXTERIOR INSULATION AT REAR

Building:	Pine Street Renovation - Apartment 1			No EIFS - Intus SHGC: .37		
Street Address:	1722 Pine St					
City, State, Zip:	Philadelphia, PA, 19103					
Country:	USA					
Building type:	Historic Brick Rowhome					
Climate:	PA, Philadelphia				Altitude of building site (feet above sea level):	35
Home owner / Client:	Laura Blau & Paul Thompson					
Street Address:	1005 S 7th St					
City, State, Zip:	Philadelphia, PA, 19147					
Architecture:	BluPath Design					
Street Address:	1005 S 7th St					
City, State, Zip:	Philadelphia, PA, 19147					
Mechanical system:	Zero Energy Design					
Street Address:	156 Milk St, Suite 3					
City, State, Zip:	Boston, MA 02109					
Year of construction:	1880	Interior temperature winter:	68.0	°F	Enclosed volume V _e ft ³ :	32086
No. of dwelling units:	1	Interior temperature summer:	77.0	°F	Mechanical cooling:	x
No. of occupants:	5.0	Internal heat sources winter:	0.67	BTU/h.ft ²		
Spec. capacity:	34	BTU/F per ft ² TFA	Ditto summer:	1.05	BTU/h.ft ²	

Specific building demands with reference to the treated floor area						
				Requirements	Fulfilled?	
Space heating	Treated floor area	1891	ft ²			
	Heating demand	8.66	kBTU/(ft ² ·yr)	109% of 7.92 kBTU/(ft ² ·yr)	no	
	Heating load	6.28	BTU/(hr.ft ²)	-	-	
Space cooling	Overall specif. space cooling demand	3.82	kBTU/(ft ² ·yr)	-	-	
	Cooling load	3.33	BTU/(hr.ft ²)	-	-	
	Frequency of overheating (> 77 °F)		%	-	-	
Primary energy	Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances	41.6	kBTU/(ft ² ·yr)	97% of 42.8 kBTU/(ft ² ·yr)	yes	
	DHW, space heating and auxiliary electricity	23.4	kBTU/(ft ² ·yr)	-	-	
	Specific primary energy reduction through solar electricity		kBTU/(ft ² ·yr)	-	-	
Airtightness	Pressurization test result n ₅₀	1.0	1/h	1 1/h	yes	

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

**NO!
But
Close**

EnerPHit building retrofit (according to heating demand)?	NO CERTIFICATION	no
---	-------------------------	----

EnerPHit verification



EXTERIOR INSULATION AT REAR

Building:	Pine Street Renovation - Apartment 1		4' EIFS - Intus SHGC: .37		
Street Address:	1722 Pine St				
City, State, Zip:	Philadelphia, PA, 19103				
Country:	USA				
Building type:	Historic Brick Rowhome				
Climate:	PA, Philadelphia	Altitude of building site (feet above sea level):	35		
Home owner / Client:	Laura Blau & Paul Thompson				
Street Address:	1005 S 7th St				
City, State, Zip:	Philadelphia, PA, 19147				
Architecture:	BluPath Design				
Street Address:	1005 S 7th St				
City, State, Zip:	Philadelphia, PA, 19147				
Mechanical system:	Zero Energy Design				
Street Address:	156 Milk St, Suite 3				
City, State, Zip:	Boston, MA 02109				
Year of construction:	1880	Interior temperature winter:	68.0 °F	Enclosed volume V _e ft ³ :	32086
No. of dwelling units:	1	Interior temperature summer:	77.0 °F	Mechanical cooling:	x
No. of occupants:	5.0	Internal heat sources winter:	0.67 BTU/h.ft ²		
Spec. capacity:	34 BTU/F per ft ² TFA	Ditto summer:	1.05 BTU/h.ft ²		

Specific building demands with reference to the treated floor area		Treated floor area	Requirements	Fulfilled?*
Space heating		1891 ft ²		
	Heating demand	7.03 kBTU/(ft ² ·yr)	89% of 7.92 kBTU/(ft ² ·yr)	yes
	Heating load	5.63 BTU/(hr.ft ²)	-	-
Space cooling	Overall specif. space cooling demand	4.00 kBTU/(ft ² ·yr)	-	-
	Cooling load	3.22 BTU/(hr.ft ²)	-	-
	Frequency of overheating (> 77 °F)	%	-	-
Primary energy	Heating, cooling, dehumidification, DHW, auxiliary electricity, lighting, electrical appliances	39.4 kBTU/(ft ² ·yr)	96% of 40.9 kBTU/(ft ² ·yr)	yes
	DHW, space heating and auxiliary electricity	21.2 kBTU/(ft ² ·yr)	-	-
	Specific primary energy reduction through solar electricity	kBTU/(ft ² ·yr)	-	-
Airtightness	Pressurization test result n ₅₀	1.0 1/h	1 1/h	yes

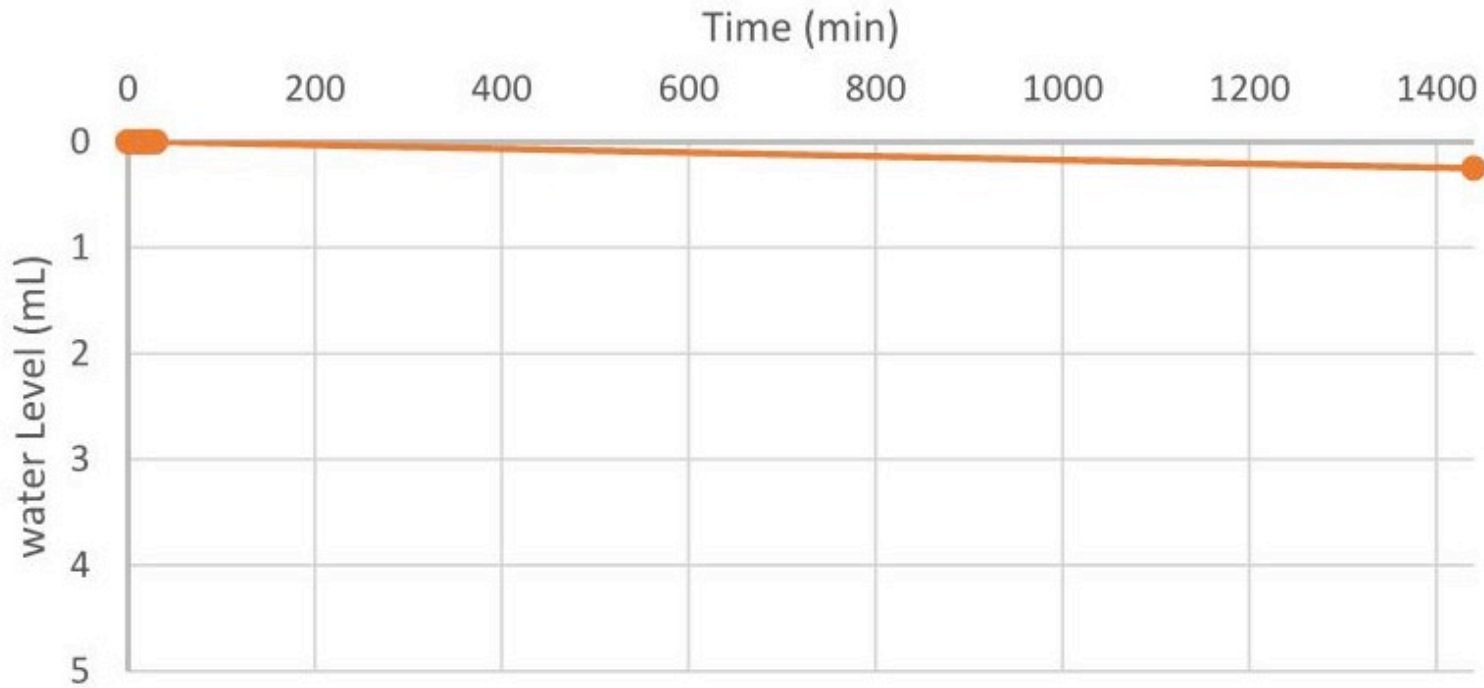
* empty field: data missing; '-': no requirement

YES!
!

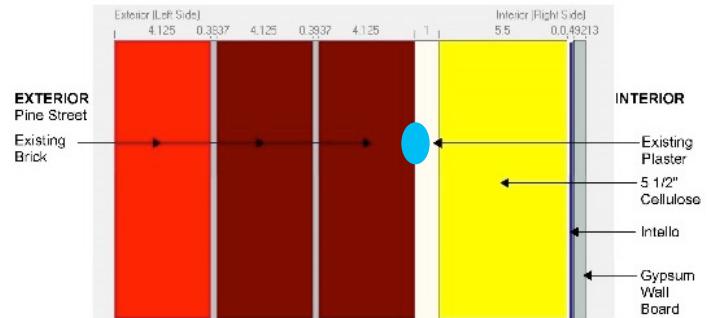
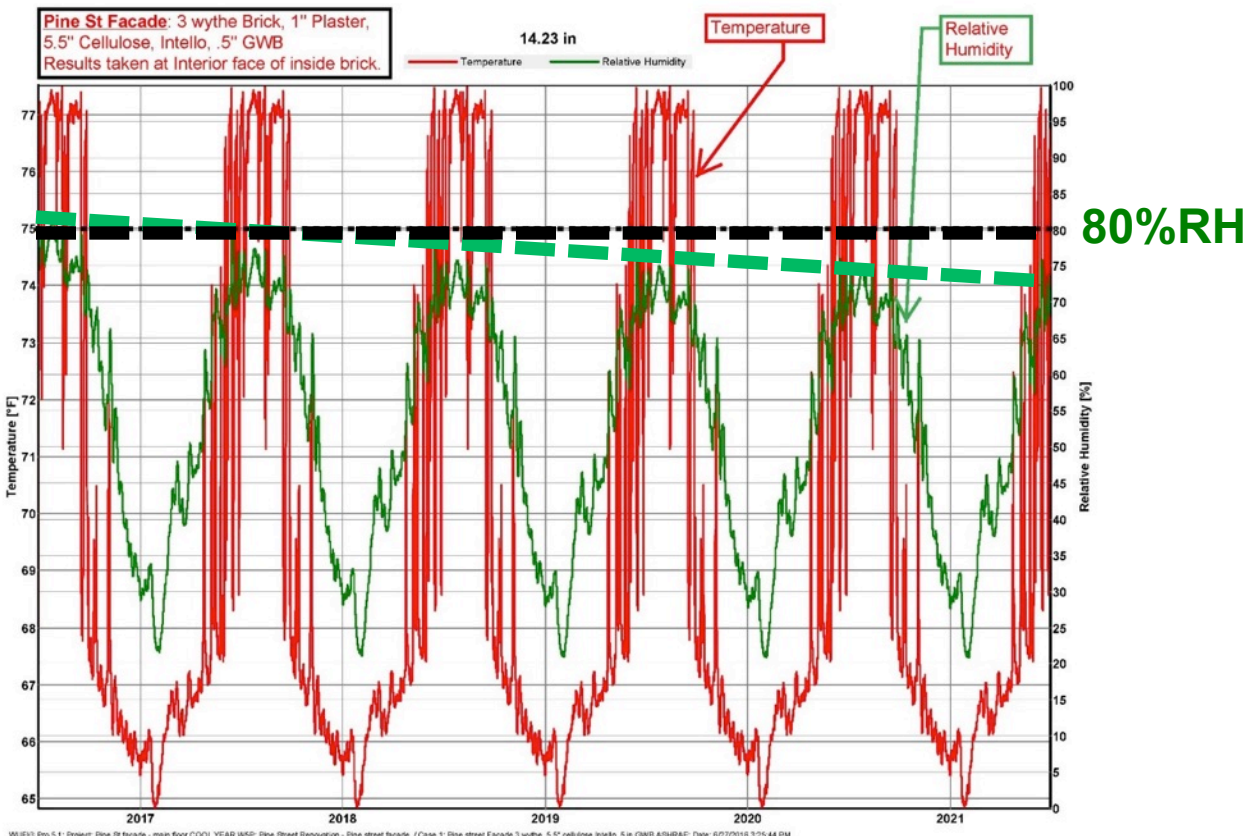
EnerPHit building retrofit (according to heating demand)?	CERTIFICATION!	yes
---	-----------------------	-----



RILEM moisture absorption test

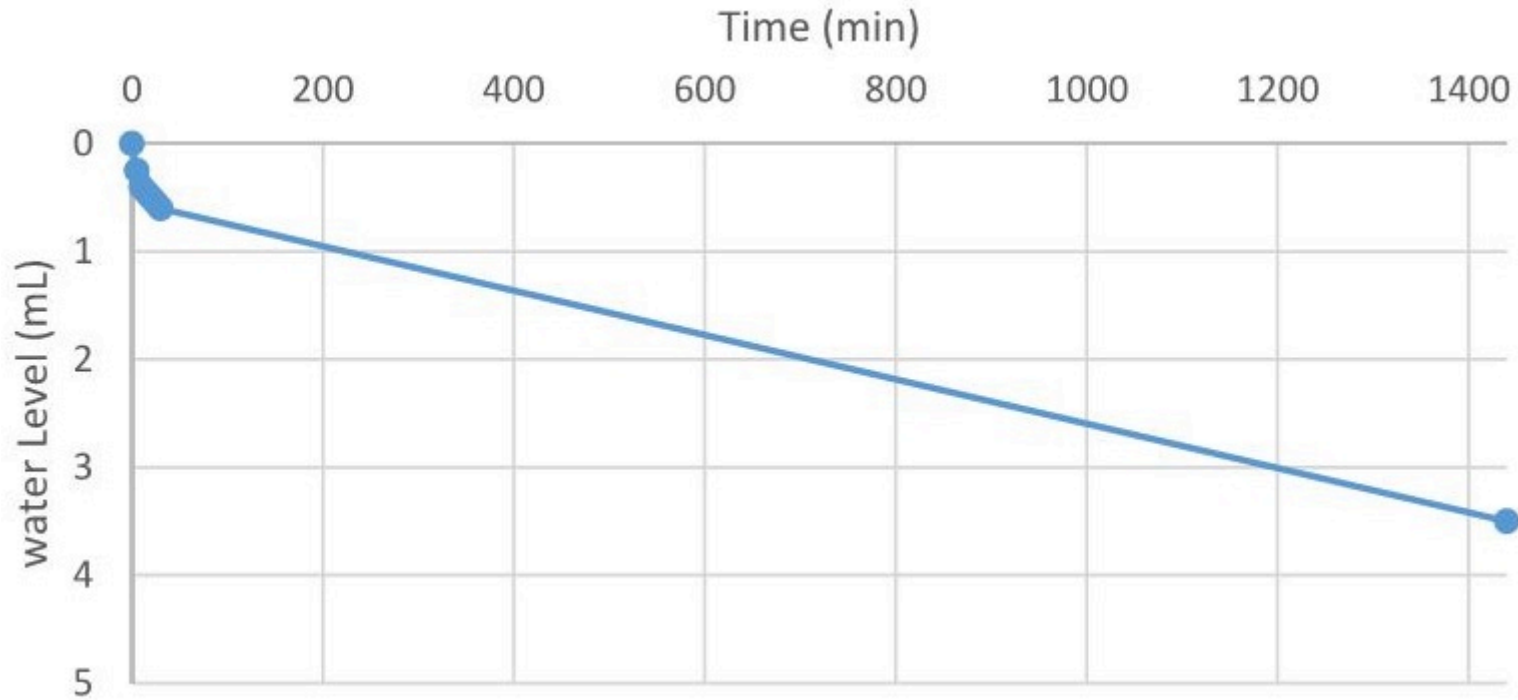


Rilem Tube Moisture Absorption Test – Pine Street
Result - Low Absorption Rate

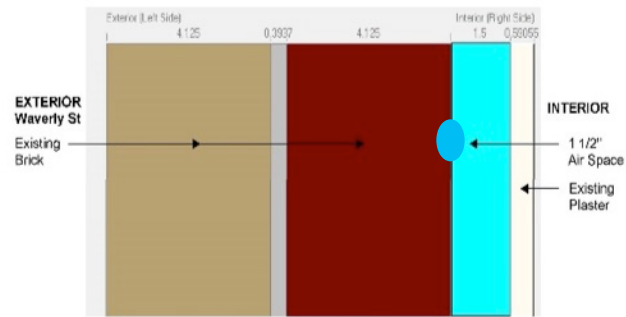
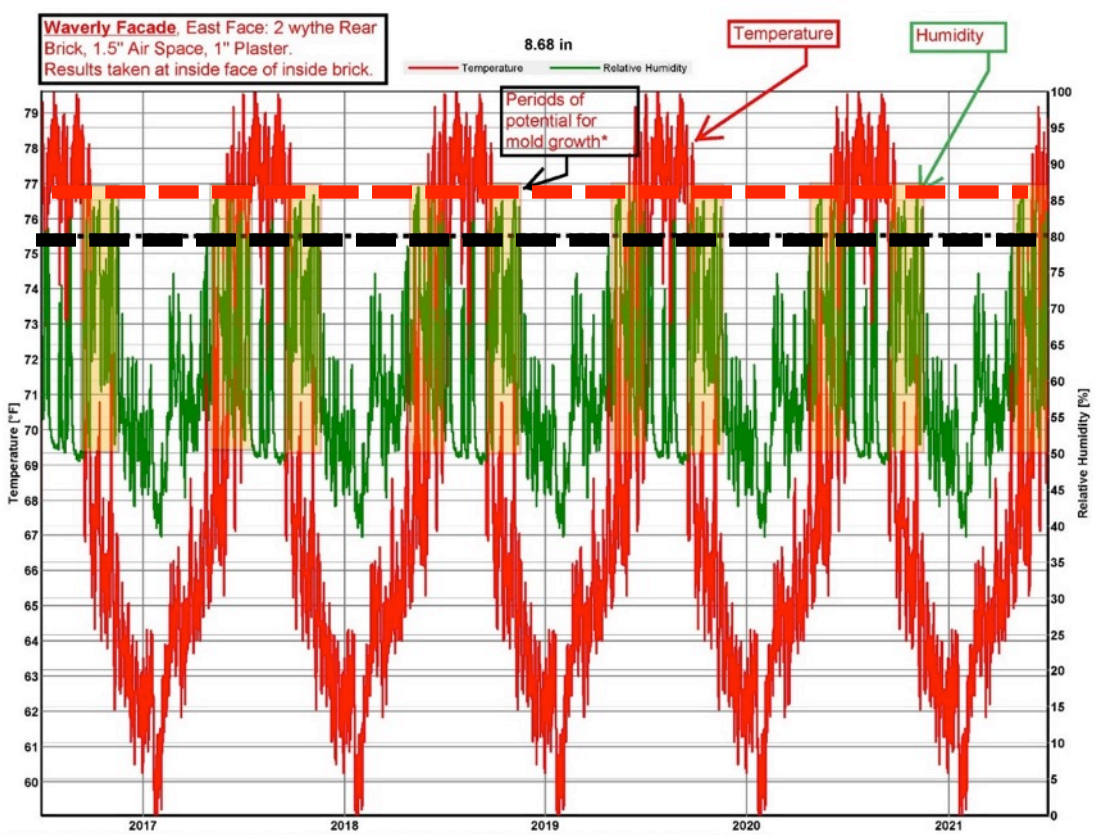


Add 5.5" Cellulose with Smart Vapor Control (R19)

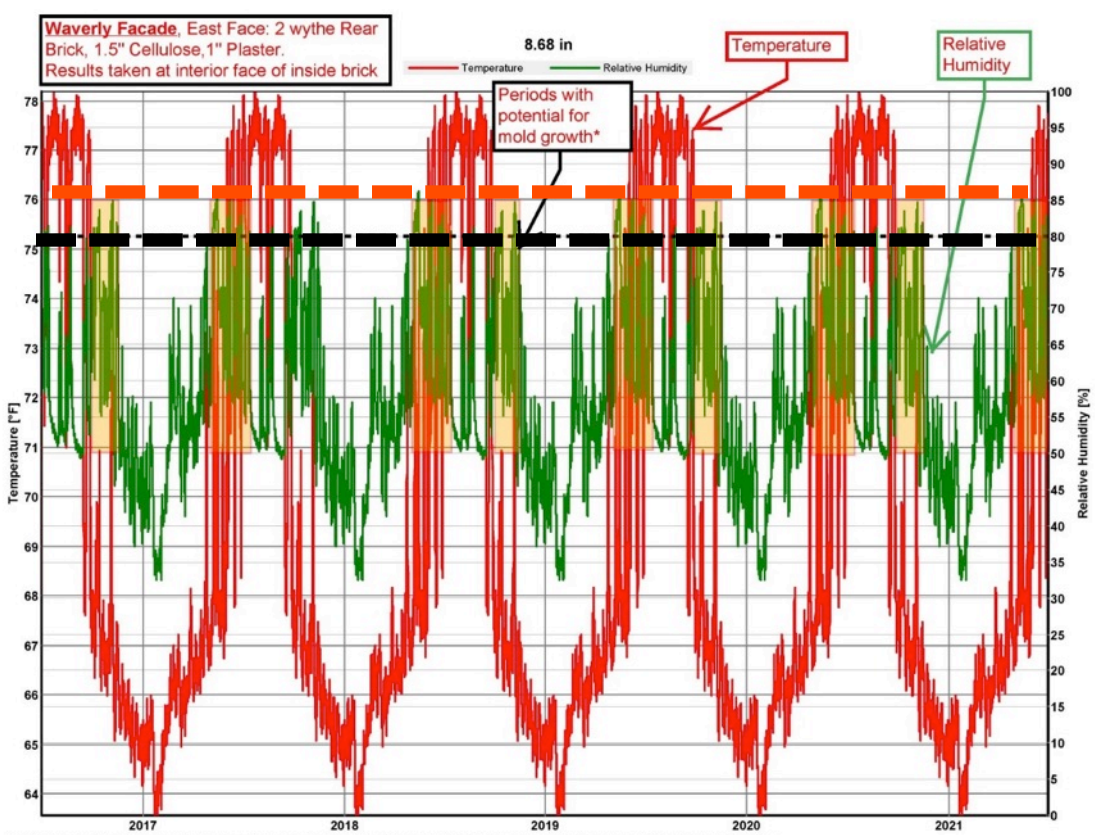
Acceptable Mold Risk



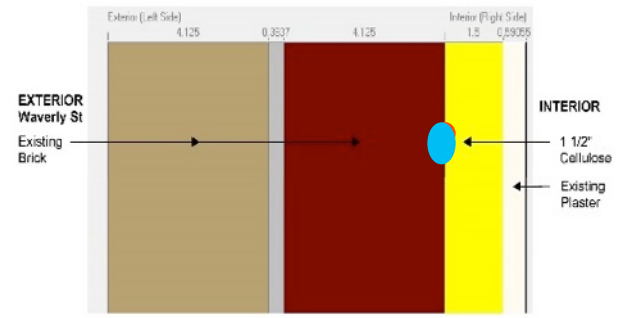
Rilem Tube Moisture Absorption Test – Waverly Street
Result - High Absorption Rate



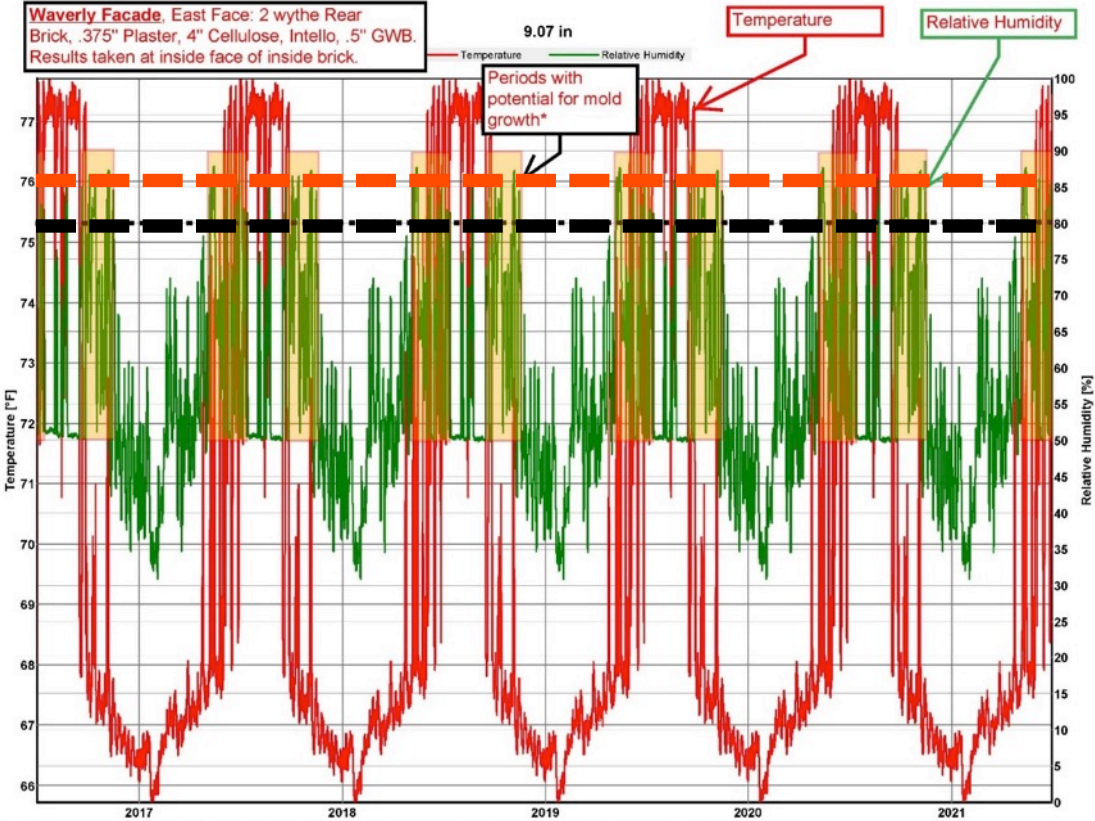
Existing Conditions
Unacceptable Mold Risk



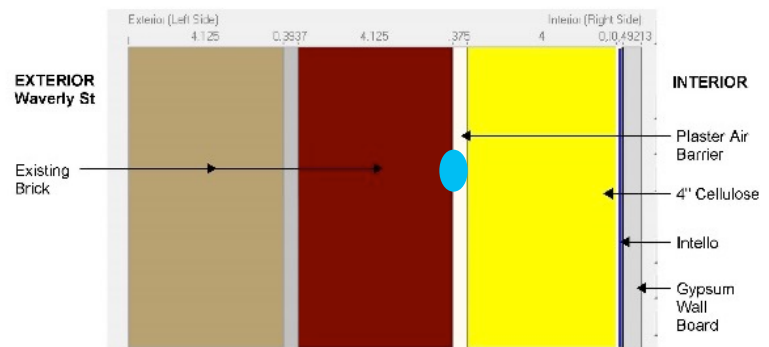
WUFI Pro 5.1; Project: Pine St facade - main floor SEAW walls poor brick WSP; Pine Street Renovation - Pine street facade; / Case 1: 2 wythe rear brick 1.5" cells 1 in plaster ASHRAE160P; Date: 6/27/2016 2:32:14 PM



1.5" Cellulose in Existing Wall Cavity
 Unacceptable Mold Risk

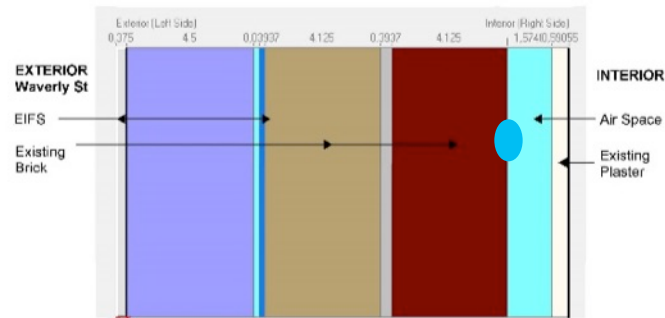
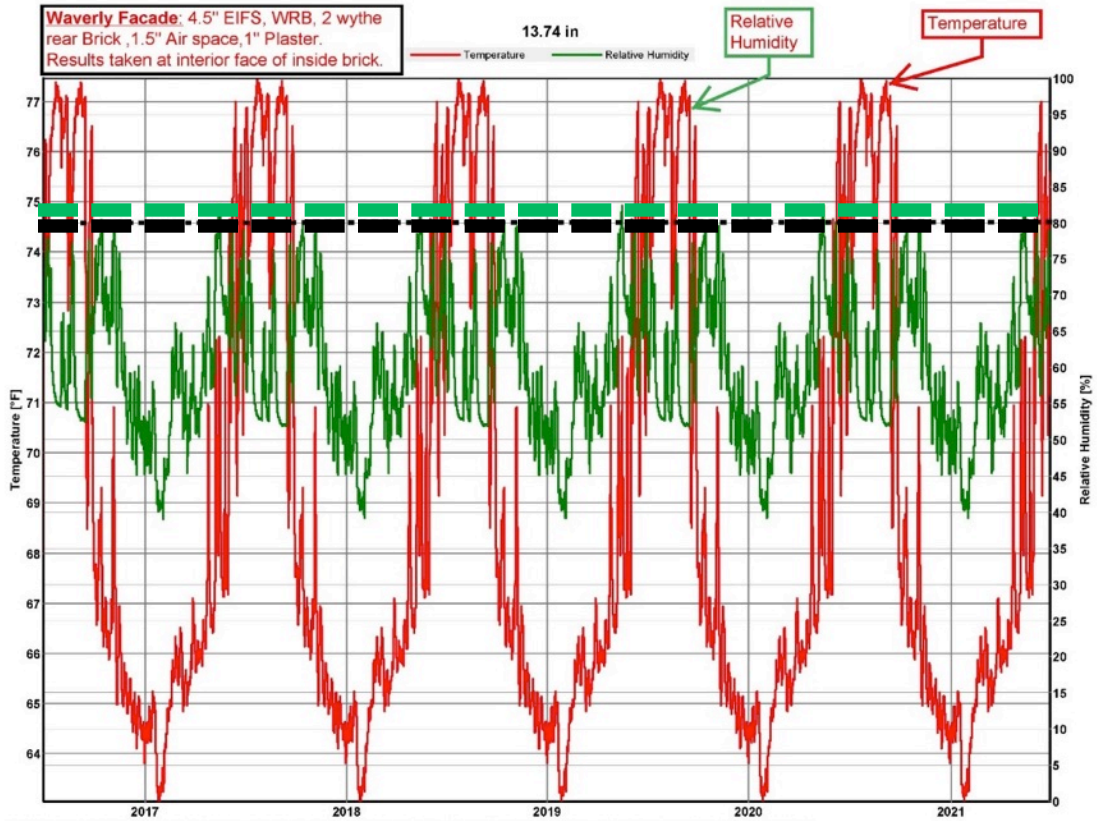


* over 50F and 80% RH

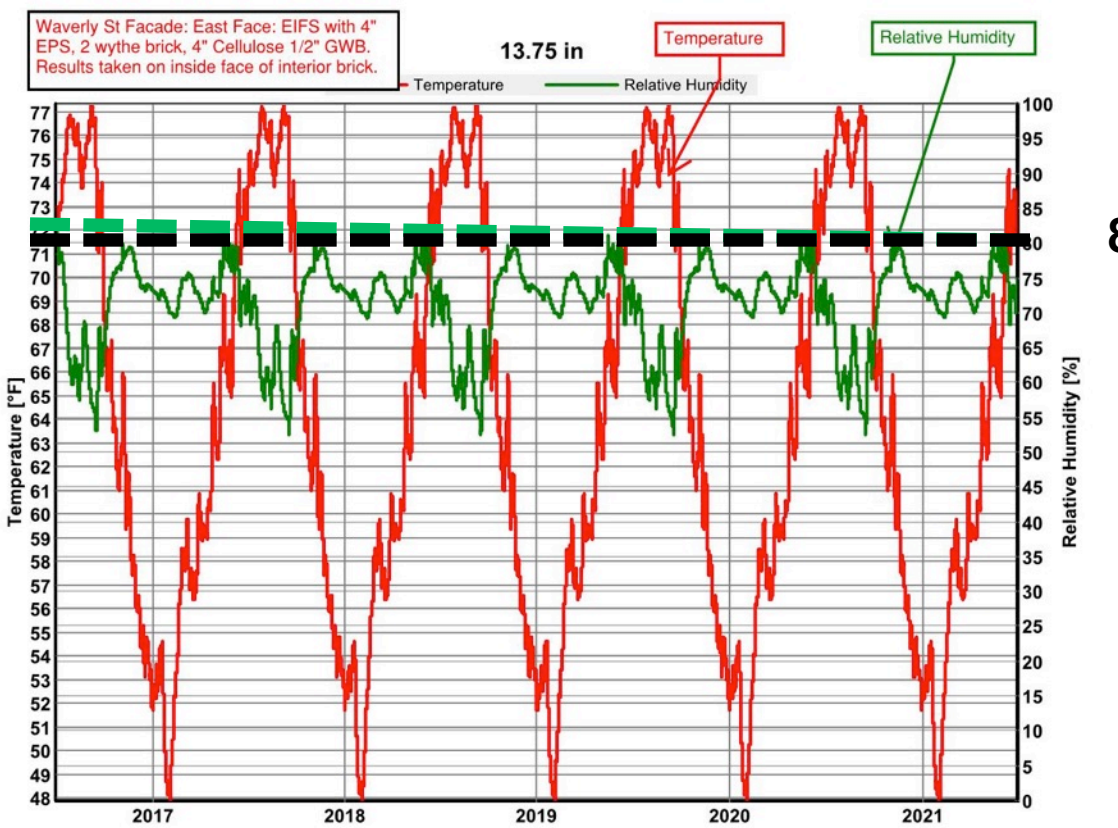


New 4" cellulose, smart air vapor barrier

Unacceptable Mold Risk

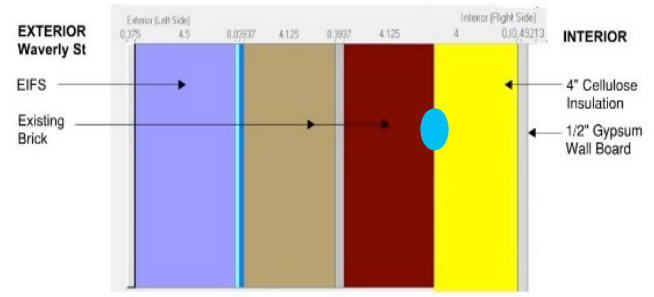


EIFS with Drainage Plane, 4" EPS
Acceptable Mold Risk



80%RH

WUFI® Pro 5.1; Project: Waverly St East facade - main floor SE&W walls poor brick.WSP: Pine Street Renovation - Pine street facade, / Case 6: EIFI & WRB 2 wyth rear brick 4" Cellulose NO Intello .5 in GWB; Date: 6



EIFS with 4" EPS + 4" Cellulose
Acceptable Mold Risk

Preservation

**Global Climate
Mitigation**



Preservation

**Global Climate
Mitigation**



**The new reality requires accommodation,
adaption, compromise, and a serious
re-evaluation of basic canons.**

Preservation

Global Climate Mitigation



OR adjust the fulcrum and accept thoughtful exceptions to meet the fundamentals of both missions.

CONCLUSIONS

Criteria for historic renovations should consider:

1. Ranking the value of historic facades as “significant” or “non-contributing”. All bricks are not historic, and all “historic” bricks are not equal.
2. Covering or altering the façade must result in a significant improvement in energy efficiency and health outcomes.
3. The proposal must be backed by proven building science based analysis.

The results will be efficient, durable, healthy buildings that maintain the historic fabric as well as support well-being on a healthy planet.

A skyline of work. One at a time.



ANOTHER PERSPECTIVE ON ENERGY USE





-90%

An aerial photograph of a city, likely New York City, showing a dense grid of brick apartment buildings. A thick black outline is drawn over the scene, following the general shape of the city block. In the center of the image, the text '-90%' is displayed in a large, bold, black font with a white outline. The background shows a mix of urban architecture, including a large brick building with many windows, a street with cars and a bus, and some greenery. The sky is overcast.

-90%

62Msf or 65,000 NYC apts. renovated to PASSIVE HOUSE
=
A single 1.2MW Coal power plant

-90%

An aerial photograph of a dense urban area, likely in New York City, showing numerous multi-story brick apartment buildings. A large, irregular black outline highlights a specific block of buildings in the center-left. Overlaid on this highlighted area is the text '-90%' in a large, white, outlined font. In the background, several industrial smokestacks are visible against a hazy sky. The foreground shows a busy street with cars and a bus.

62Msf or 65,000 NYC apts. renovated to PASSIVE HOUSE
=
A single 1.2MW \$2B Coal power plant

~~✗~~
-90%

An aerial photograph of a dense urban area, likely New York City, showing numerous multi-story brick apartment buildings and a busy street with cars and a bus. A large, irregular black outline is drawn over the scene, and a red 'X' is placed in the upper left corner. The text '-90%' is overlaid in the center of the image.



**60 % OF THE WORLD'S BUILDINGS
WILL BE REBUILT
IN THE NEXT TWO DECADES.**

“That is a huge opportunity if we do it right.”

– Ed Mazria, Architecture 2030

25-75 years
between renovations



WASTED \$\$
MISSED opportunities



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

RESOURCES

ZERO ENERGY READY HOMES energy.gov/eere/buildings/zero-energy-ready-home

LEED Building rating system
new.usgbc.org/leed

2000 WATT SOCIETY Global energy effects
novatlantis.ch/en/2000-watt-society

THE CLIMATE TRUST Climate solutions for government, utilities and large businesses
climatetrust.org

RESOURCES

WORLD CLASS SUPPLY High performance building supply, worldclasssupply.com

FOURSEVENFIVE High performance building supply, foursevenfive.com

