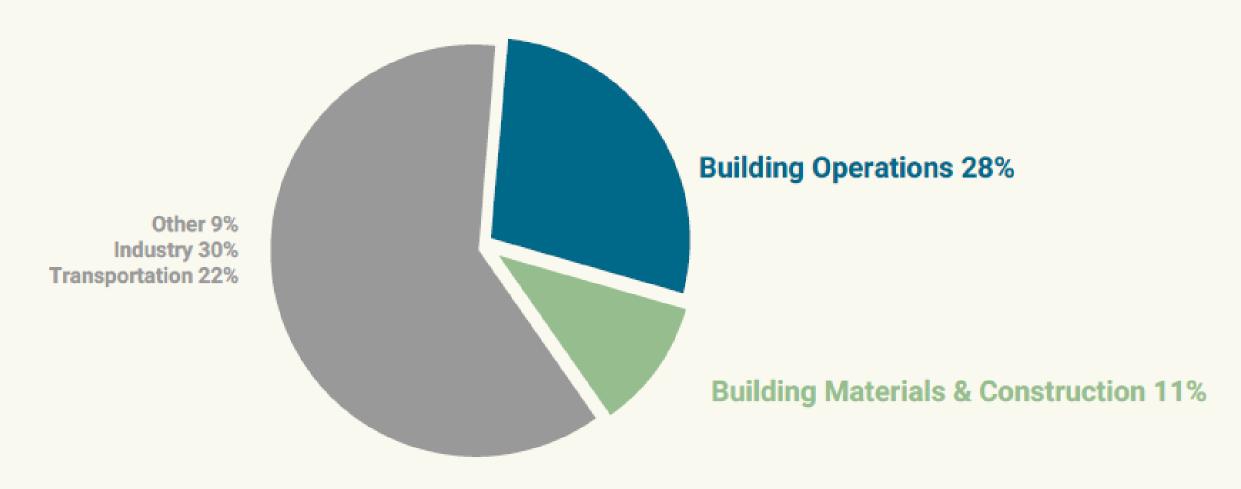
Moran Square, Fitchburg, MA Low Carbon Historic Retrofit





Rees Larkin Development, TAT, Biome Studio, Petersen Engineering, Building Science Corporation, New Frameworks, Advanced Building Analysis, **Keith Construction**

Global CO2 Emission by Sector



- Architecture 2030

Decarbonize Moran Square

- 1. leveraging embodied carbon existing building
- 2. operational carbon PHIUS Passive House & solar
 - 3. low carbon & carbon storing materials

















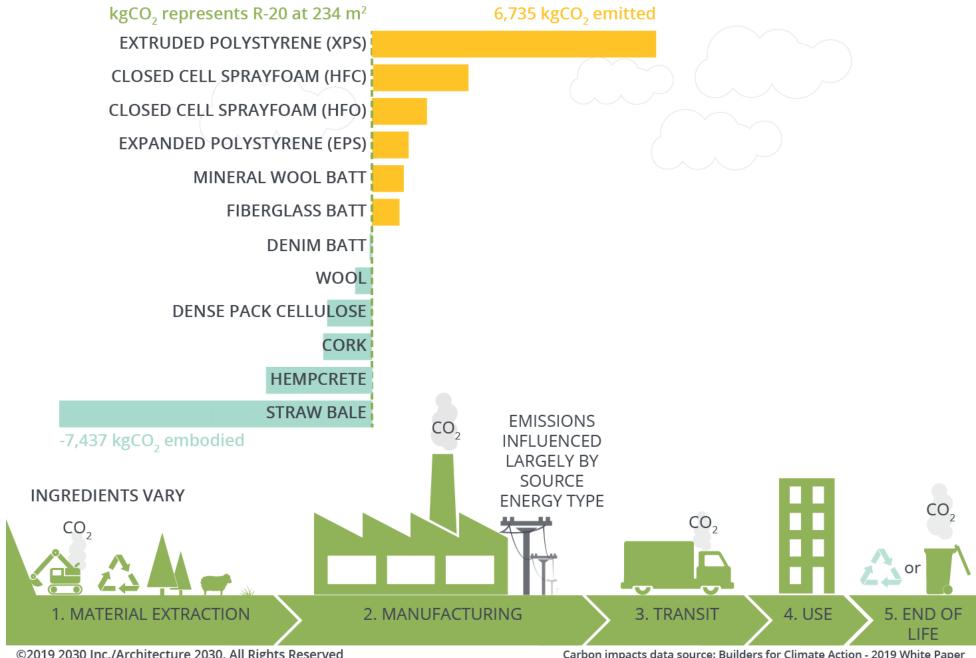
carbon storing materials

CRADLE-TO-GATE

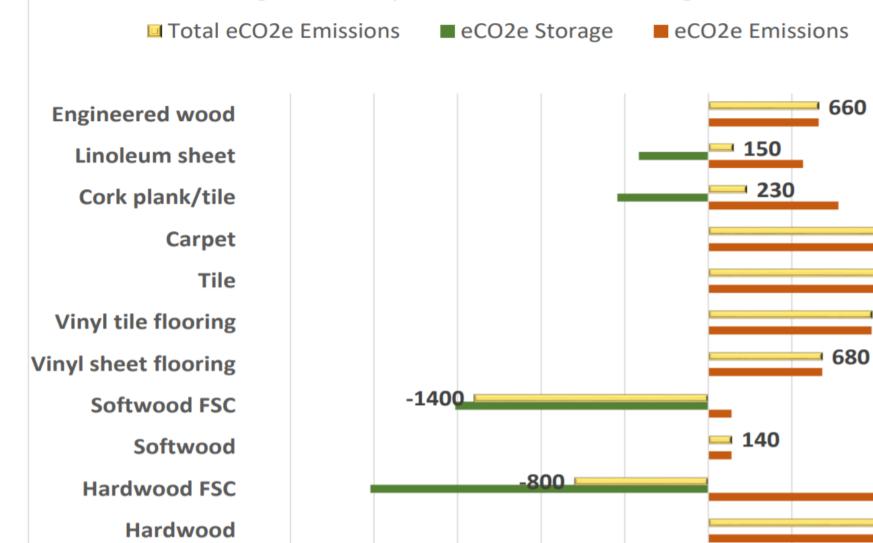
"Embodied Carbon (eCO2e) is the sum impact of all the greenhouse gas emissions attributed to the MATERIALS throughout their life cycle."

http://carbonleadershipforum.org/

CARBON IMPACTS OF INSULATION



Embodied CO2e Emissions by Flooring Type, kg eCO2e per 100 m2 flooring





Carbon storing materials palette

plant-based, carbon-storing building materials



























and no red list chemicals!



Our sources of data:

- Industry average EPD for North America
- Product specific EPD for North America
- Industry average EPD for Europe
- Product specific EPD for Europe
- LCA data from peer reviewed sources
- ICE database

Jacob Deva Racusin +Ace McArleton⁸



Use Less Materials!

Low Carbon Materials

- 1. Concrete Increase Fly Ash and Reduce Portland
- 2. Insulation Cellulose, Mineral Wool, Eco-Fiberglass, Glavel, Low HFO Foam

3. Studs - Wood Instead of Steel

4. Flooring – Reuse wood, Marmoleum, Interface LVT (zero carbon)

5. Sheetrock - Ecosmart

cut operational carbon!
PHIUS Passive
House + solar

Passive House (PHIUS)

Continuous insulation without thermal bridging

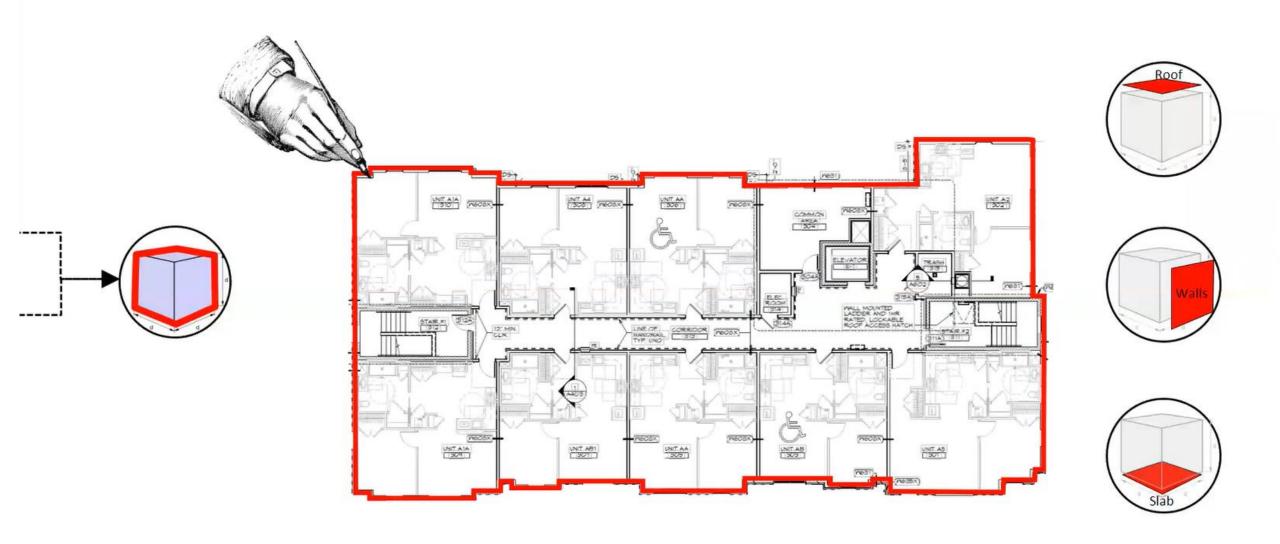
Airtight

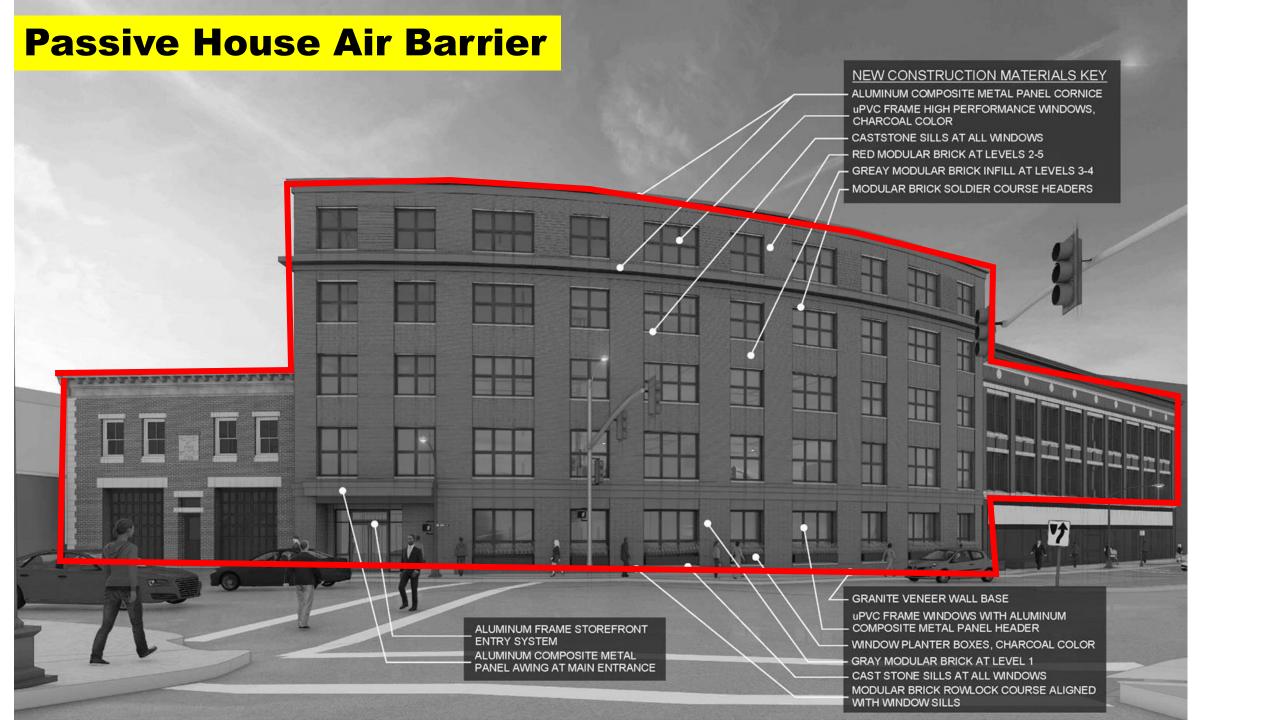
High performance windows & doors

Heat & moisture-recovery ventilation

Minimal space conditioning

AIR BARRIER

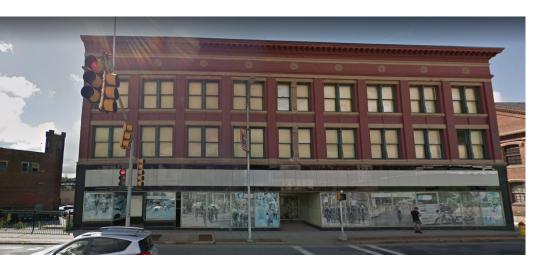




Federal Historic Tax Credits

Moran Square = Good Candidate for Passive House

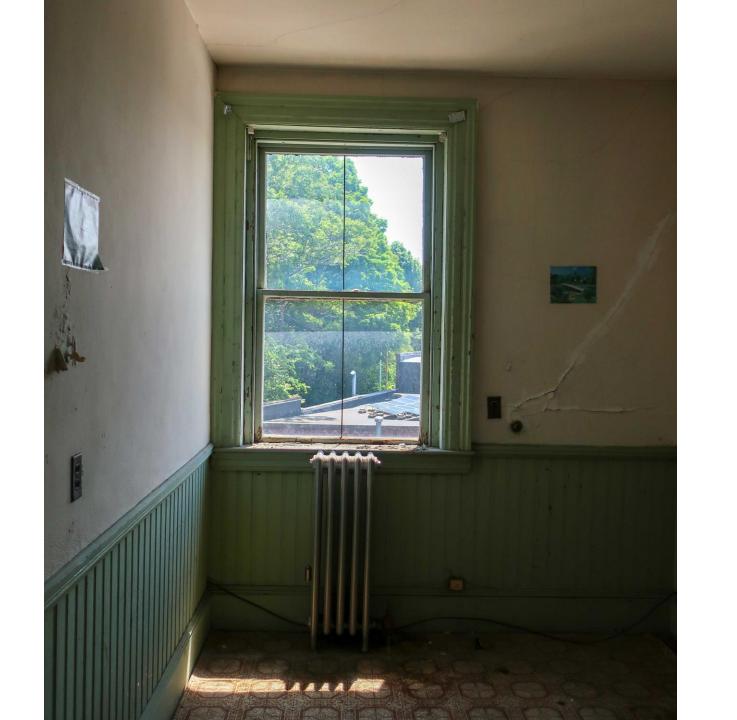
1. simple architecture2. simple windows3. limited interior exposed brick



National Park Service Standards and Guidelines

- 1. Windows!! Casement to Meet Air Infiltration Goals
 - 2. Wall Section Depth
 - 3. Exposed Brick
 - 4. Thermal Bridges
 - 5. Nothing Visible from the Exterior
 - 6. New Building Brick Facade





Simulated Double Hung Casement Windows! – U < .14



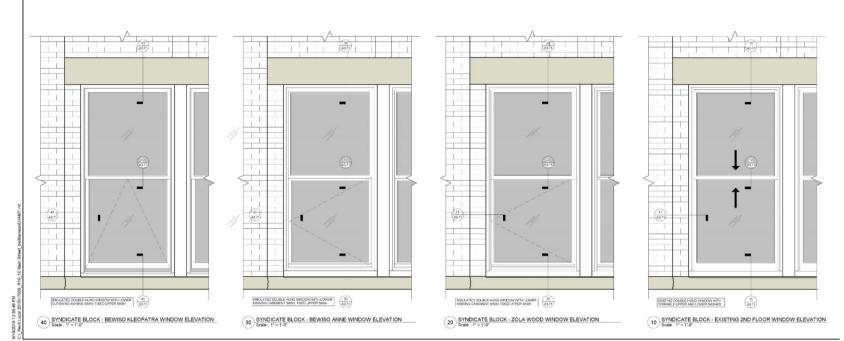


- photo from Zola

National Park Service



SYNDICATE BLOCK - EXISTING 2ND FLOOR WINDOWS



tat

© The Architectural Team, Inc. 50 Commandant's Way at Admiral's Hill Cheisea MA 02150 0 617.889.4402 F 617.884.4329 architecturalteam.com

Consultant:
Revision:
Architect of Record:
Drawn: BW
Checked: GK
Scale: 1" = 1'-0" Key Plan:
Project Name: MORAN SQUARE REDEVELOPMENT
15 SUMMER ST & 10 MAIN ST - FITCHBURG Sheet Name:
EXTERIOR WINDOW ELEVATIONS - SYNDICATE BLOCK
Project Number:
17009
Issue Date:
09/16/19
m:

A3.70



Yaro Installation – Mockup

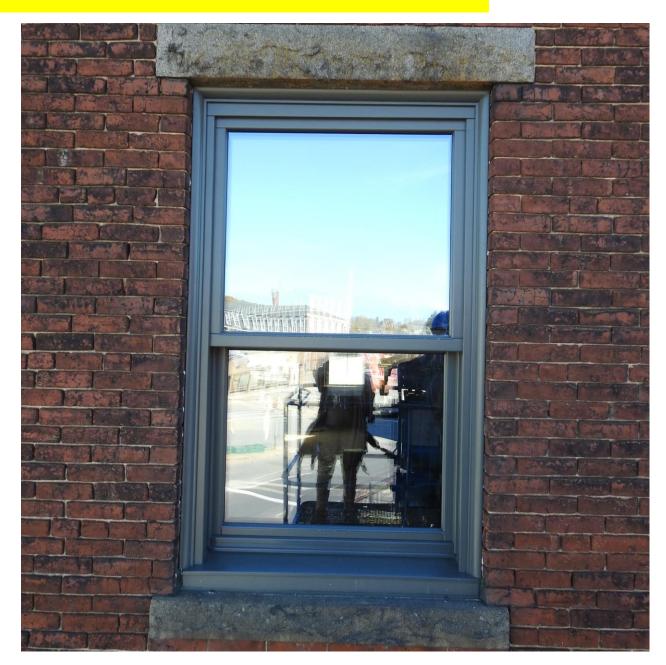


Original Historic Window



Simulated Double Hung Casement Window

Solar Heat Gain Coefficient – Too Reflective!



Too Bulky







Too Bulky – Meeting Rail Profile

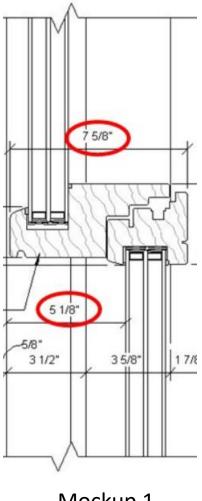


Original Historic Window

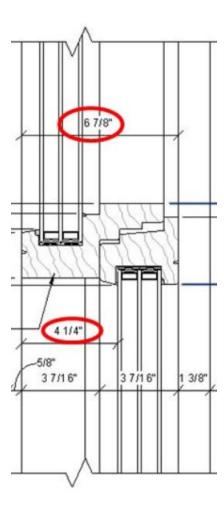


Simulated Double Hung Casement Window

Meeting Rail



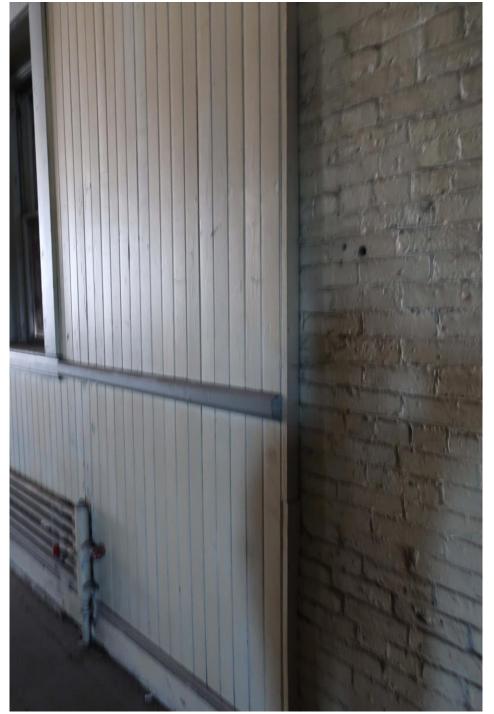
Mockup 1



Original Proposal to NPS

wall section depth





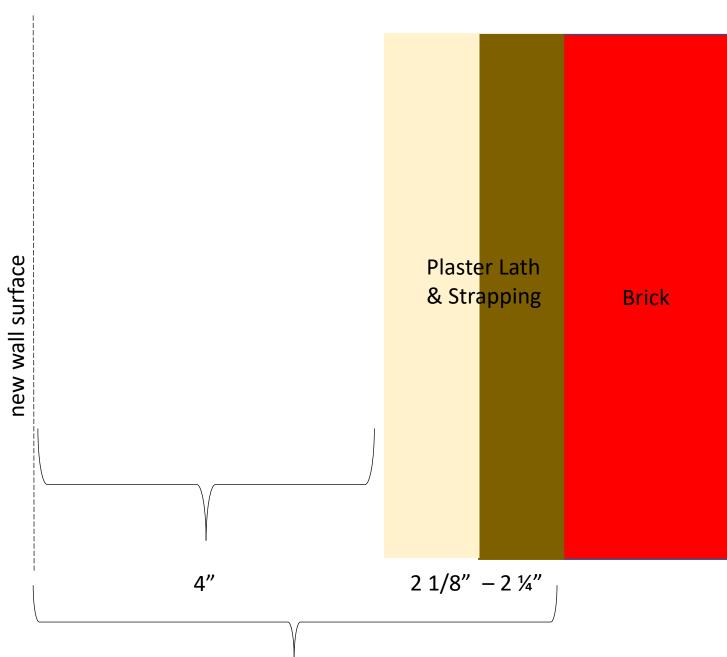




~ 5'6"







6 $1/8 - 6 \frac{1}{4}$ " from brick to new wall surface

Harper Building

Foam-Free Insulation and Air Sealing

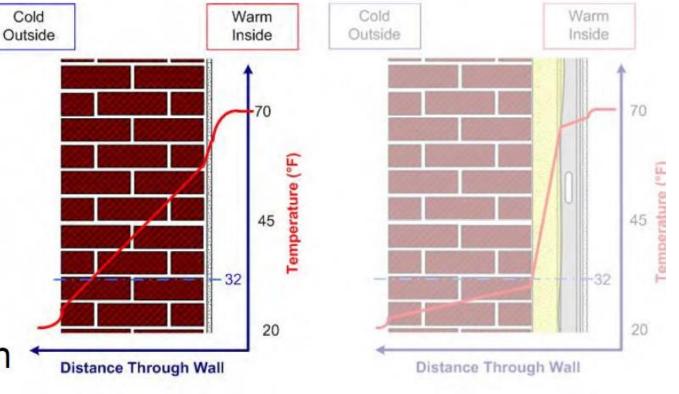
Cold Climate Risks

Freeze-thaw (reduced drying)

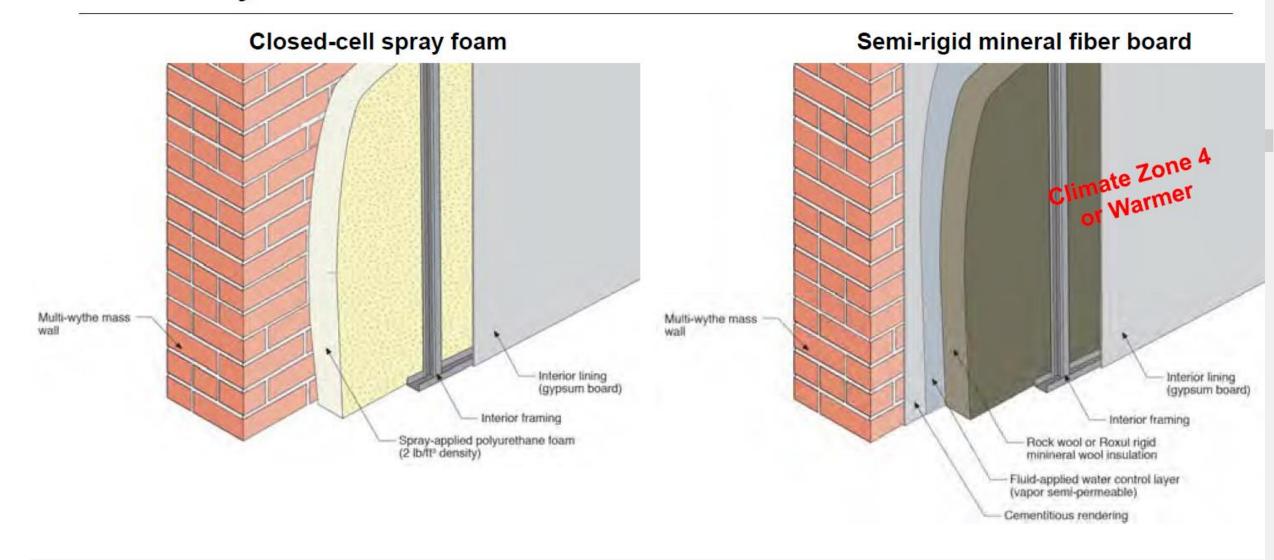
 Air leakage condensation on interior face of masonry

 Rot / corrosion of embedded elements

 Covering interior → less early warning of damage problems in the wall



Masonry Interior Insulation Retrofit Assemblies



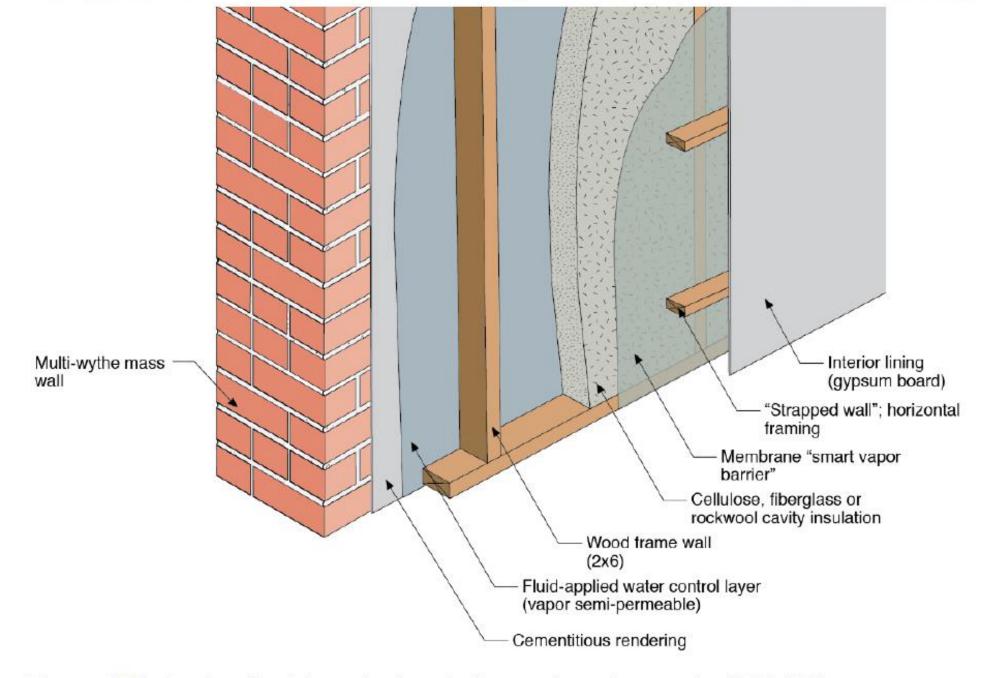


Figure 167: Stud wall with cavity insulation and service cavity (BSI-105)

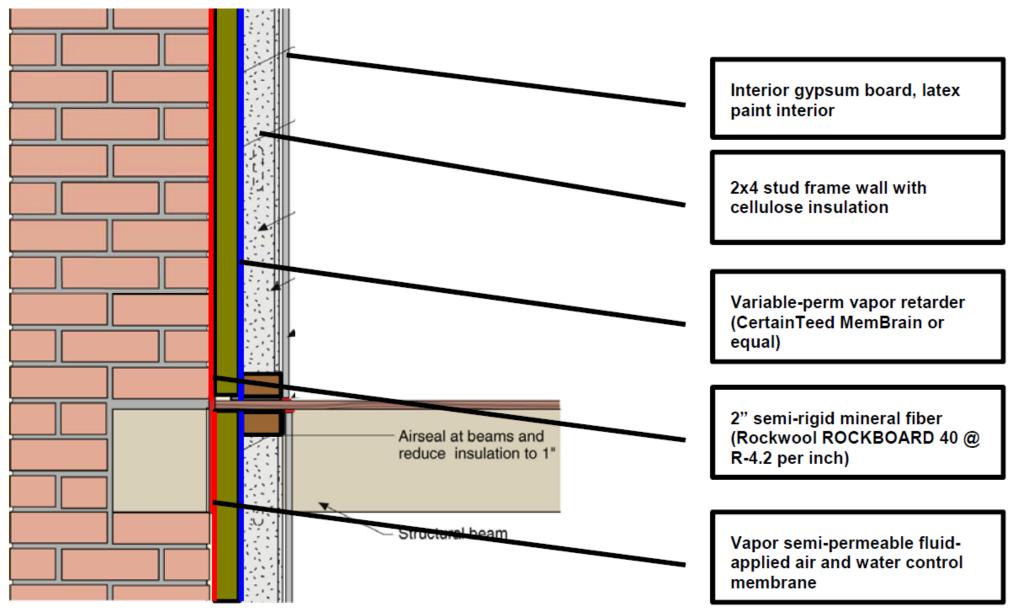
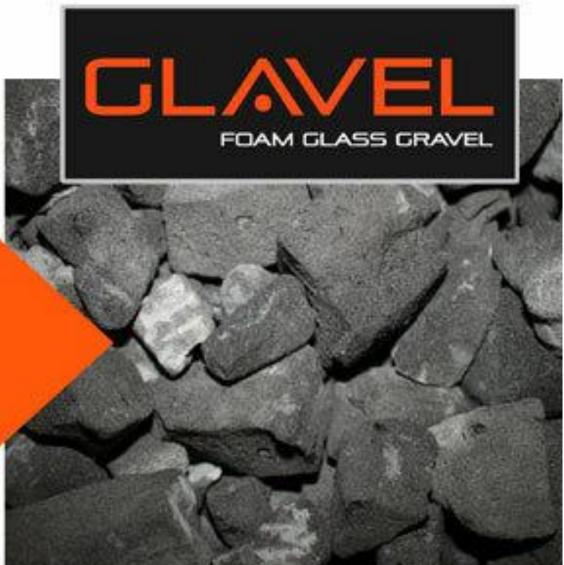


Figure 163: Conceptual drawing of mineral fiber and cellulose insulation option

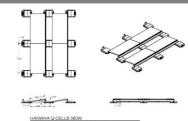








100 KW Solar





MODULE NOTES

-PV MODULE SPECS (VI) 388
-PV MODULE QUANTITY: 272
-SYSTEM FOWER RATING (STC KWDC): 183.36
-ORIENTATION/TLT (DEGREE): LANDSCAPE/8.54*

BALLAST NOTES

-BALLAST BLOCK: 16"x6"x4" @ 32 LBS ECOFOOT 2+ (BLOCK PER E2+)





BILL OF MATERIALS

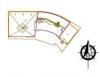
NAME	QTY
ECOFCOT2+ (ECO-002_207)	398
UNIVERSAL CLAMP KIT (ES10466)	328
WIND DEFLECTOR (ECO-002_311C)	272
ECOFCOT MLPE BRACKET (ES10970)	0
38" BONDING JUMPER (ES10378)	46
ATTACHMENT (PART NUMCER TED)	0
LOWER MID-SUPPORT (ES10498)	272
UPPER MID-SUPPORT (ES10502)	544
1 5/8" X 1 5/8" 12 GAUGE STRUT (10')	0
32 LBS BALLAST BLOCK (BOURTHE LOCALLY OR BURY LINE BY OTHERS)	766

SITE NOTES

BASIC WIND SPEED (MPH)	120
EXPOSURE CATEGORY	В
GROUND SNOW LOAD (PSF)	60
OCCUPANCY CATEGORY	1.0
SEISMIC (Ss)	.203
ROOF HEIGHT (FT)	56
PARAPET HEIGHT (IN)	0
ROOF SLOPE (DEG)	1.19
ROOFING TYPE	TPO MEMBRANE
ASCE7 VERSION	2010
BUILDING CODE	2012

BOLLINGCOCE

DRAWING INDICATES PLACEMENT OF
EQUIPMENT AND BALLAST. PLEASE
REFER TO INSTALLATION MANUAL FOR
FULL PRODUCT DETAILS. INSTALLER IS
RESPONSIBLE FOR VERIFICATION OF
SITE AND PROJECT SPECIFICS. DESIGN
IS FINALZED WHEN ACCOMPANIED BY
STAMPED ENGINEERING REPORT.



NO.	REVISION	BY	DA
Α	REVESED LAYOUT	AC	2600



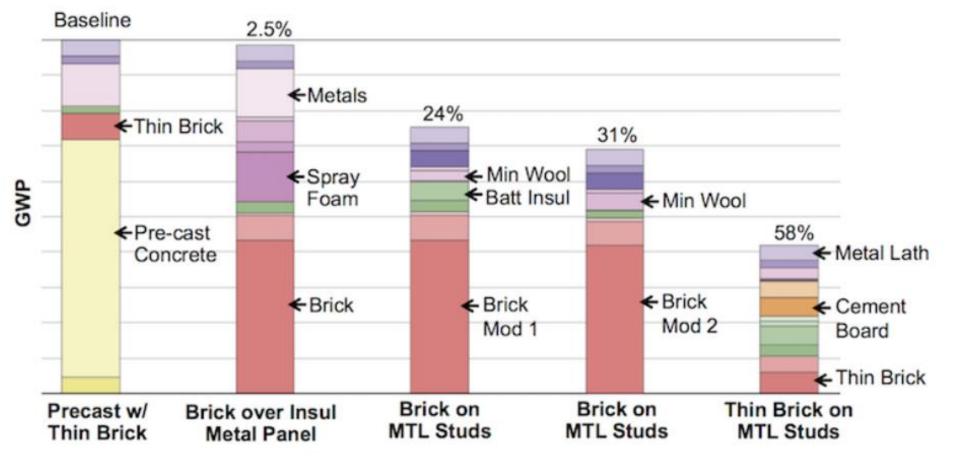
ECOLIBRIUM SOLAR 507 RICHLAND AVE., SUITE 301 ATHENS, OH, 45701

PRODUCED FOR: SUNBUG SOLAR MORAN SQUARE 10 MAIN ST FITCHBURG, MA 01420

2020-07-08	Steel	
Sode 3/32" = 1'-0"	S-1.0	
Drawn By:	3-1.0	

Material Reduction	Historic Building Reuse	Achieved
Energy	Passive House + Solar PV	Achieved
Concrete	Reduce Portland, Increase Fly Ash	Achieved
Siding on new building	FSC Wood, no brick/no fiber cement	National Park Service Requirement
Insulation	Cellulose, eco-fiberglass, mineral wool,	Wall section = cellulose and fiberglass.
	Glavel	Demising walls (acoustic) = eco-fiberglass.
		Under slab = Glavel.
		Ceiling of parking garage (compromise!) –
		low HFO foam
		No XPS!!!
Dimensional framing	Wood instead of steel	???
Windows	Wood	Some
Flooring		No carpet!
		Reuse of some existing wood flooring.
		Forbo marmoleum.
		LVT (Interface says carbon neutral)
Countertops	Wilsonart and Formica	Greenguard and recycled content
Sheetrock	EcoSmart	???
Cabinets	FSC	No good options. Using wood.
Wood	FSC	No

A Tale of Five Bricks



Architect Brad Benke studied the impacts of brick façade systems and discovered that five functionally equivalent wall types had very different impacts. Thin brick on metal studs, shown at the far right, reduced embodied carbon 58% compared with a baseline wall system (thin brick with precast concrete).

Image: LMN Architects

https://www.buildinggreen.com/feature/urgency-embodied-carbon-and-what-you-can-do-about-

Brick

Greenleaf (31% recycled content)

Thin Brick

Team Coordination and CoVid

Passive House - Yes

Low Carbon Materials - Huh? Where's the checklist, points, certification?