

F*#M-FREE ASSEMBLIES

FABULOUS, FEASIBLE, AND FUN

TWO TEAMS – ONE VISION

Carri Beer, AIA
Brennan + Company Architects

Michael Hindle CPHC, CPHB
Passive to Positive Consulting

Jacob Deva Racusin
Ben Graham

brennan+company
ARCHITECTS

Passive to **POSITIVE**



New Frameworks
Natural Design Build

WHY FOAM FREE?



HOLISTIC,
LOW-IMPACT DESIGN

WHY FOAM FREE?



HOLISTIC,
LOW-IMPACT DESIGN

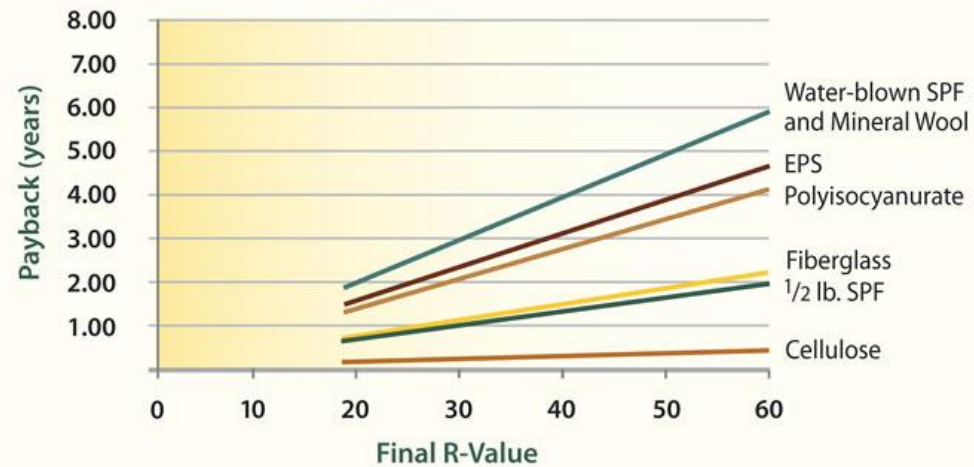
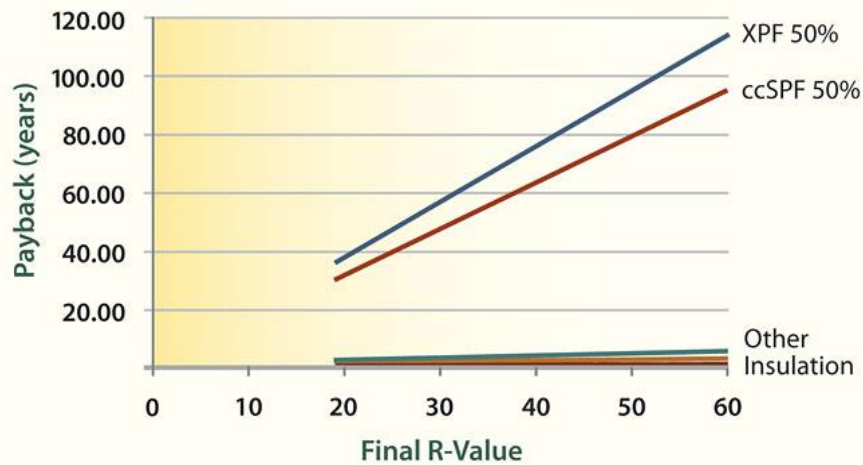
living in america

2 million plastic beverage bottles every 5 minutes

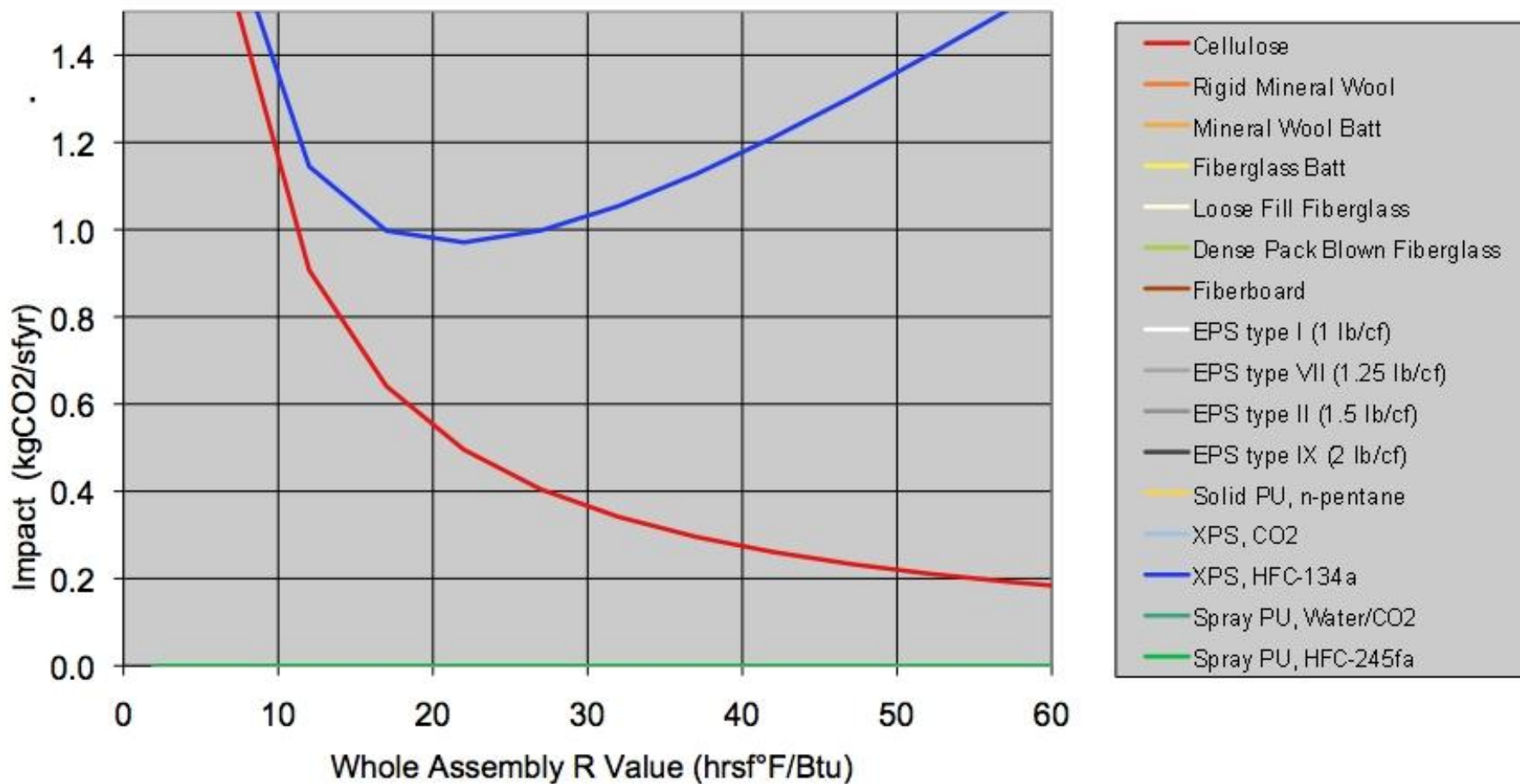


How many carcinogens are released by these bottles and plastic bags?
How many endocrine enhancing chemicals are released?
How much oil did it take to manufacture them?
WHAT ABOUT YOUR INSULATION?

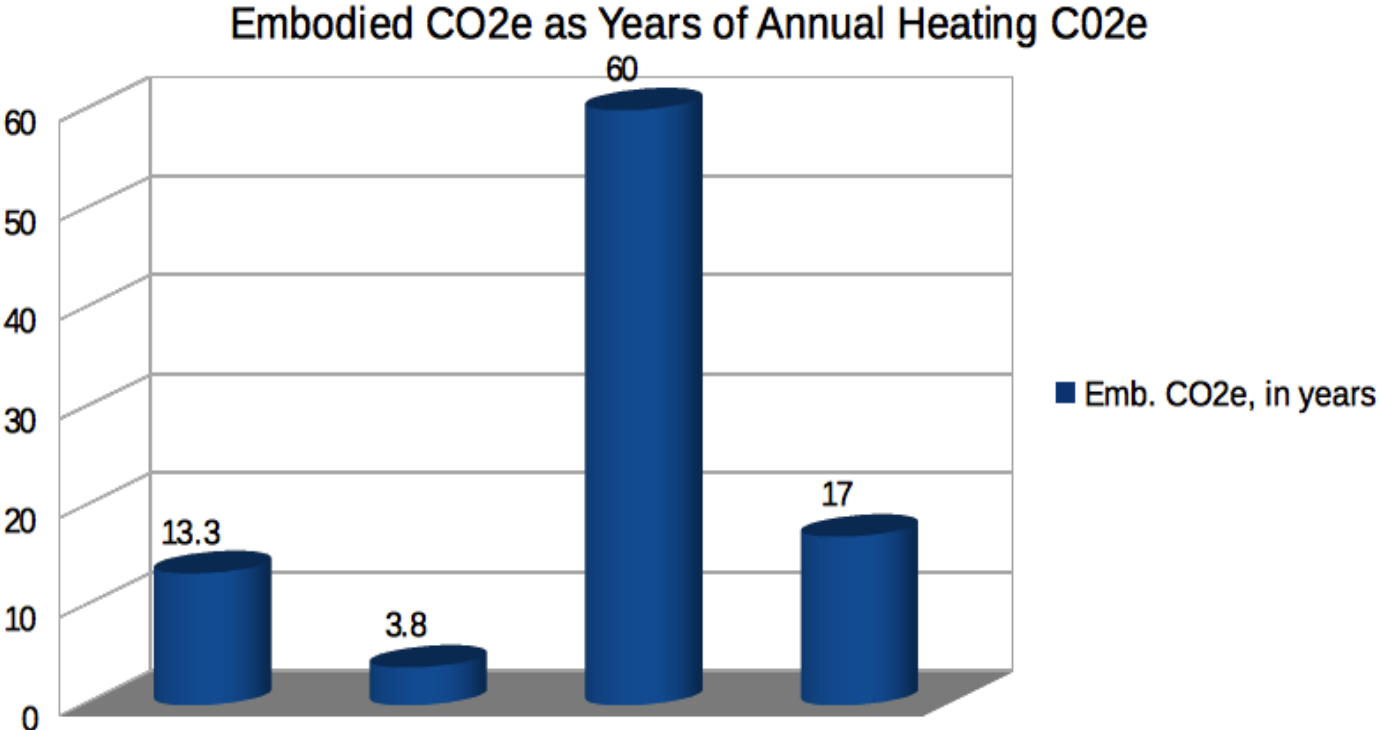
MATERIALS LIFE-CYCLE IMPACT



Climatic Impact of Energy Use + Embodied GWP



Why Embodied CO₂e Matters



Year of Embodied CO₂e
“Payback” (break-even)

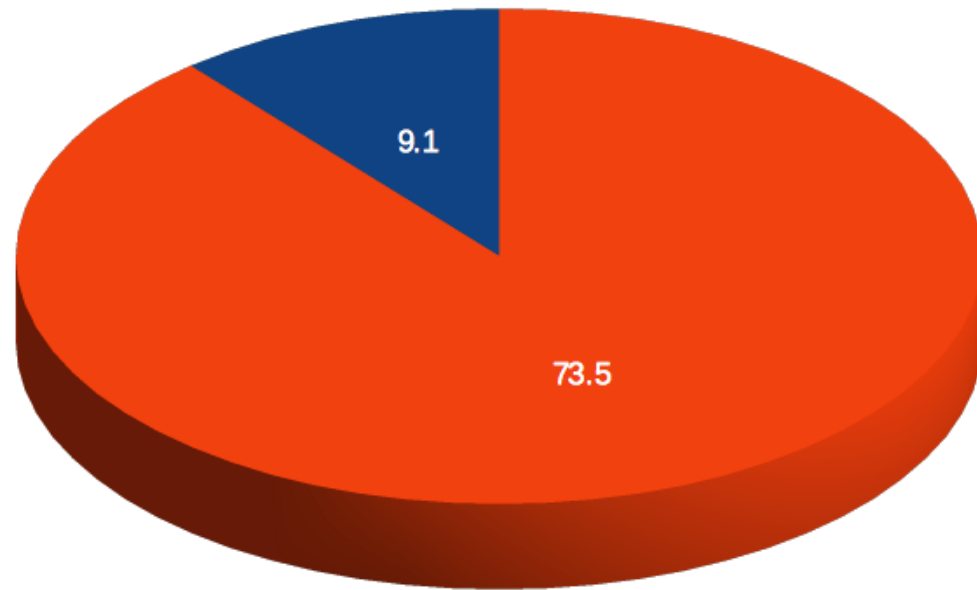


2029	2020	2056	2033
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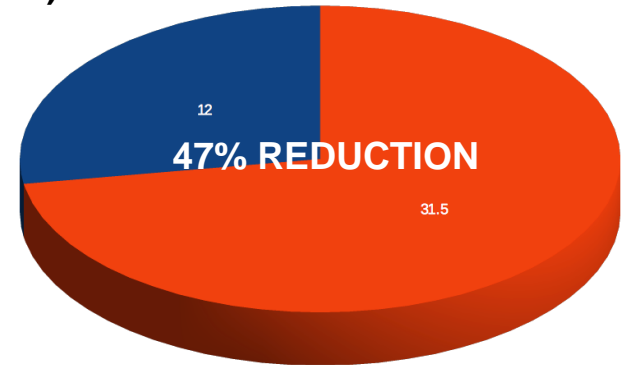
Why Embodied CO₂e Matters

- Emb CO₂e, tons
- 35 yrs Heat CO₂e, tons

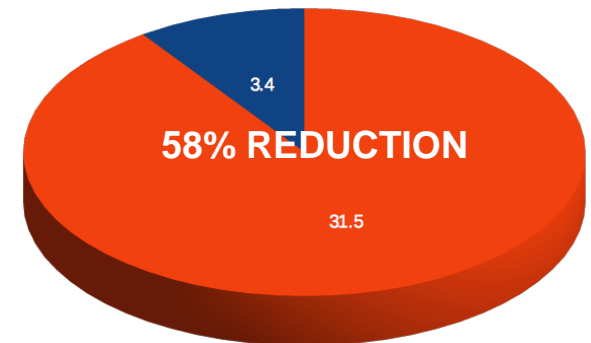
Code Minimum - VT (82.6 Tons)



HP Foam - VT
(43.5 Tons)

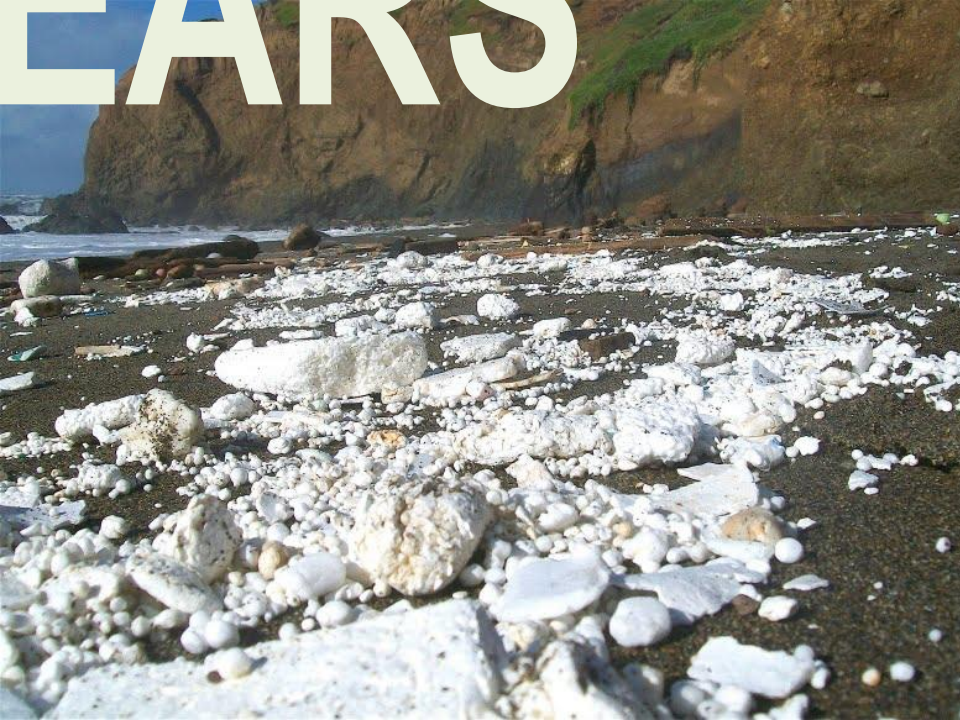


HP LowCarb -
VT (34.9 Tons)





500 YEARS



A close-up photograph of a nest containing several bright blue eggs. The nest is made of dry, brownish twigs and straw, creating a textured background. The lighting is soft, highlighting the smooth surface of the eggs.

REMEMBER RACHEL CARSON?

MATERIALS' LIFE- CYCLE IMPACT MATTERS

American babies are born with the highest blood levels of flame retardants in the world.
(EBN June 2004).

. . . when the flame retardant hits wastewater streams . . . it loses bromine atoms, increasing its bioaccumulation potential and potential subsequent health hazards.
(EBN vol. 20 #12).

“PBDEs disrupt thyroid and estrogen hormones, which can cause . . . permanent changes to the brain and to reproductive systems (including reduced sperm count in males and changes to ovarian cell structure in females). . .

PBDE levels for . . . about 15 million people are nearing concentrations that have been found to cause serious health effects in animal studies. “The current margin of safety is low.”

toxicologist Thomas P. McDonald, (EBN vol. 13 #6)

And Styrenes ? . . .

A close-up photograph of a nest containing several bright blue eggs. The nest is made of dry, brownish straw and twigs. The lighting is soft, highlighting the texture of the eggs and the surrounding material.

REMEMBER RACHEL CARSON?

MATERIALS' LIFE- CYCLE IMPACT MATTERS

Styrenes are highly fat soluble materials and neurotoxins that accumulate in lipid-rich tissues of the brain and nervous system, causing acute and chronic functional impairment . . .

a known carcinogen . . .

<http://www.earthresource.org/campaigns/capp/capp-styrofoam.html>

EPA National Human Adipose Tissue Survey 1982 – documented styrenes present in 100% of human tissue samples

EPA National Human Adipose Tissue Survey 1982

1988 study by the Foundation for Advancements in Science and Education found styrene contamination in 100% of samples from 8 – 350ng/g (1/3 levels determined to cause neurotoxic symptoms)

Foundation for Advancements in Science and Education

A close-up photograph of a nest containing several bright blue eggs. The nest is made of dry, brownish twigs and straw, creating a textured background. The lighting is soft, highlighting the smooth surface of the eggs.

REMEMBER RACHEL CARSON?

MATERIALS' LIFE- CYCLE IMPACT MATTERS

Among the chemicals used in spray polyurethane foam (SPF) insulation, “Isocyanates, such as MDI (methylene diphenyl diisocyanate), are highly reactive chemicals that can cause skin, eye, and lung irritation, asthma, and chemical sensitization when absorbed through the skin or inhaled.”

Building Green, EPA Takes Action on Spray-Foam Health Risks, May 3rd, 2011

Polyurethane foam has been known to cause chemical sensitivity in extremely small exposures after initial work related exposures.

Briefing on Spraf Polyurethane Foam: EPA/OSHA

MATERIALS LIFE- CYCLE IMPACT

WE HAVE ALTERNATIVES –

we just have to choose them + design + build accordingly



F*#M-FREE FOUNDATIONS

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Natural Design Build

THE PASSIVE BIRDHOUSE

PASSIVE HOUSE, NET-ZERO, FOAM FREE

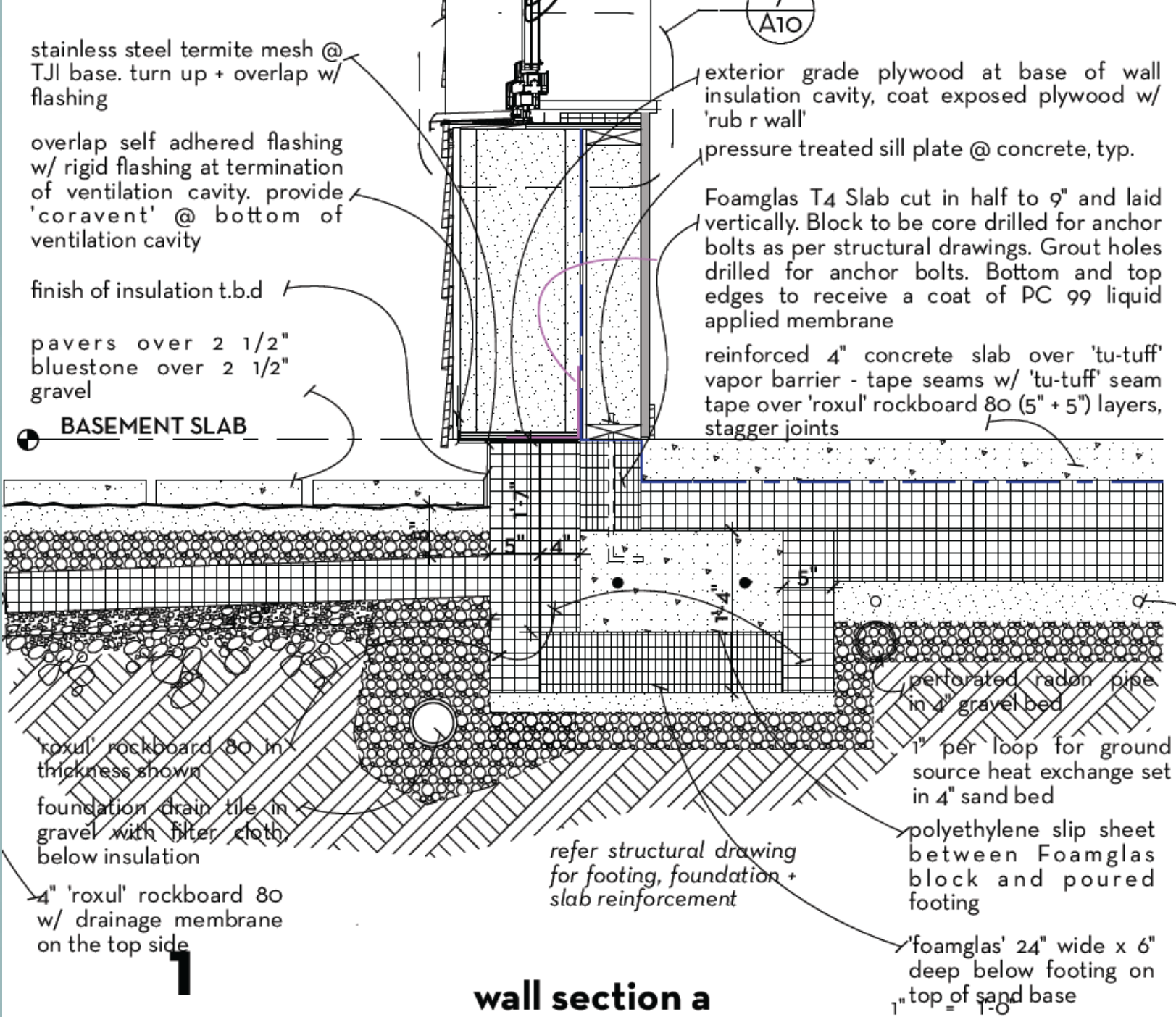


Architect: Carri Beer, AIA
Brennan+Company Architects

PH Consultant: Michael Hindle, CPHC
Passive to Positive

Builder: Gosnell Builders Inc.

FOAM FREE ENCLOSURE #1



stainless steel termite mesh @ TJI base. turn up + overlap w/ flashing

overlap self adhered flashing w/ rigid flashing at termination of ventilation cavity. provide 'coravent' @ bottom of ventilation cavity

finish of insulation t.b.d

pavers over 2 1/2" bluestone over 2 1/2" gravel

BASEMENT SLAB

A10

exterior grade plywood at base of wall insulation cavity, coat exposed plywood w/ 'rub r wall'

pressure treated sill plate @ concrete, typ.

Foamglas T4 Slab cut in half to 9" and laid vertically. Block to be core drilled for anchor bolts as per structural drawings. Grout holes drilled for anchor bolts. Bottom and top edges to receive a coat of PC 99 liquid applied membrane

reinforced 4" concrete slab over 'tu-tuff' vapor barrier - tape seams w/ 'tu-tuff' seam tape over 'roxul' rockboard 80 (5" + 5") layers, stagger joints

'roxul' rockboard 80 in thickness shown

foundation drain tile in gravel with filter cloth below insulation

4" 'roxul' rockboard 80 w/ drainage membrane on the top side

refer structural drawing for footing, foundation + slab reinforcement

perforated radon pipe in 4" gravel bed

1" per loop for ground source heat exchange set in 4" sand bed

polyethylene slip sheet between Foamglas block and poured footing

'foamglas' 24" wide x 6" deep below footing on 1" top of sand base

wall section a

1

1-0

4" 'roxul' rockboard 80
over 'rub r wall' or
approved alternative
waterproofing

pressure treated sill plate @
concrete, typ.

reinforced 4" concrete slab
over 'tu-tuff' vapor barrier -
tape seams w/ 'tu-tuff' seam
tape over 'roxul' rockboard 80
(5" + 5") layers, stagger joints

BASEMENT SLAB

'roxul' rockboard 80 in
thickness shown

foundation drain tile in
gravel with filter cloth,
below insulation

perforated radon pipe in
4" gravel bed

1" per loop for ground
source heat exchange set
in 4" sand bed

polyethylene slip sheet
between 'foamglas' block
and poured footing

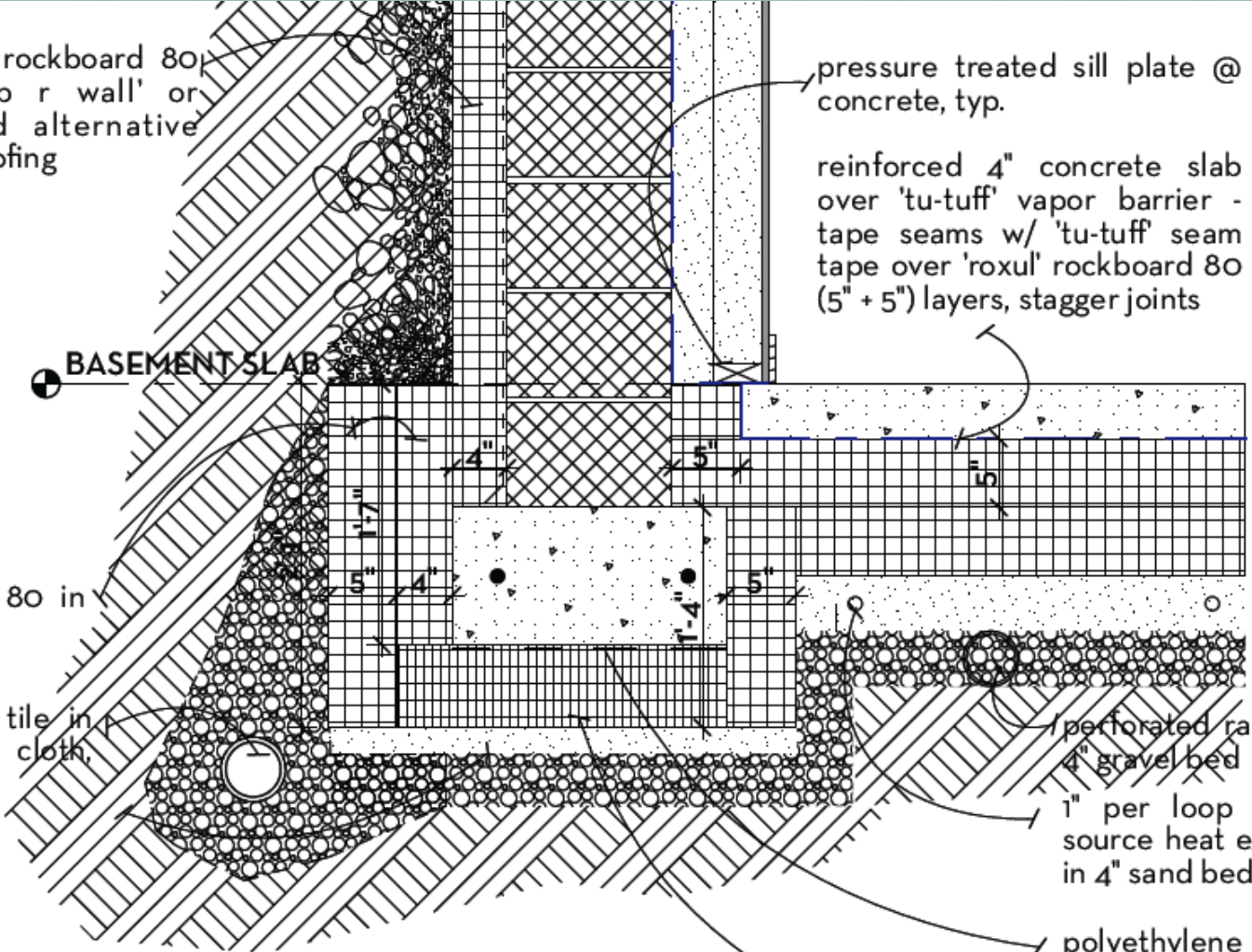
'foamglas' 24" wide x 6"
deep below footing on
top of sand base

refer structural drawing
for footing, foundation +
slab reinforcement

2

wall section b

1" = 1'-0"





FOAMGLAS BELOW FOOTING



FOAM FREE FOUNDATIO N

PERIMETER FOOTING INSULATION



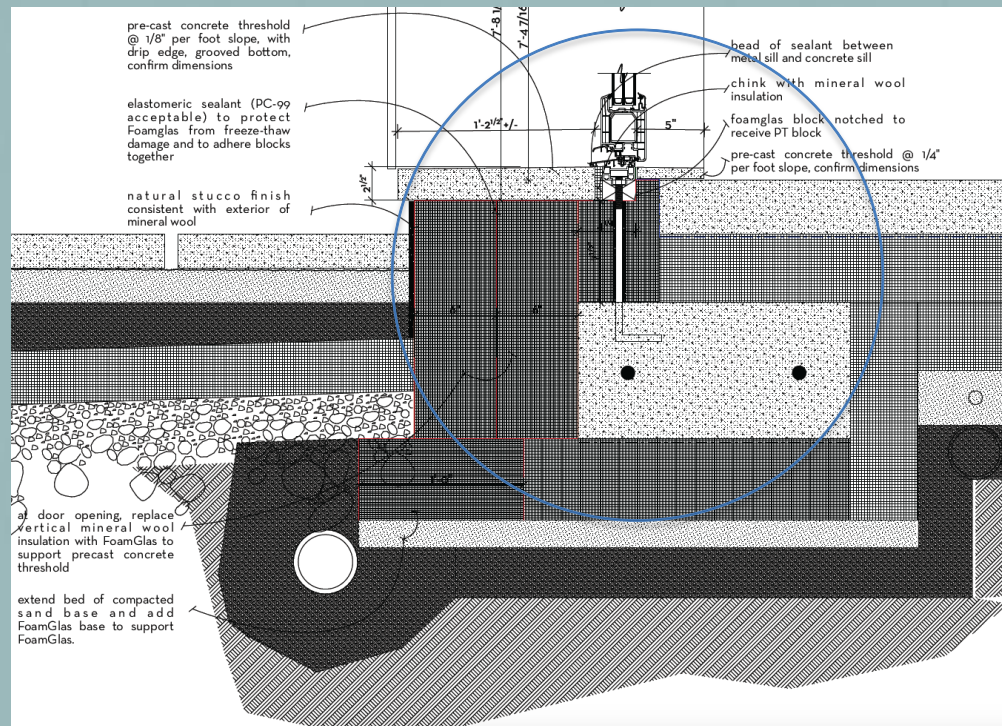


POURED FOOTINGS OVER
FOAMGLAS





FOAMGLAS PERIMETER BLOCK
+ MINERAL WOOL BELOW SLAB



FOAMGLAS THRESHOLD



MINERAL WOOL BELOW SLAB



EXTERIOR MINERAL WOOL AT FOUNDATION



MINERAL WOOL FROST SKIRT



POURING CONCRETE ON
MINERAL WOOL

FOAM FREE FOUNDATIO N

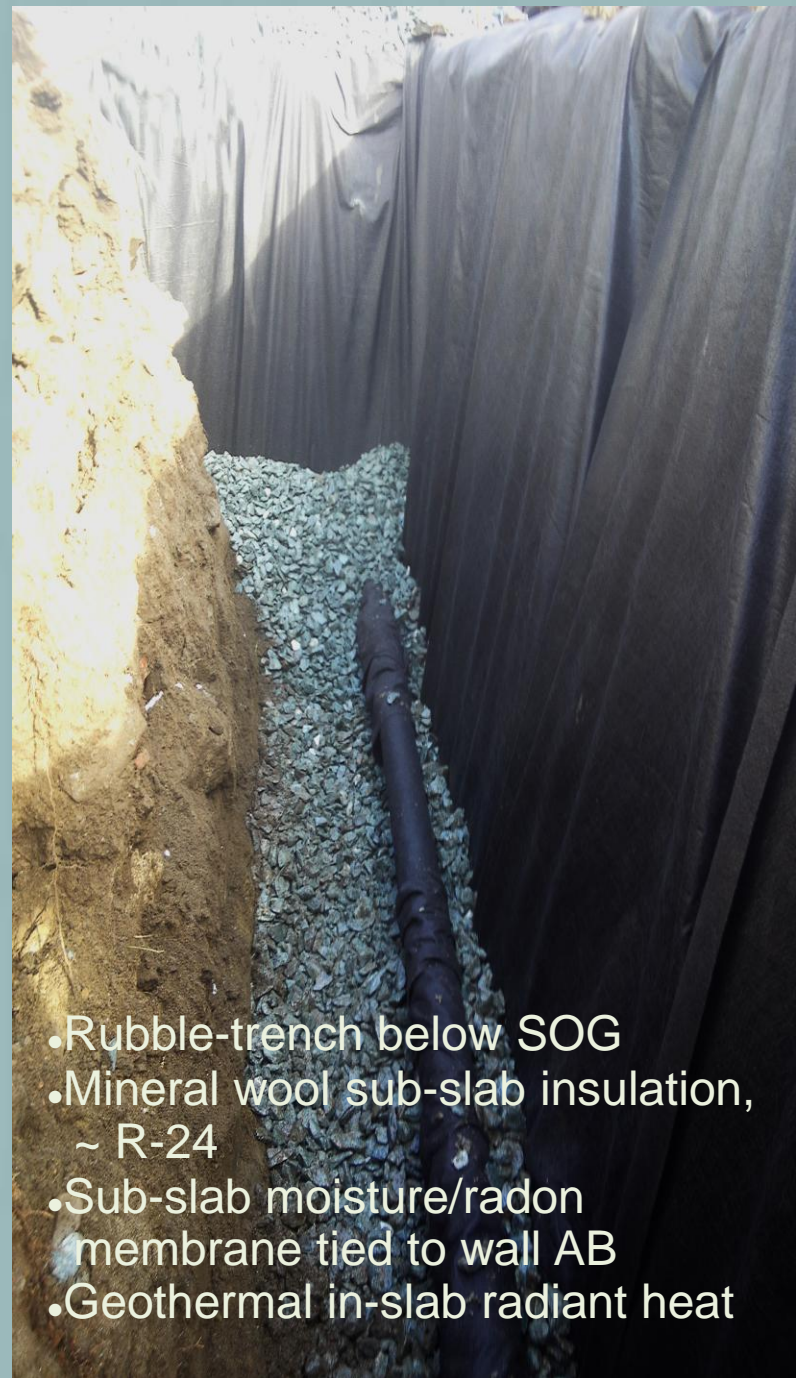
FOAMGLAS THERMAL
BREAK OF
CONDITIONED
BASEMENT TO
UNCONDITIONED
GARAGE
FOUNDATION







Roxul sub-slab insulation, R24 (new spec is R30)
20 mil vapor/moisture/radon barrier, continued to wall
EPS/Roxul slab-edge, R30
HD EPS used below footings for structure



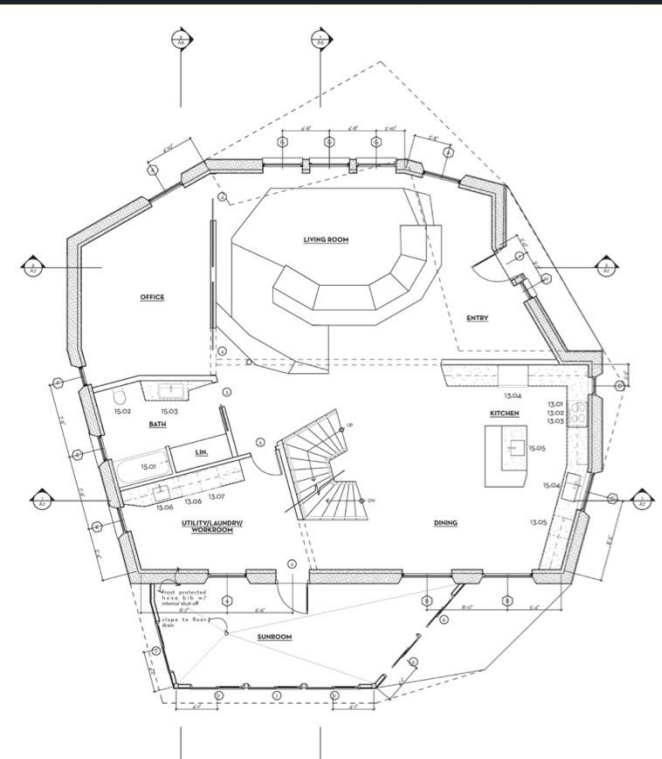
- Rubble-trench below SOG
- Mineral wool sub-slab insulation, ~ R-24
- Sub-slab moisture/radon membrane tied to wall AB
- Geothermal in-slab radiant heat

**NON-FOAM DETAIL WAS \$6,524
MORE THAN EPS FOAM**

**WHICH FOR THIS PROJECT WAS AN
INCREASE OF 0.006%**

**(LABOR WAS A WASH BECAUSE THE
MATERIALS WERE SO EASY AND
ENJOYABLE TO USE.)**

**SUBSEQUENT DETAIL REVISIONS
YIELDED PROJECTED 30% SAVINGS,
REDUCING INCREMENTAL COST TO
\$3000**



Perlite – lower cost alternative to mineral wool?

F*#M-FREE FOUNDATION RETROFIT

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New Frameworks
Natural Design Build

Foam-Free Basement Retrofit

Sub-slab drainage w/ dimple mat

Air-tight battery-BU sump pump

20-mil sub-slab moisture/vapor barrier

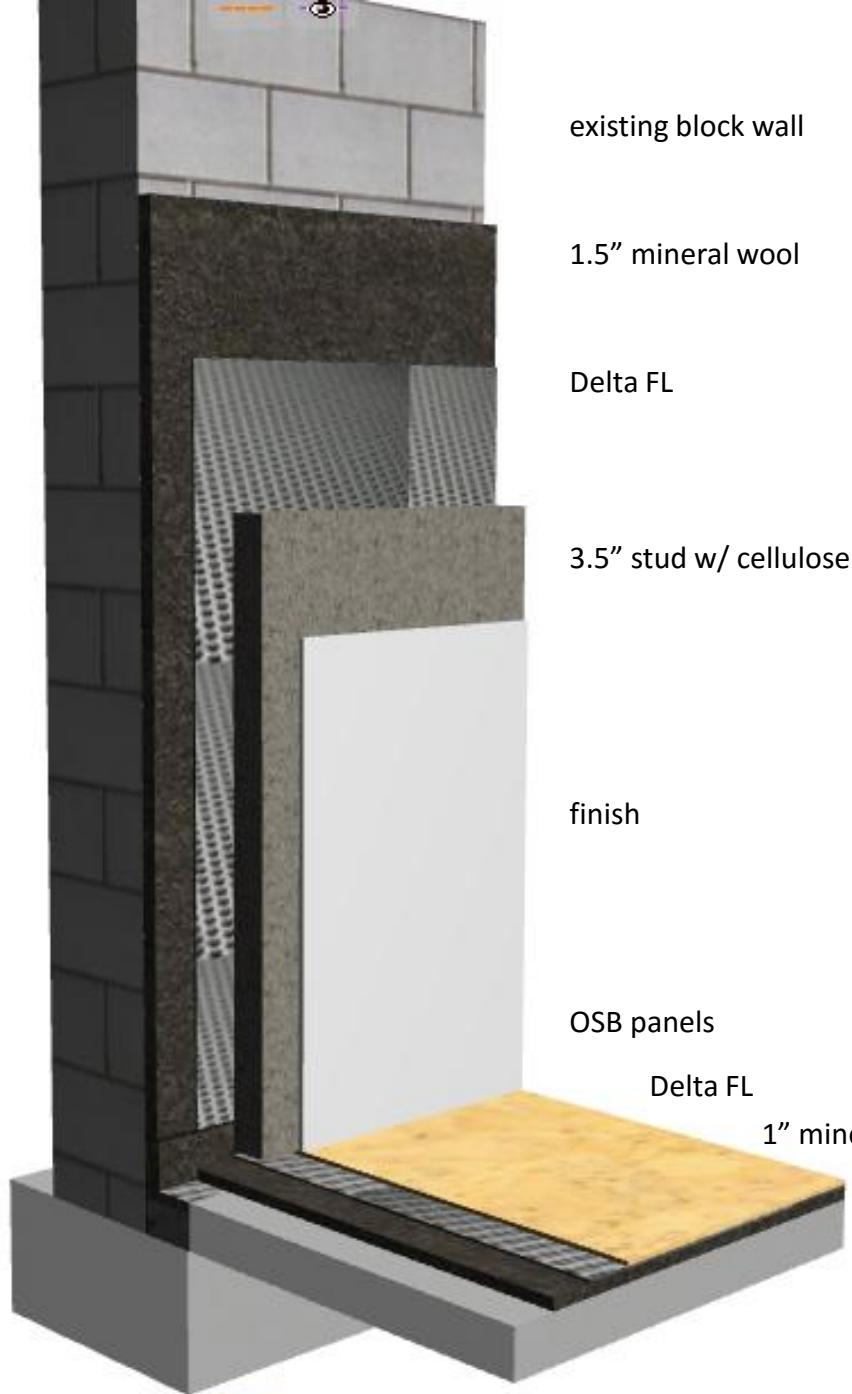
10-mil wall moisture/vapor barrier



Foam-Free Basement Retrofit



Two layers 2" mineral board w/ vertical 1x strapping
Butyl-tipped 7" Headlok fasteners, self-sealing to VB
Interior air-barrier to reduce condensation, isolate insulation



existing block wall

1.5" mineral wool

Delta FL

3.5" stud w/ cellulose

finish

OSB panels

Delta FL

1" mineral wool

CarMic basement
detail

F*#M-FREE WALL ASSEMBLIES

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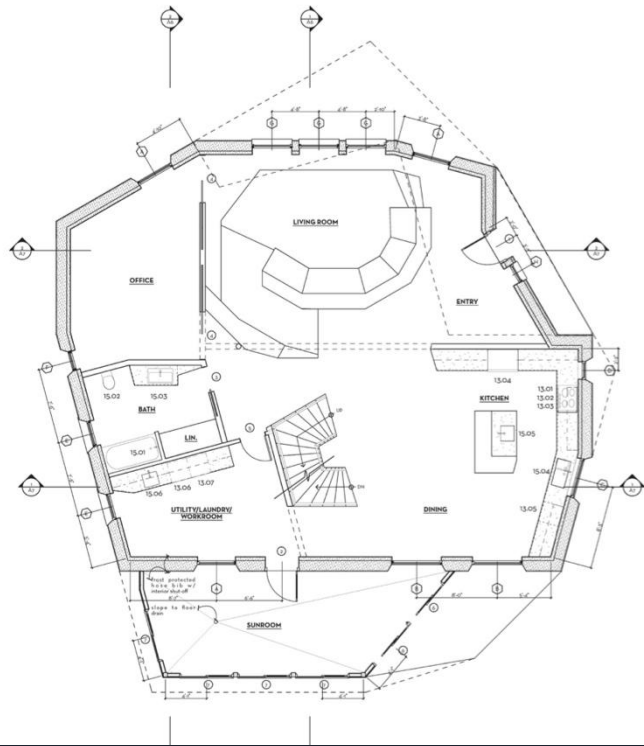


FOAM-FREE WALL ASSEMBLIES



FOAM-FREE WALL

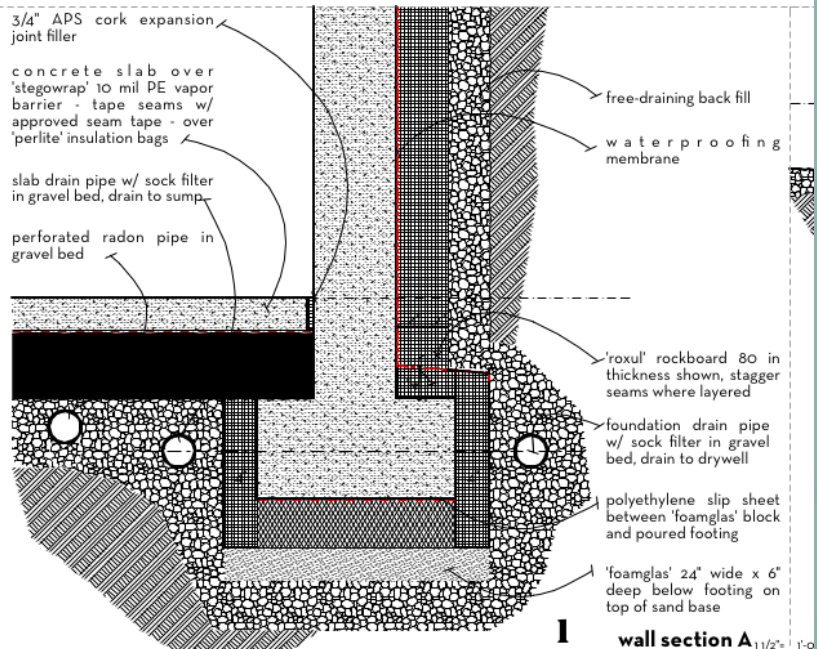
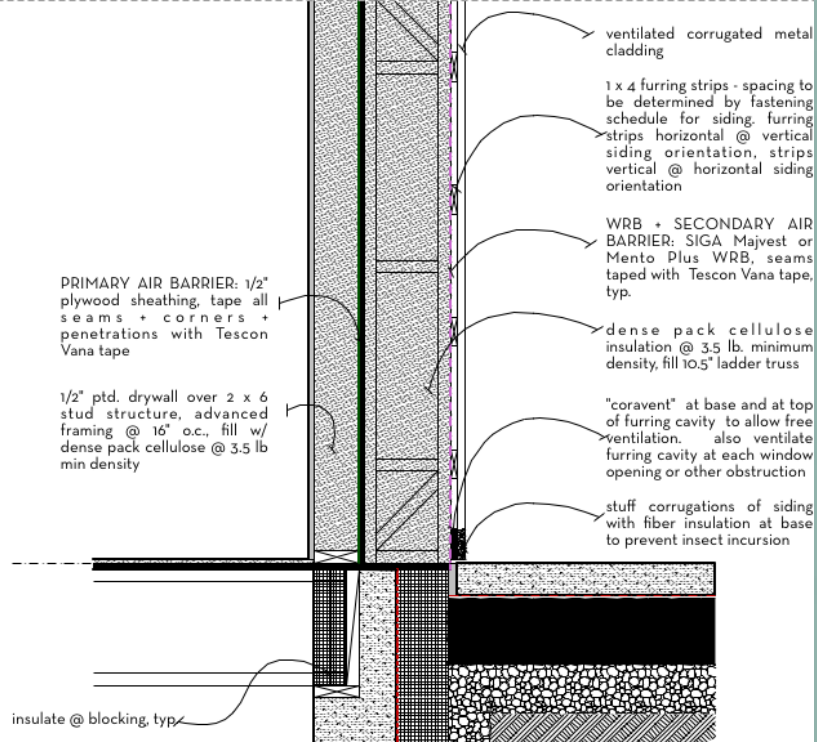
HONEYCOMB BUNKER PASSIVE HOUSE, NET-ZERO FOAM FREE



Designer: Daniel Gantenbein
Architect: Carri Beer, AIA LEED AP
Brennan+Company Architects

PH Consultant: Michael Hindle, CPHC
Passive to Positive

FOAM FREE ENCLOSURE #3



Straw Cell

3rd Generation Straw Wall
Passivehaus / ZNE Ready

Air Tight – <1.0 ACH50

*Cheaper – No TF, half the
plaster*

Faster – Less plaster prep

Easier – Solid frame support

*More Flexible – Dried in before
bales are installed, winter
plaster*

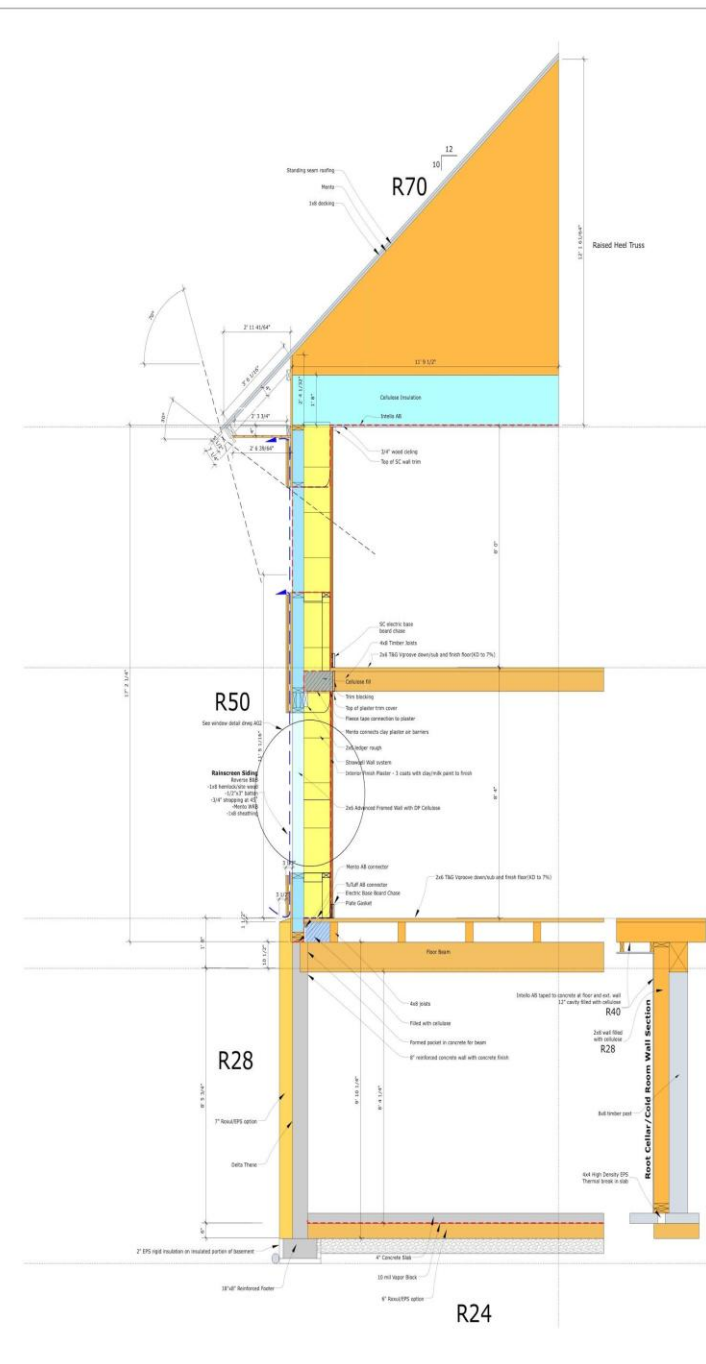
More Durable – Rainscreen

More Insulating – $R20+30=R50$



Straw Cell

Ready for Plaster Air Barrier



Prefabricated Straw Panels

Residential / Commercial / Institutional
Fast Installation / Lower Cost
Quality Control / On- or Off-Site
Air-Tight / Super Insulated / Durable





Foam-Free Insulated Sheathing Products – Structural and Non-Structural

Fiberboard ~ Mineral Board ~ Cork

Organize Your Layers!

*Interior wall AB continuous to
ceiling AB above paneling
Interior stud wall to support 2nd
floor frame, service cavity*





Foam-Free Deep Energy Retrofit

*HD Mineral Board Exsulation – Two 2" layers, R16 cont.
New Square Air-Tight Window Bucks Set Into Old R.O.*

Foam-Free Deep Energy Retrofit

New Triple-Glaze FG Windows

Air-Tight WRB

Ventilated/drained shingle strapping



F*#M-FREE ROOF ASSEMBLIES

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Jacob Deva Racusin
Ben Graham

brennan+company
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Passive to **POSITIVE**



New Frameworks
Natural Design Build



FOAM FREE ROOF

UNINTERRUPTED
BLANKET



FOAM FREE ROOF

**UNINTERRUPTED
BLANKET**



FOAM FREE ROOF

OVER A
DENSEPACKED
CATHEDRAL CEILING



F*#M-FREE TRANSITIONS AND AIR-SEALING

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Ben Graham

brennan+company
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New Frameworks
Natural Design Build



ordinary, non- "Passive House" construction



FOAM-FREE CONTINUITY OF
AIR-TIGHT LAYER

SIGA-Majpell 5
www.siga.ch

The better insulation

ROXUL	The Better Insulation
ROXUL	The Better Insulation
ROXUL	The Better Insulation
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The Better Insulation

SIGA-Wiglup
www.siga.ch
SIGA-Wiglup
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SIGA-Wiglup
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SIGA

www.siga.ch

www.siga.ch
SIGA-Majpell 5
www.siga.ch





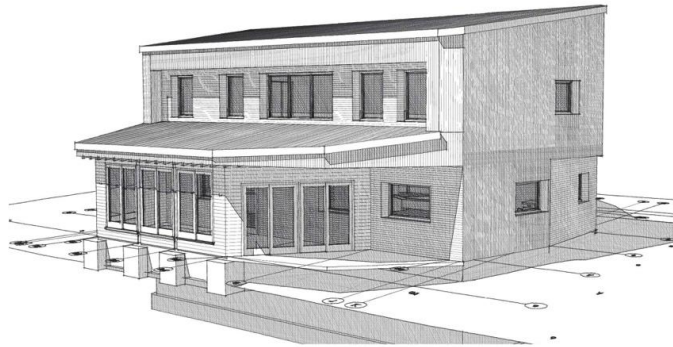


FOAM-FREE WINDOW DETAIL

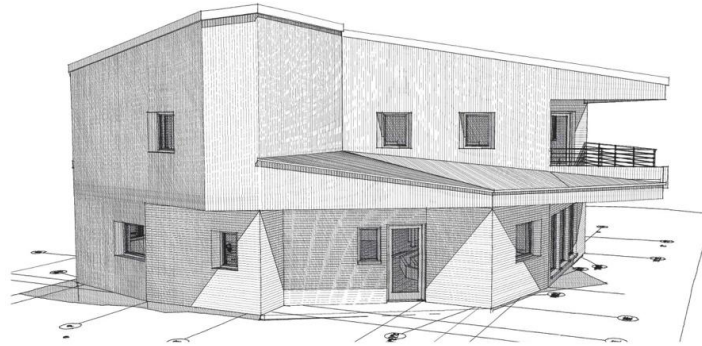


AIR-TIGHT TAPE INSIDE, FREE
DRAINING, BACK-DAMMED
SILL TO THE EXTERIOR

I DON'T EVEN WANT TO THINK ABOUT IT!!



1 southeast sketch



2 northeast sketch



3 northwest sketch



4 southwest sketch

DATE: 10/10/19
PROJECT: GANTENBEN RESIDENCE
ARCHITECT: GANTENBEN ARCHITECTS

1000 Avenue of the Americas, New York, NY 10020
1000 Avenue of the Americas, New York, NY 10020

PROJECT: GANTENBEN RESIDENCE
DATE: 10/10/19
ARCHITECT: GANTENBEN ARCHITECTS
WOODSTOCK, NEW JERSEY 08098

phase: 020
progress set: 02/19

drawing: exterior sketches



sheet no.

A5

Architecture | Research | Design | Construction | Project | Interior | Working | Drawing | Photo | Video | Installation | Exhibition | Collaboration

Plaster as an Air Barrier

Not your Grandparents' plaster!

- Thicker and more rugged -
designed to be an AB, not
just a finish
- Air-tight - achieve <0.6 ACH50
- Liquid-applied - flexible application
- Hard and durable - 1+” solid
masonry
- Inspectable and repairable -
no hidden membranes,
simple repairs

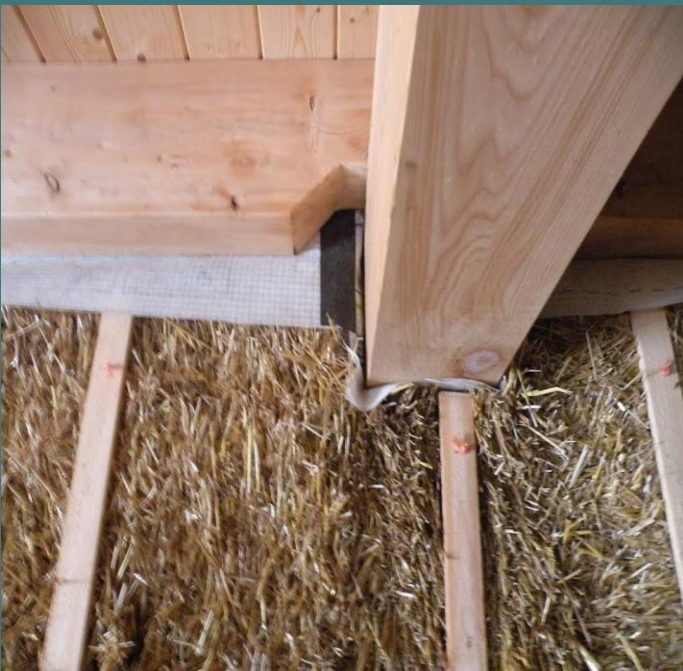


Natural Plasters - A Case Study in Resiliency

Does your 200 yr building have a 200 year air barrier?



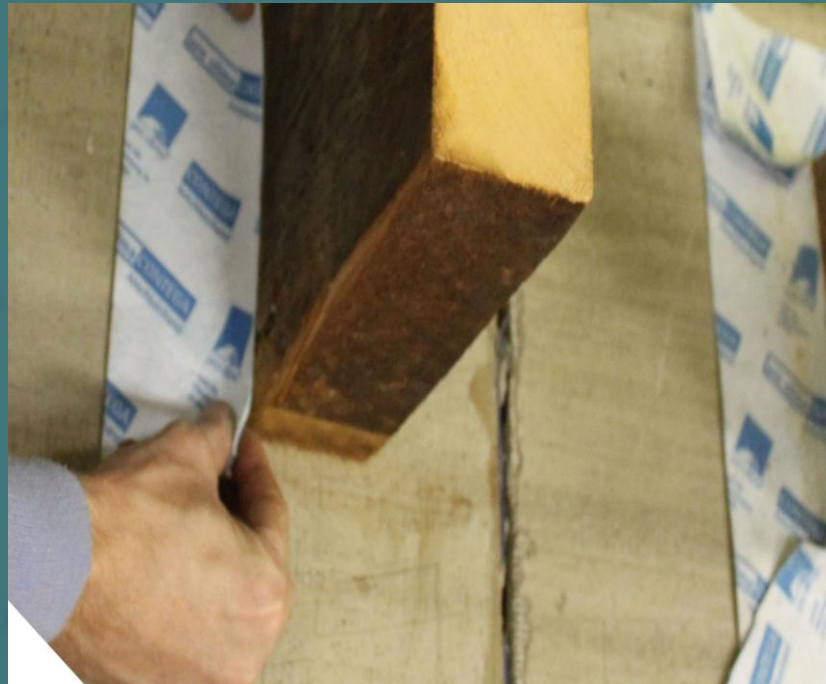
Making connections



Baseboard Electrical Chase with Strawcell wall



Romex wire is placed behind groove in baseboard above. Outlets are fixed in place for easy wiring. Baseboard pieces between outlets are removable to run wires. Switches are run up door trim and placed in wood boxes attached to the side of trim. **Design profile to be determined.**



F*#M-FREE ETC.

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New Frameworks
Natural Design Build

Hempcrete - Hemp and Lime

Cast or spray insulation - R-3/in

Flexible install, cures hard

Ultra-low CO₂e / C-negative

Moisture-durable, vapor open

Fire retardant, no chemicals

Floors, walls, roofs, foundations



Foam-Free High-Performance Door

Passive House-Level Specs

Glazing and Door

Native wood, Mineral Board

Cork available for lower weight



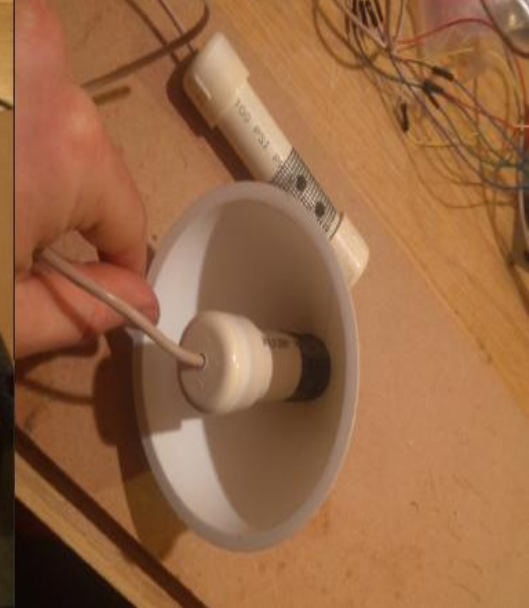
SmartWand Building Monitor

FEATURES:

In-Assembly Temperature
and RH Sensors
Automated Cloud Storage
Visualization and Analysis
Support for add'l sensors
(i.e. VOCs, CO)

USES:

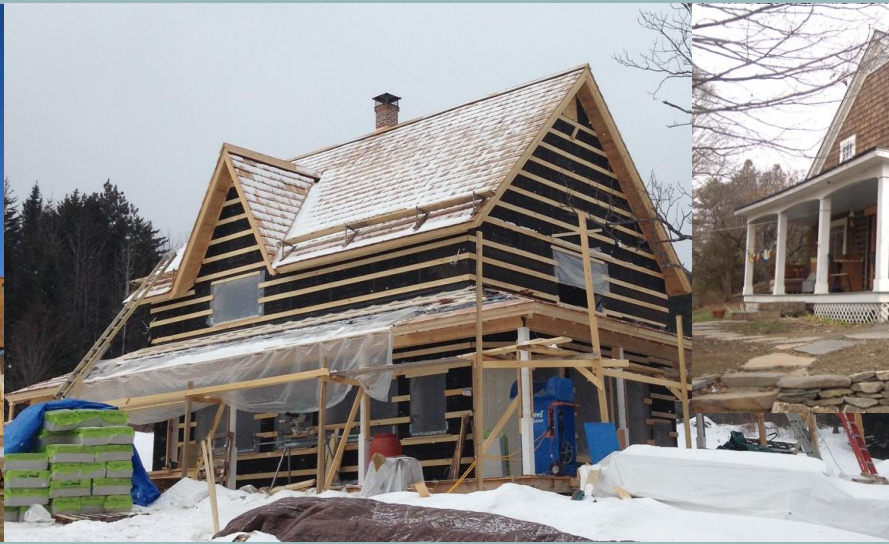
Proof-of-concept for
innovative
assemblies
Research and development
Quality control/assurance
Marketing and promotion



SUPER-INSULATED AND....



Picture of Wayl



COMPLETELY FOAM-FREE!



photo by Chris Jordan: "midway: message from the gyre" series <http://www.chrisjordan.com/>

“Whether we and our politicians know it or not, Nature is party to all our deals and decisions, and she has more votes, a longer memory, and a sterner sense of justice than we do.”

Wendell Berry

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