

Passive House Northwest

AIA CEU Provider

DeCarbonize Your Passive House

AIA Course # phnw075

Andrew Michler

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Course Description

As our building become much more efficient the importance of what we build with becomes a core design consideration. The emerging understanding of the impact of materiality in construction, while still imprecise has a deep and lasting environmental impact. The carbon footprint of a conventional building may be an important but small percentage of its lifetime impact, with Passive House the environmental impact of materials can notably go up as the energy consumption goes down. This is a particularly salient objective when investing in fabric first design and the resulting demand for more raw materials.

Learning Objectives

At the end of the this course, participants will be able to:

1. Identify the lifecycle cost and GWP of insulation and other construction materials in a high performance envelope.
2. Implement at building methodologies which incorporate low impact materials in a high performance envelope.
3. Understand how materials like cellulose, rock wool and alternative insulations improve the vapor profile and thermal mass of a high performance envelope.
4. Understand why it is important to incorporate low GWP materials to achieve immediate environmental impact.

YOU LIVE IN GIRLY HOUSE

A meme featuring two men from the British sitcom 'Blackadder', specifically the characters Edmund and Melchior. They are dressed in their iconic grey sweaters and white gloves, pointing directly at the viewer with stern, commanding expressions. The background is a simple blue studio backdrop.

YA, YOU NEED TO LIVE IN PASSIVHAUS

Passive House is extreme body training for our buildings

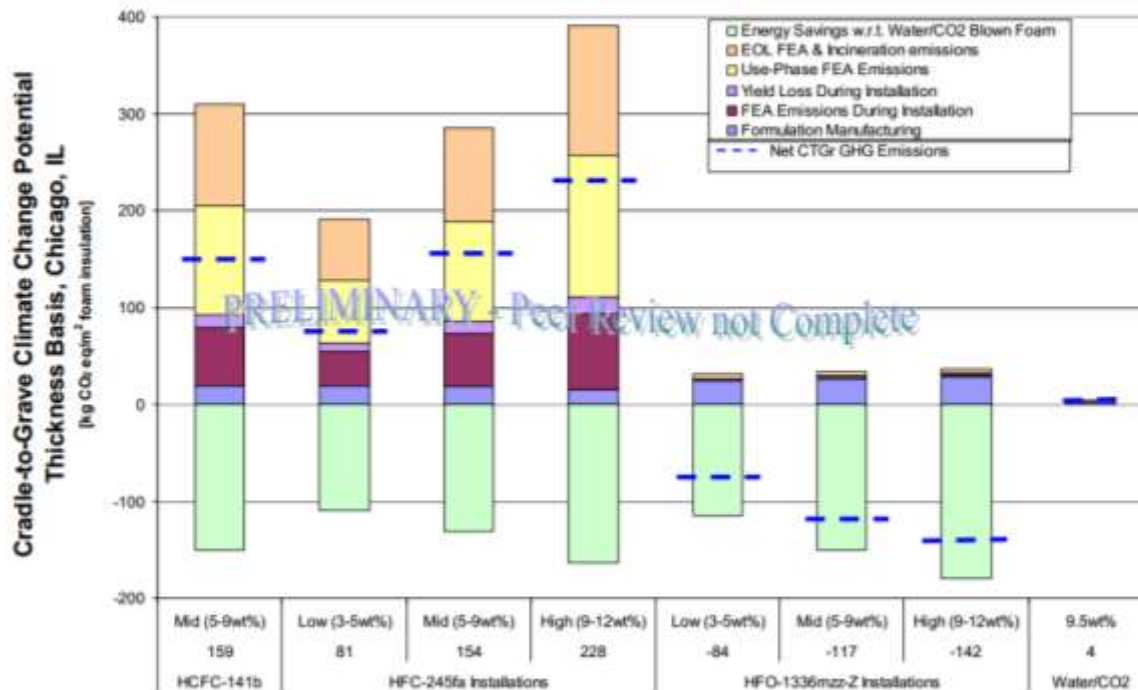
If it is like
performance
training.



Why would we eat junk food?

Starting from way behind the line

Cradle-to-Grave Results: Lifecycle GHG for 5.5" Basis - Chicago



Increasing FEA results in higher energy savings and lower overall Climate Change Potential (CCP)



INGREDIENTS: ENRICHED BLEACHED WHEAT FLOUR [FLOUR, FERROUS SULFATE, "B" VITAMINS (NIACIN, THIAMINE MONONITRATE (B1), RIBOFLAVIN (B2), FOLIC ACID)], SUGAR, CORN SYRUP, WATER, HIGH FRUCTOSE CORN SYRUP, PARTIALLY HYDROGENATED VEGETABLE SHORTENING (CONTAINS ONE OR MORE OF: SOYBEAN, CANOLA OR PALM OIL), DEXTROSE, WHOLE EGGS. CONTAINS 2% OR LESS OF: MODIFIED CORNSTARCH, CELLULOSE GUM, WHEY, LEAVENINGS (SODIUM ACID PYROPHOSPHATE, BAKING SODA, MONOCALCIUM PHOSPHATE), SALT, CORNSTARCH, CORN FLOUR, CORN DEXTRINS, MONO AND DIGLYCERIDES, POLYSORBATE 60, SOY LECITHIN, NATURAL AND ARTIFICIAL FLAVORS, SOY PROTEIN ISOLATE, SODIUM STEAROYL LACTYLATE, SODIUM AND CALCIUM CASEINATE, CALCIUM SULFATE, SORBIC ACID (TO RETAIN FRESHNESS), COLOR ADDED (YELLOW 5, RED 40). MAY CONTAIN PEANUTS OR TRACES OF PEANUTS.

Twinkie ingredients

Du-Pont spray foam comparison chart

Embodied energy MJ/Kg

| | |
|--------------------|-------------|
| Cellulose | 0.94 to 3.3 |
| Cork | 2 |
| Mineral wool | 16.60 |
| Fiberglass | 28.00 |
| EPS | 88.60 |
| XPS | 80 (approx) |
| Spray Polyurethane | 101.50 |

Comparable BTU

R-20 insulation covering one square foot:

Cellulose 200-600 BTU

Mineral wool 2,980 BTU

Fiberglass 4,550 BTU

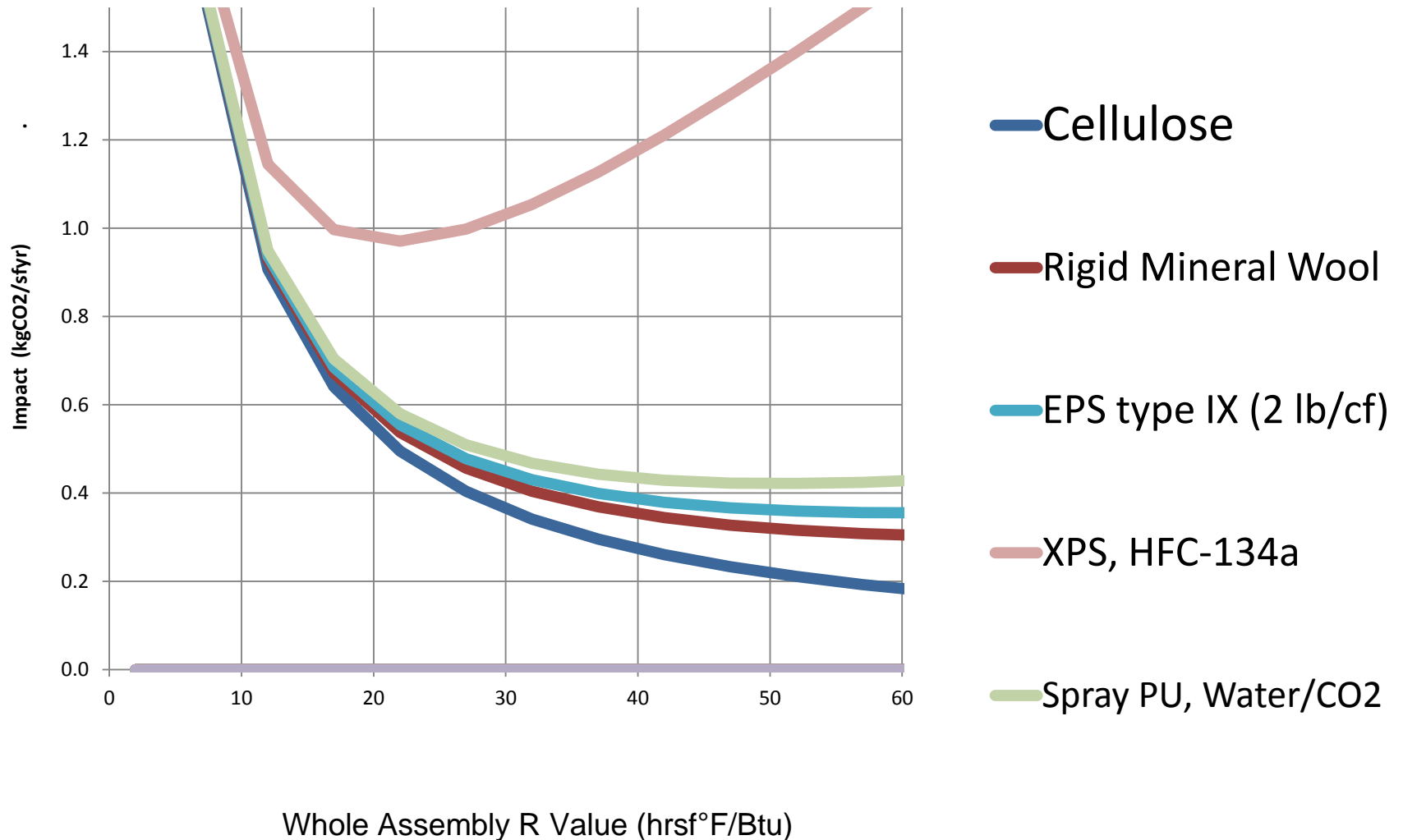
Polyisocyanurate 14,300 BTU GWP 8x co2

XPS 16,000 BTU GWP up to 1430x co2

EPS 18,000 BTU GWP 7x co2

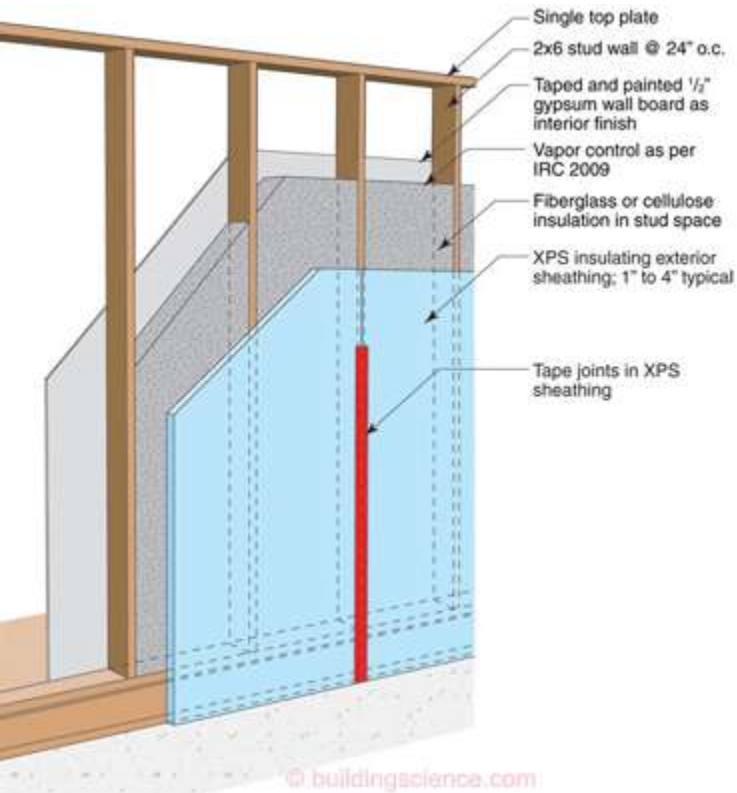
Global Warming Potential

Climatic Impact of Energy Use + Embodied GWP

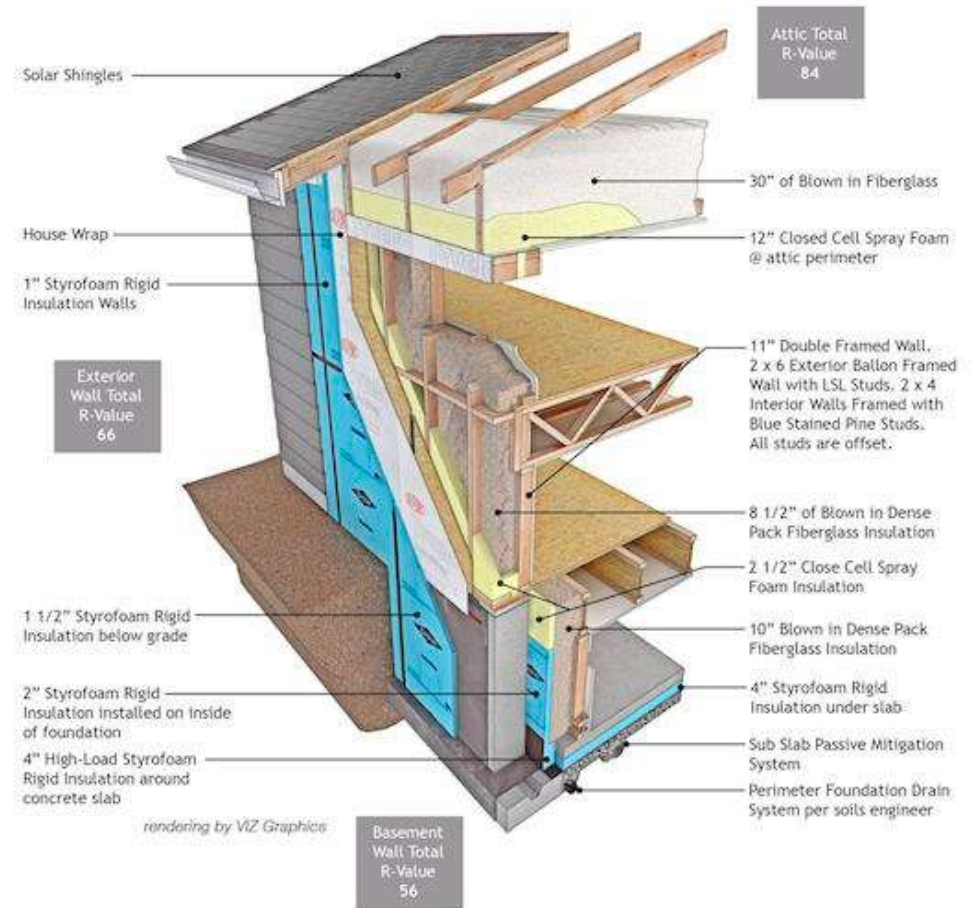




Flabby House

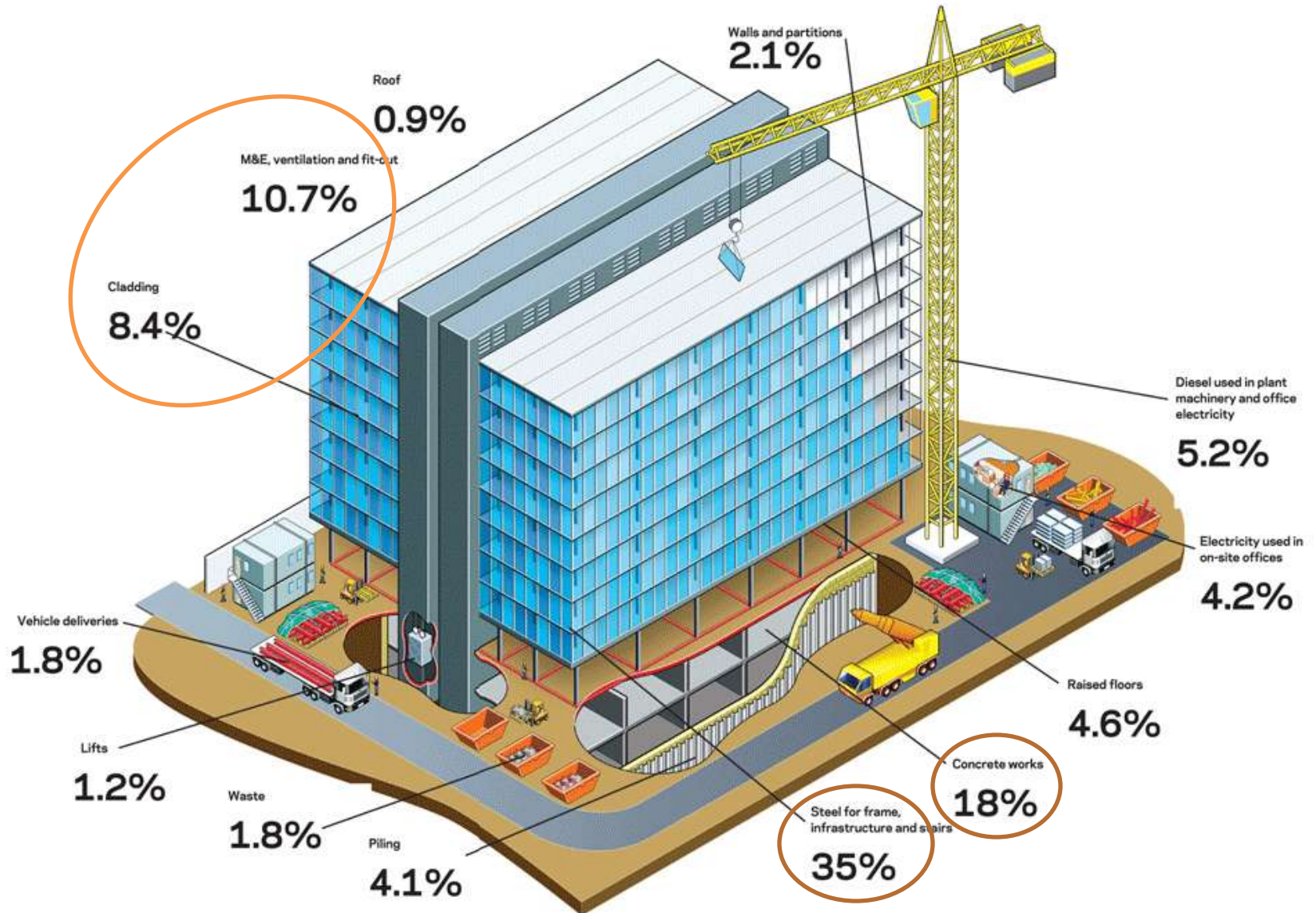


The pretty good wall becomes...



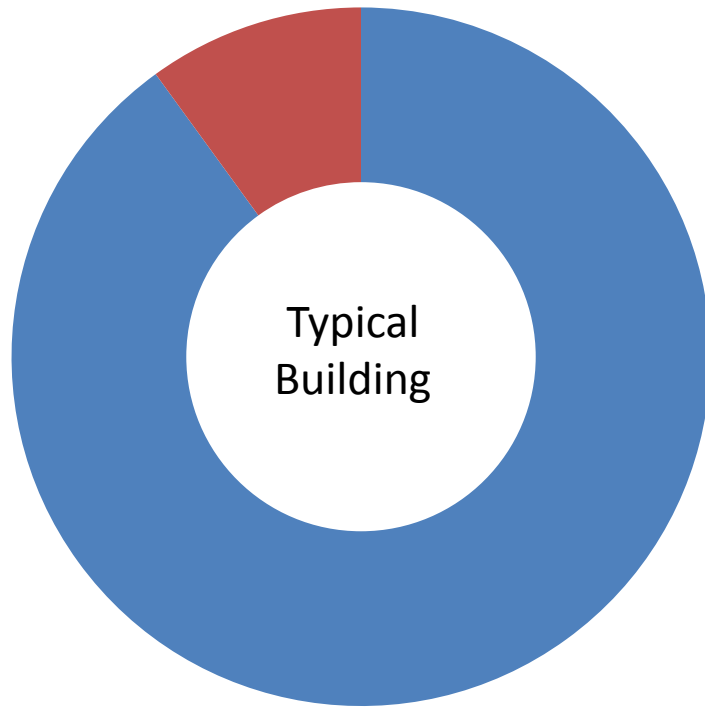
A no good at all wall when you push it too hard.
 Brookfield Residential Midtown Residence Eight

CO2 MAKES ITS GETAWAY

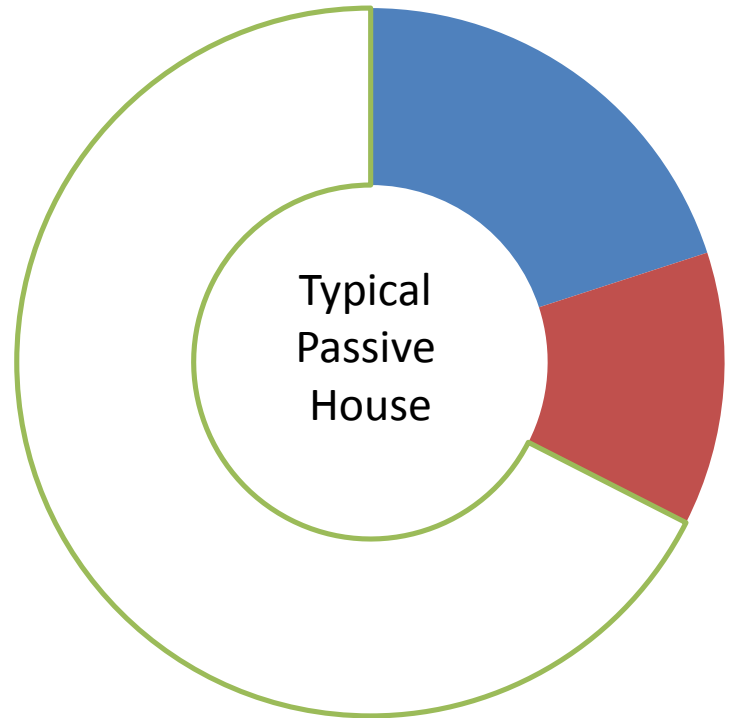


Energy Consumption of a Building

Use Period of 60 years



Operational Energy
Sometime in the future



Embodied Energy
Emissions right now

So, Umm, Where is the finish line?



Andrew Michler @AndrewMichler

26 Jan

@WolfgangFeist @475ken @styrohome if goal is to provide very low GWP shelter why begin from way behind start line?



Wolfgang Feist

@WolfgangFeist

 Follow

@AndrewMichler @475ken @styrohome ??whats the problem?grey energy?thats not of any importance with building materials (unless you use CFC)

8:14 AM - 26 Jan 2015

1 RETWEET



Path to addressing Climate Change

Return to 350 PPM CO₂

Buildings are 48% of total US CO₂ emissions yearly.
(42% energy, 6% materials)

We will build out or rebuild 75% of the built environment by 2035.

In 15 years *half* our annual CO₂ from buildings
will be from embodied energy as we improve EE.

*Architecture 2030

This race is as much a sprint
as it is a marathon.

RECarbonize Your Passive House



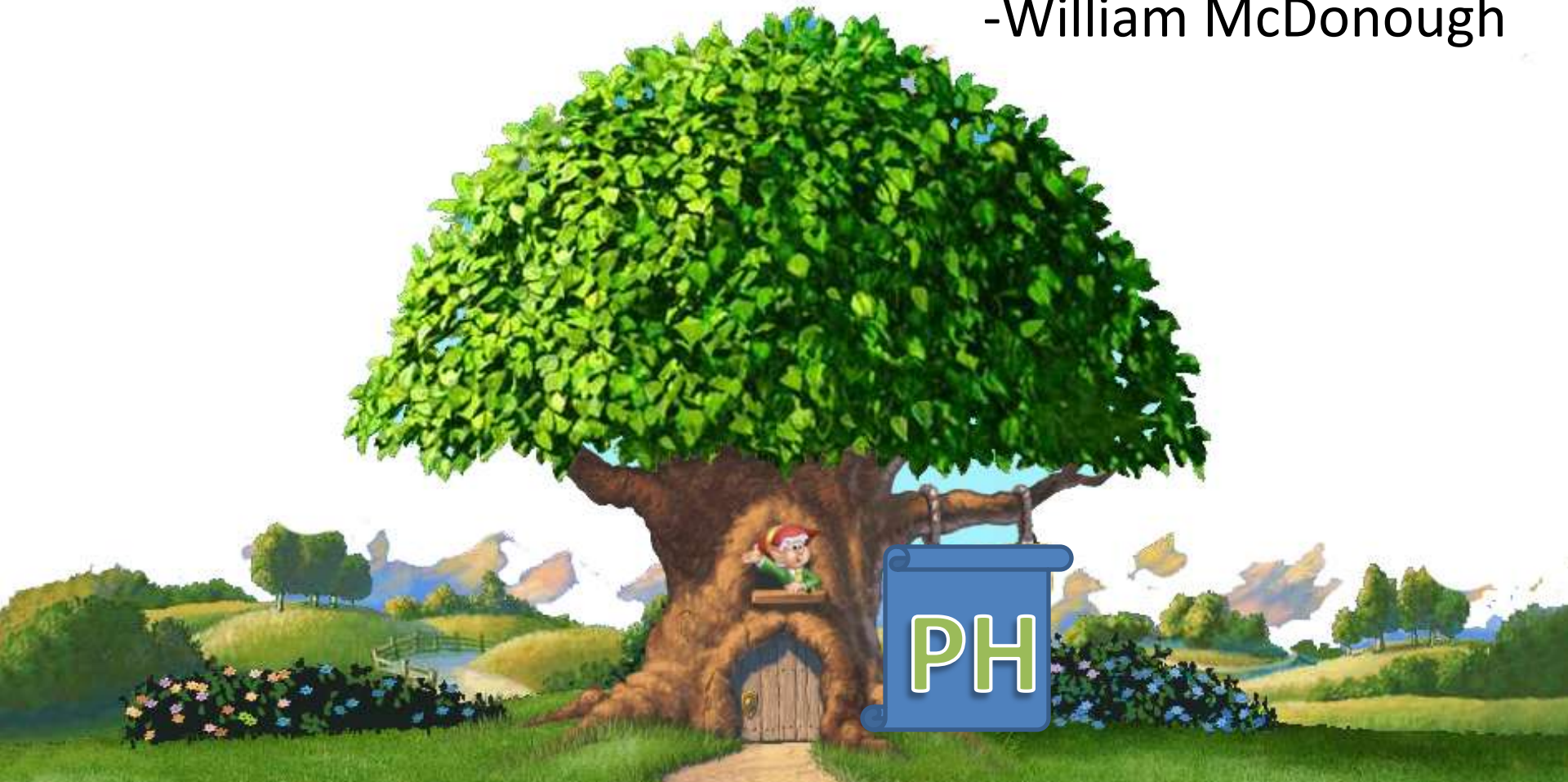
“Carbon is not an energy problem.

It’s a materials problem.

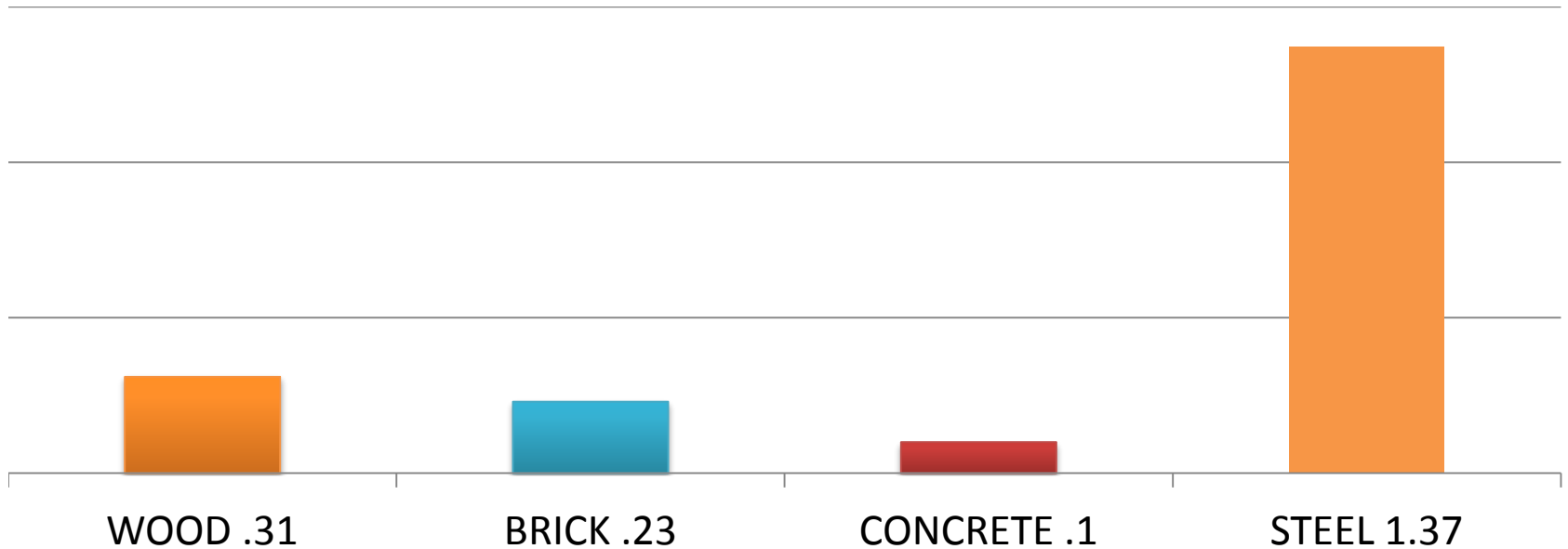
We have it in the wrong place which is the atmosphere.

We need it where it is useful for us.”

-William McDonough



Embodied Carbon kgCO₂/kg in manufacture (*by weight which is not how applied in field)



WHY Build with Wood?

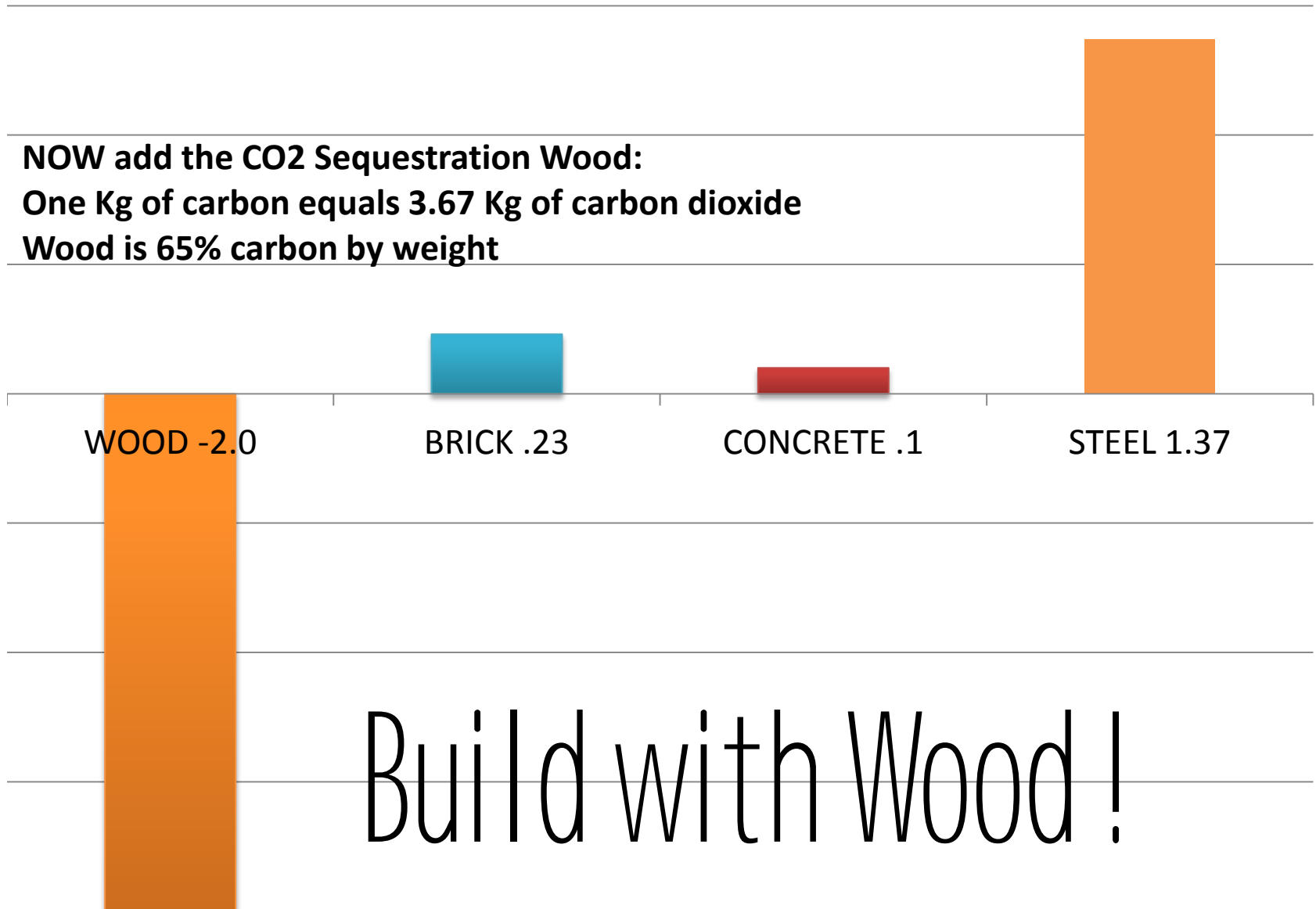
Source: Inventory of Carbon & Energy (ICE) Version 2.0

Embodied Carbon kgCO₂/kg in manufacture (*by weight which is not how applied in field)

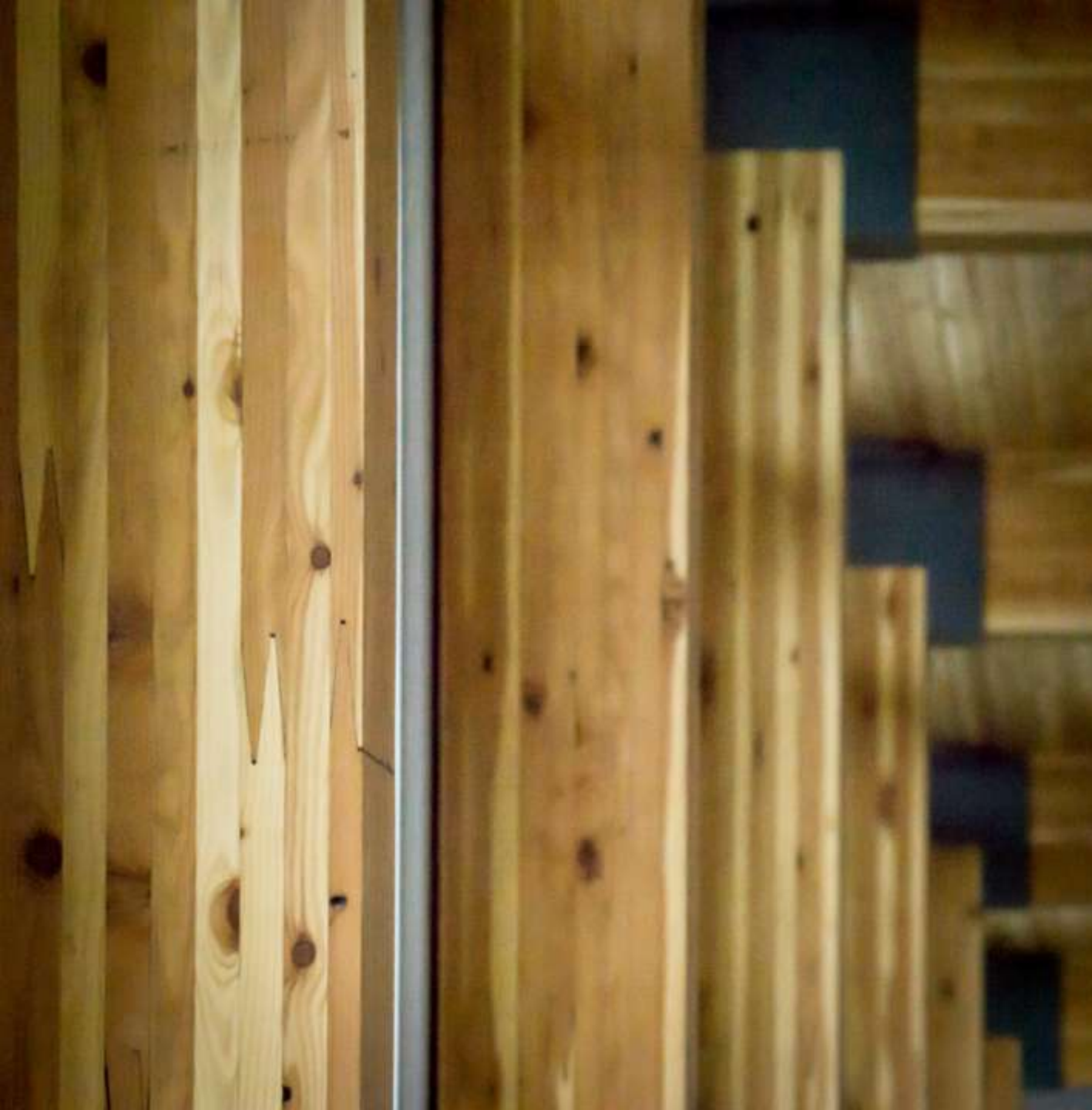
NOW add the CO₂ Sequestration Wood:

One Kg of carbon equals 3.67 Kg of carbon dioxide

Wood is 65% carbon by weight

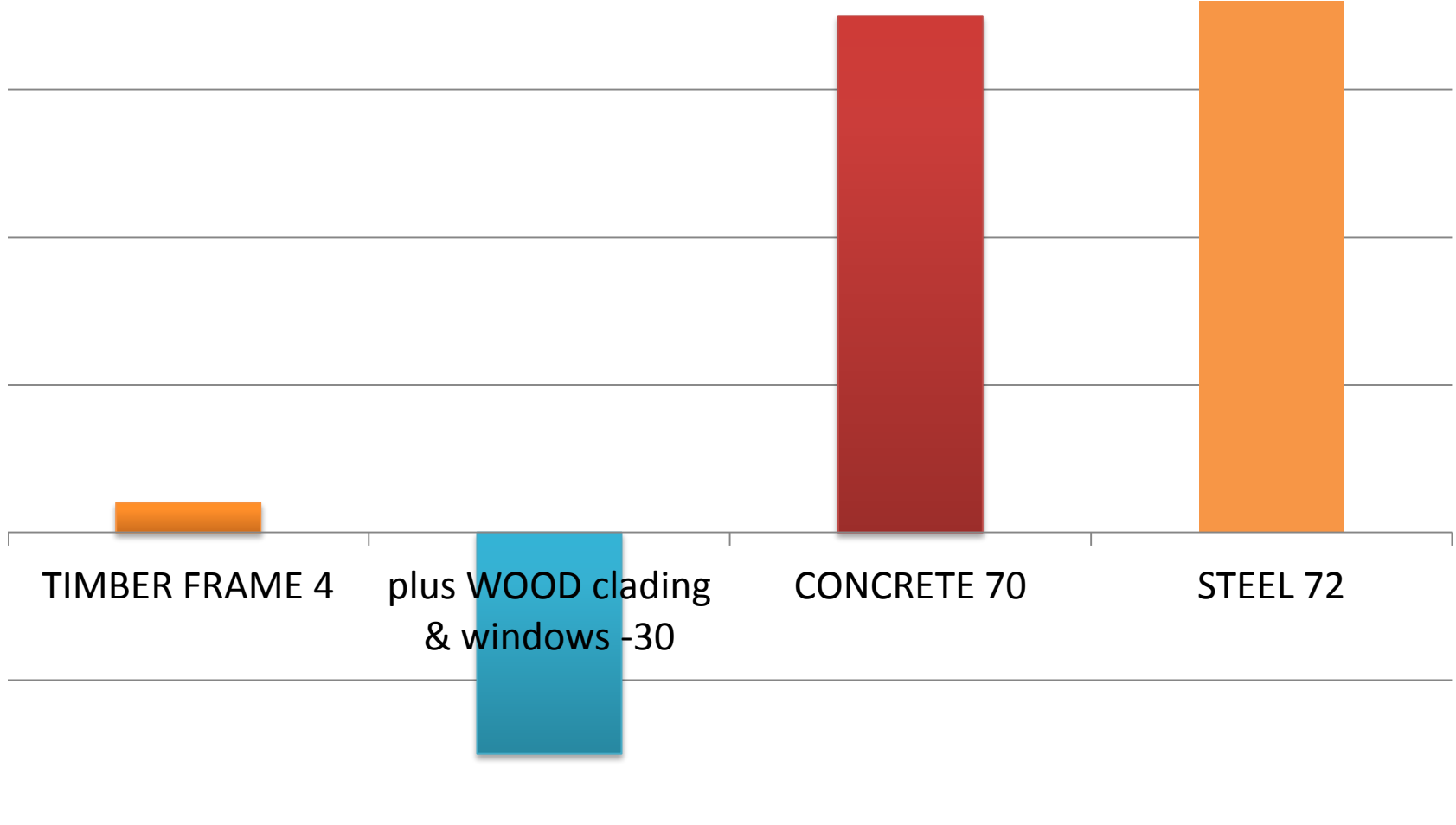


Build with Wood !



Wood is 65%
carbon by
weight which
is great.
But even
better
it offsets
other
structural
materials.

CO2 per building area in tons





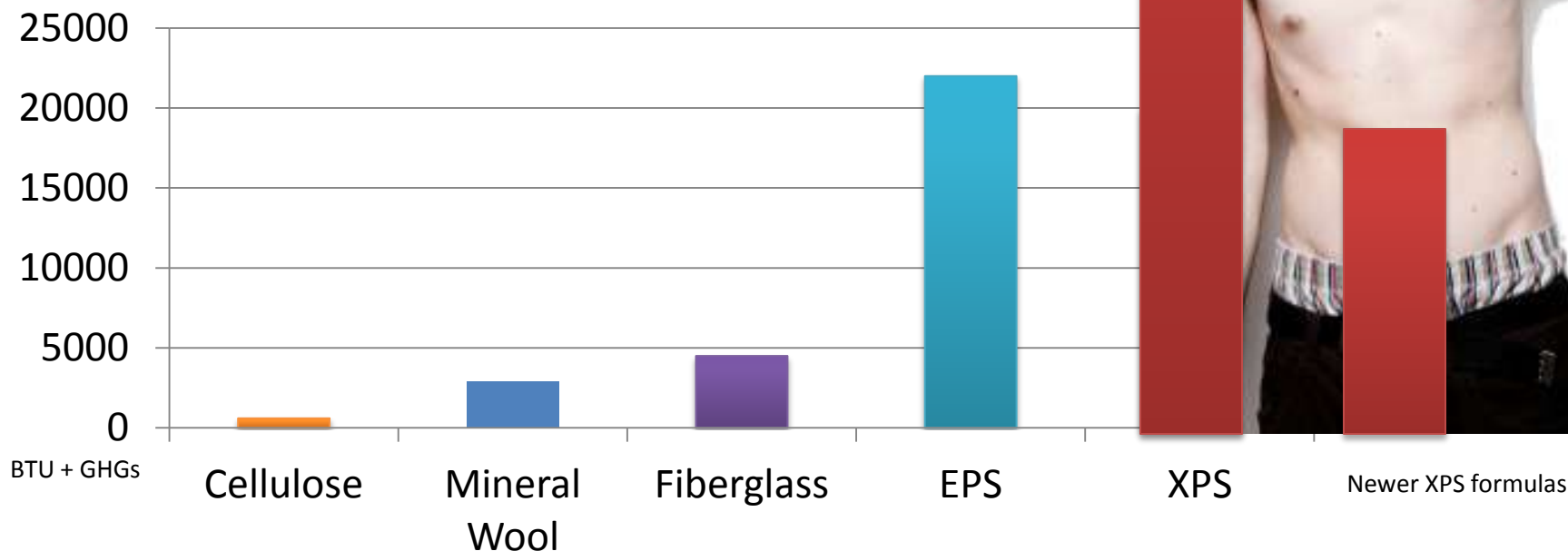
Bullitt Center

Seattle

Cree Buildings
Massive Wood Office Building:
Life Cycle Tower One
Passive House Tower



Insulate With Cellulose Then Mineral Wool, and fiberglass if you have to (Really, fiberglass?)



*XPS ~134
Rocks it man!
GWP of 1400 for
8 years dude!*



Foamless 1.0

2x4 or 2x6 typical construction

OSB or CDX taped

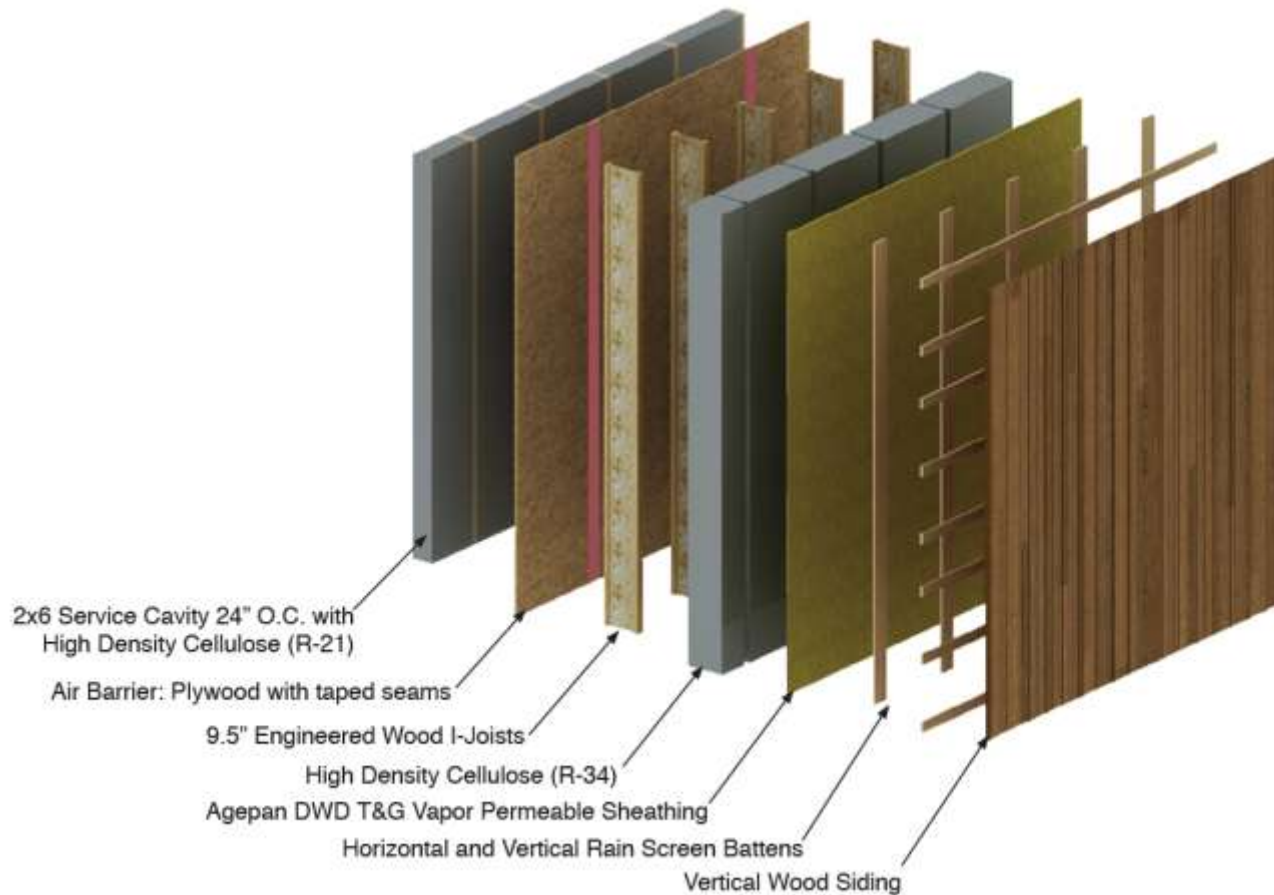
Larson truss or I-joist

Mineral wool or Wood fiber

Purlins

Siding

Hammer and Hand Pumpkin Ridge Passive House



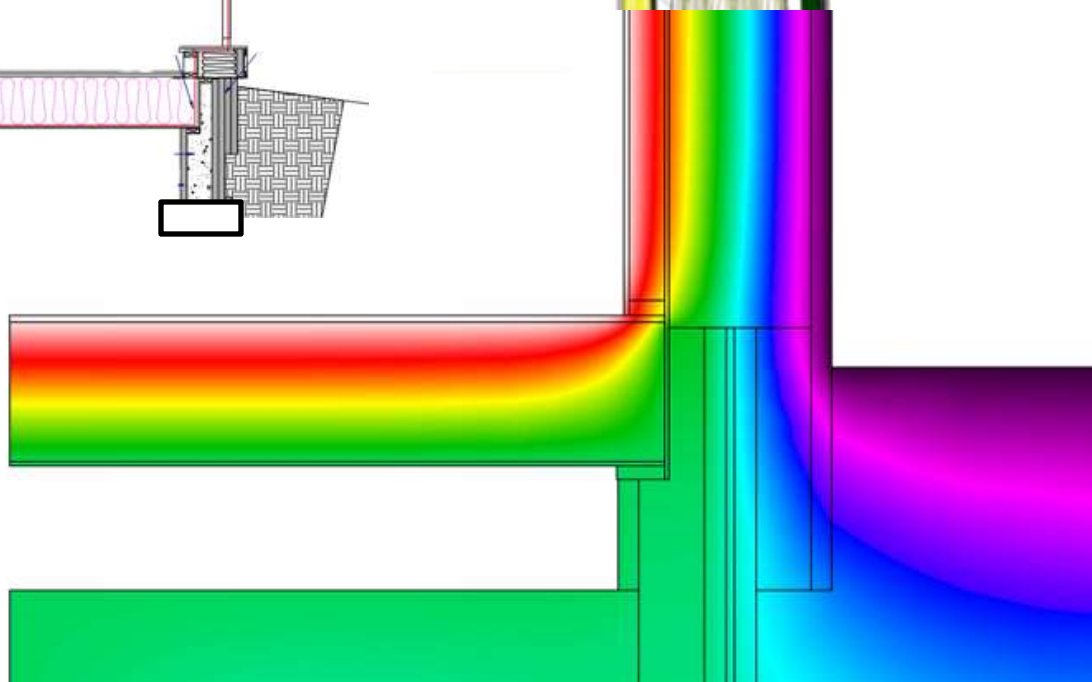
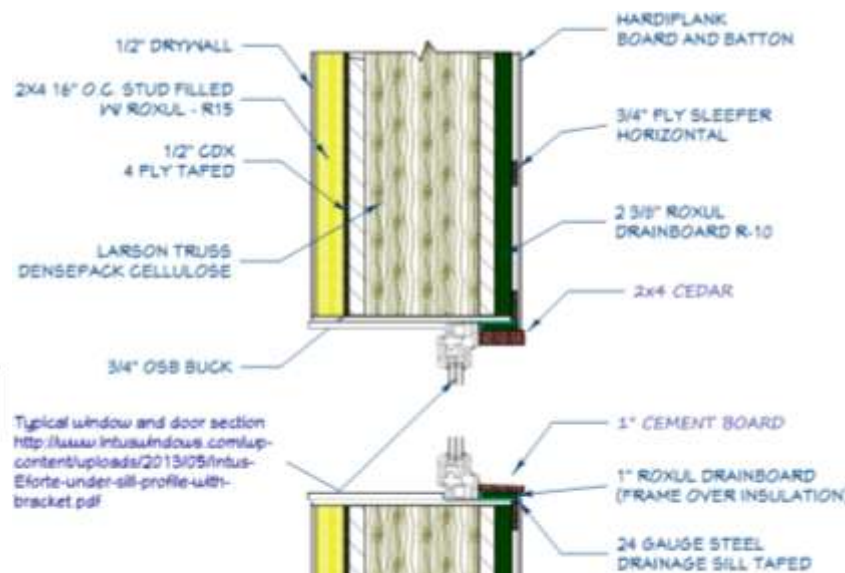
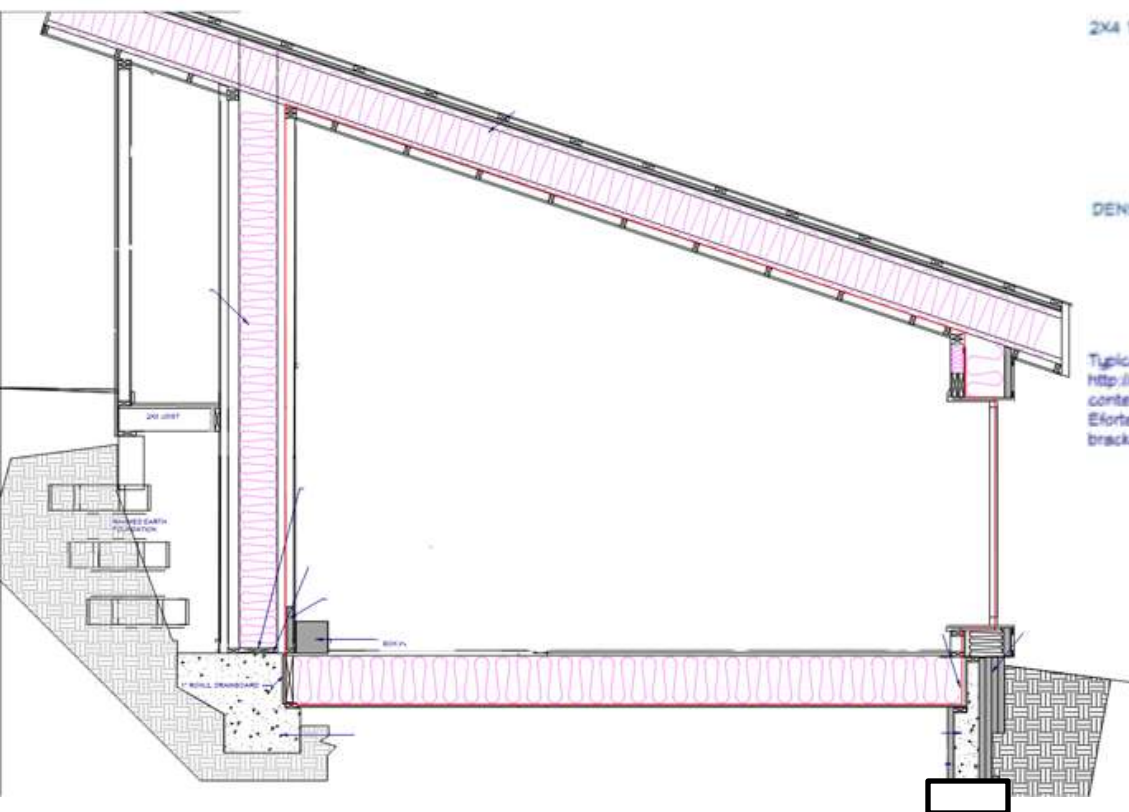


Home Sweet home

MARTaK Work/Live
aiming for Passive House
Plus certification

Starts with FOAM-LESS-NESS

















Roof is 2x4+3/4 ply (overhang)

Mineral wool batt

OSB roof deck vented from below

30lbs organic felt

Steel roof for rain catchment





1160 bags
29,000 lbs
That's a 25 lbs bag
per square foot



I s t h i s a
P a s s i v e H o u s e ?



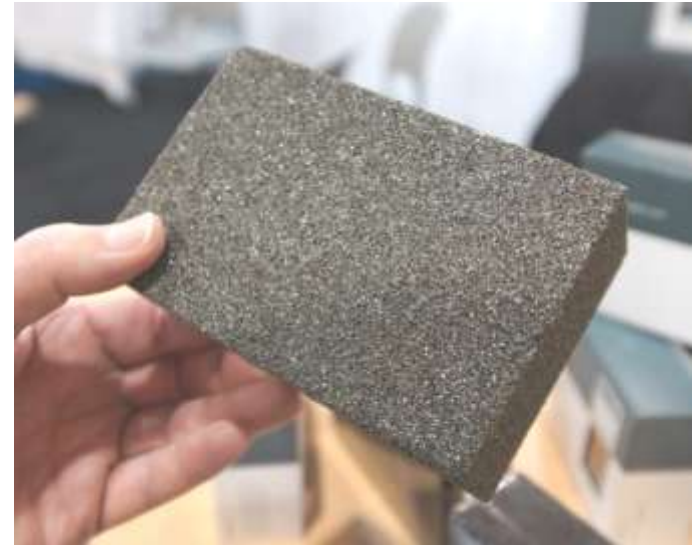
Donohoe Foam Free Passive House



carbonPH 2.0



Tool kit 2.0



Straw 2.0



Creatererra design using Ecocono Panels

Aeron Chair

Herman Miller
7 million produced



Chairs at the time were mainly foam; foam was a huge part of their cost. Without it, the chair's economics would change radically.

"The chair plant was filled with foam hanging from the ceiling and curing in the open air, everywhere you looked. It smelled horrible," says Gary Miller. "You had to wonder, 'Where's the end to this? How can this scale?'"

"Green wasn't an issue at the time," says Don Chadwick. "But instinctively, we felt the importance of getting more performance from less materials."

-Fast Company Design

U P N E X T

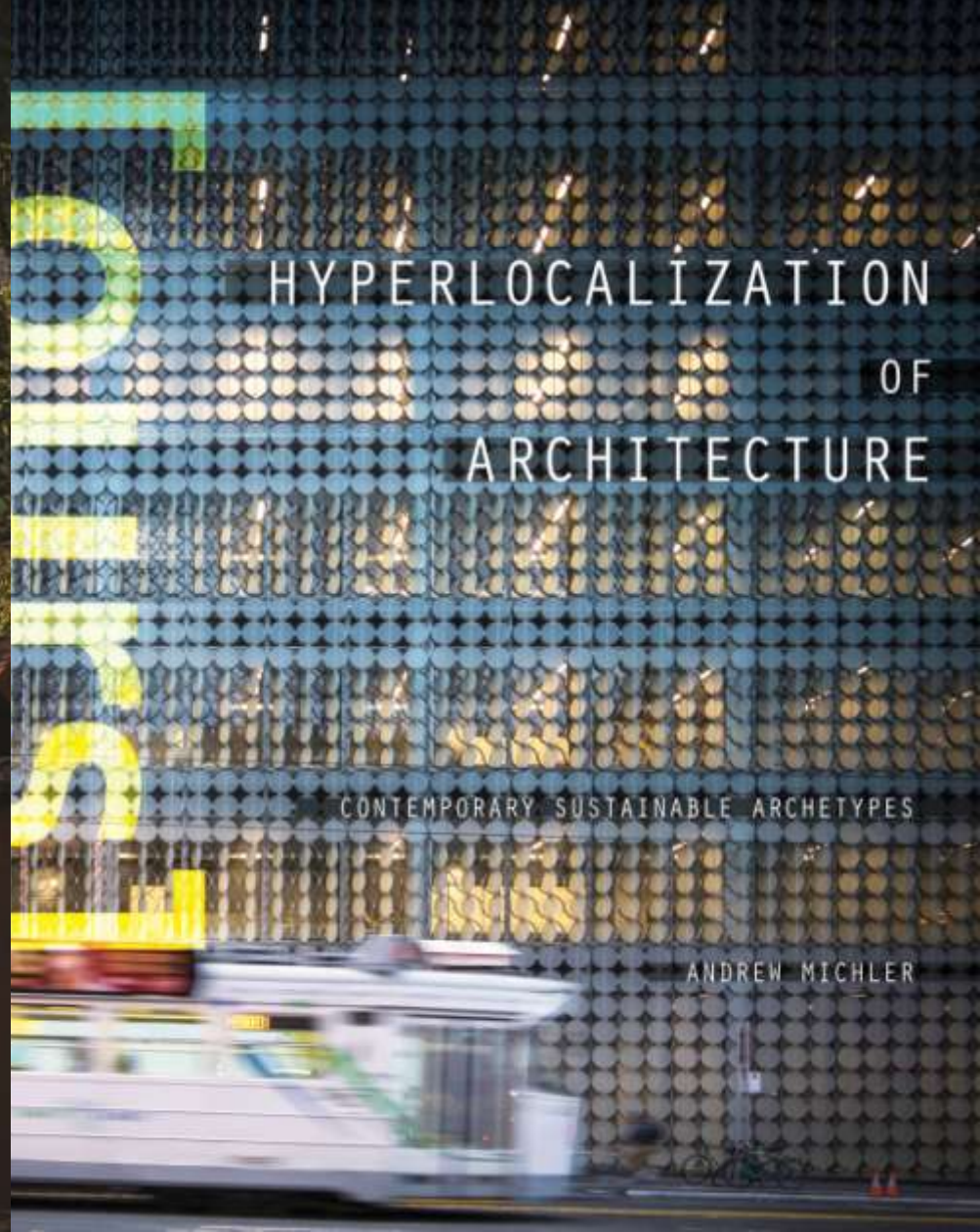
KEN LEVENSON : Toward Safe and Natural High-Performance Enclosures

Program Description: There is a growing demand for building materials that meet low-energy goals while maintaining the health, safety, and wellness of building occupants for the life the building. Many products going into high performance and Passive House buildings today are falling short: particularly spray foam.

This presentation will cover the basic building science of high performance enclosures. A wide range of material options such as wood fiberboard, sheathings, membranes, mineral wool, straw bale, cellulose and other insulations will be considered. Airtightness goals will be analyzed, looking at ground, wall, and roof conditions as well as the design, construction, and testing of the assemblies.

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[andrew@baosol . com](mailto:andrew@baosol.com)

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