

# LEED vs LBC vs Passive House vs Low/Zero Carbon vs WELL



LBC

PH

CARBON

WELL

ADVOCACY

WATER

SITE

LOCATION +  
TRANSPORTATION

INDOOR  
ENVIRONMENTAL  
QUALITY

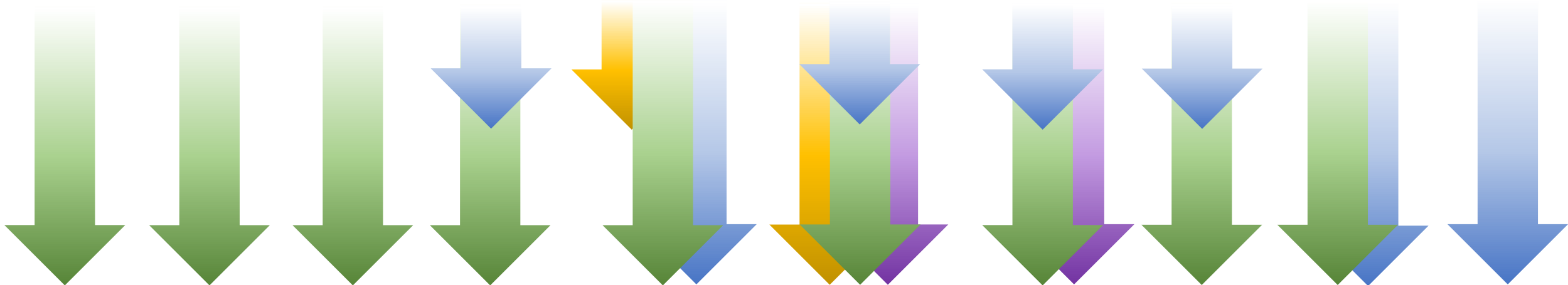
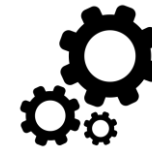
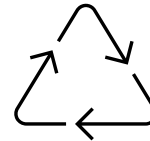
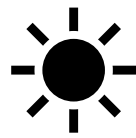
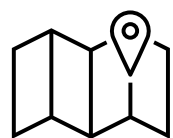
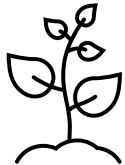
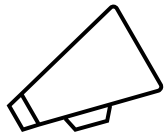
ENERGY &  
ATMOSPHERE

MATERIALS

INTEGRATIVE  
PROCESS

COMMUNITY  
+ EQUITY

HEALTH +  
WELLBEING





INTERNATIONAL  
**WELL**  
BUILDING  
INSTITUTE™

Mission:  
To improve human health and wellbeing  
through the built environment.



# WATER

Focus on water quality and the distribution and control of liquid water in a building. Addresses:

- quality of and access to drinking water
- water management to avoid damage to building materials and environmental conditions



# NOURISHMENT

Make fruits and vegetables and nutritional transparency available.

Encourage the creation of food environments, where the healthiest choice is the easiest choice.

2700K

4600K

6500K

4600K

2700K

# LIGHT



Promote exposure to light and create lighting environments that promote visual, mental, and biological health.

High Awareness

Drop in Awareness

6 AM

7 AM

8 AM

9 AM

10 AM

11 AM

12 PM

1 PM

2 PM

3 PM

4 PM

5 PM

6 PM



# MOVEMENT

Integrate movement opportunities into the culture of buildings and communities. Promote physical activity through:

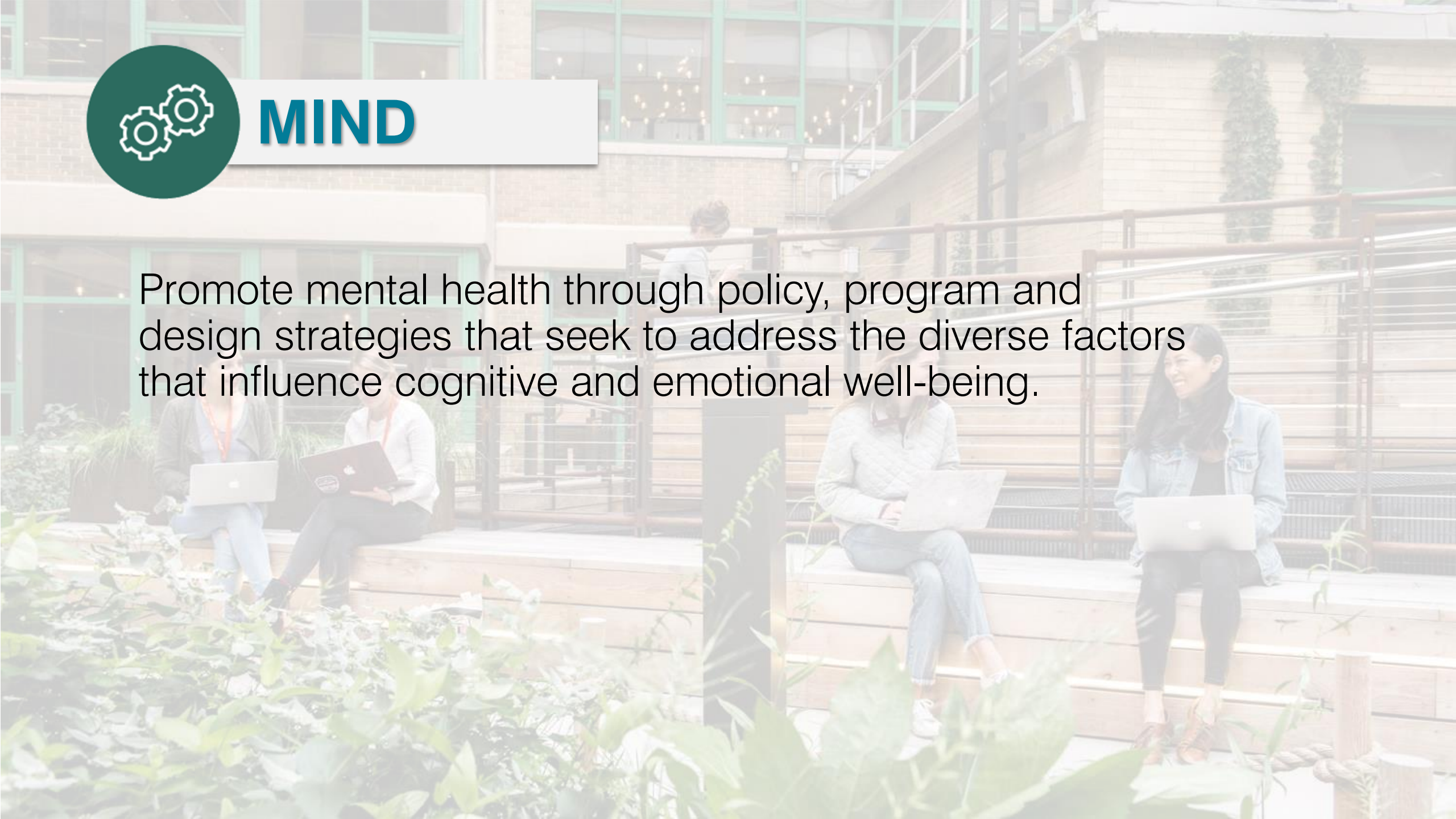
- design
- policies
- programs





# MIND

Promote mental health through policy, program and design strategies that seek to address the diverse factors that influence cognitive and emotional well-being.



# Contact us:



**Sangeetha Sambandam**

WRT

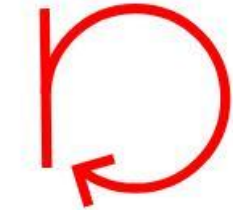
[ssambandam@wrtdesign.com](mailto:ssambandam@wrtdesign.com)



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**Christina Aßmann**

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# Resources:

Nuthatch Hollow

<https://tinyurl.com/4aajau7e>

Passive House Podcast

<https://tinyurl.com/d23ekky>

Spaghetti Carbon-Era

<https://tinyurl.com/muhyrwp8>



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**Kristie Broussard**

Re:Vision Architecture

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# VILLAGE AT PARK RIVER

A multiphase, multifamily affordable housing project transforming a neighborhood in Hartford, Connecticut

# TRANSFORMATION OF A NEIGHBORHOOD



SITE PRIOR DEMO



PHASE 1 & 2 - IN CONSTRUCTION

## Westbrook Village:

- 40-acre former public housing site

## Village at Park River:

- 432 units
- Multiphase - 8 phases
- Multifamily
- Mixed Income Housing
- Mixed-use Community
- Re-establishment of premier gateway into the City

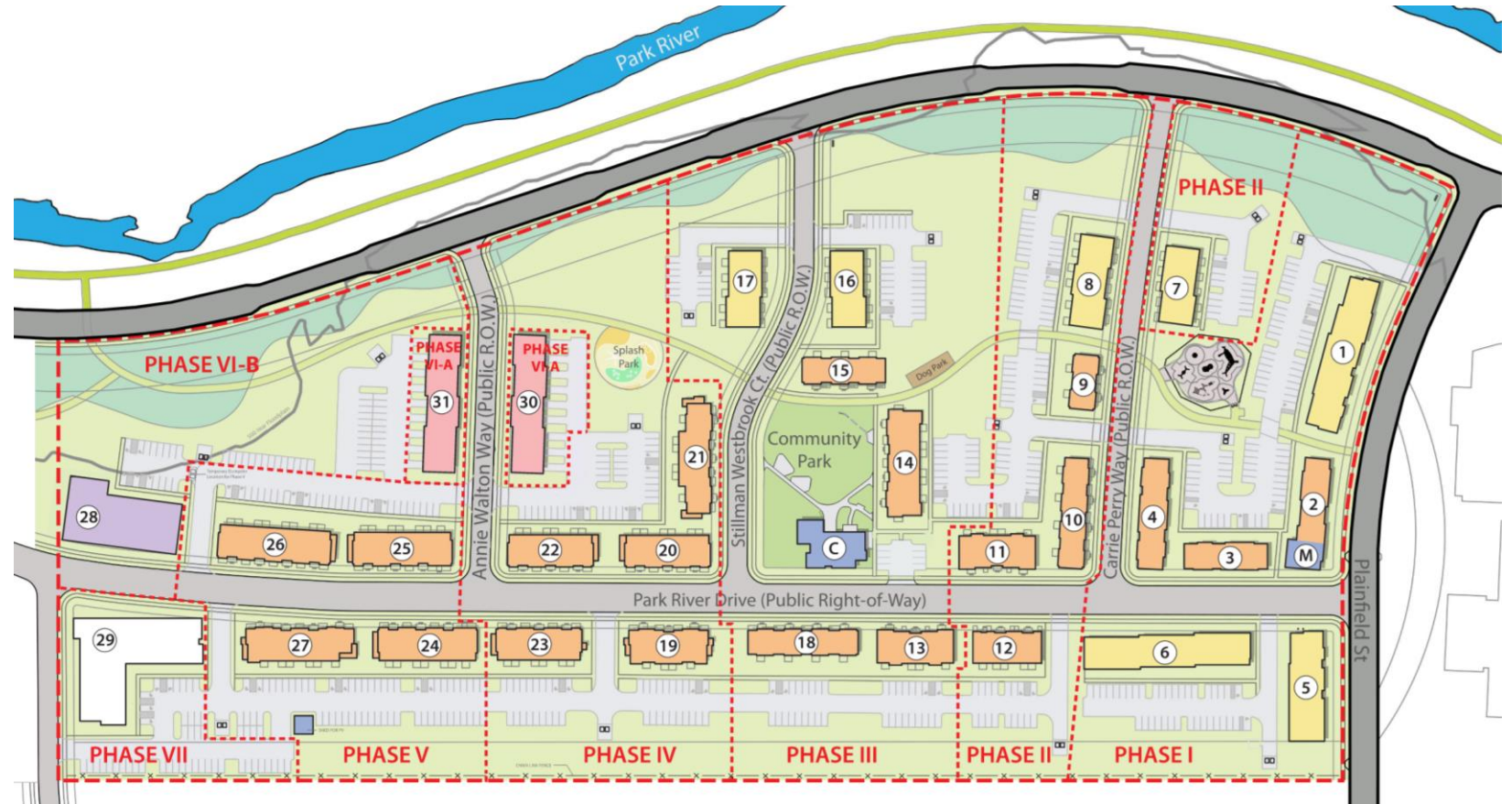
# MULTIPHASE - MULTIFAMILY - MIXED INCOME HOUSING

PHASE	1 BR	2 BR	3 BR	Total
I	28 37%	32 43%	15 20%	75
II	29 48%	24 40%	7 12%	60
III	26 40%	31 48%	8 12%	65
IV	24 40%	29 48%	7 12%	60
V	26 45%	24 41%	8 14%	58

PH 1: LIHTC AWARDED - CONSTRUCTION COMPLETED - FULLY OCCUPIED - CERTIFIED TO PHI STANDARDS  
 PH 2: LIHTC AWARDED - CONSTRUCTION COMPLETED - FULLY OCCUPIED - CERTIFICATION IN PROCESS TO MEET PHIUS+ 2015  
 PH 3: LIHTC AWARDED - IN CONSTRUCTION - TO BE COMPLETED - SPRING 2022 - PRE-CERTIFIED TO PHI STANDARDS  
 PH 4: LIHTC AWARDED - CONSTRUCTION TO BREAK GROUND - FALL 2021 - TO BE CERTIFIED TO PHI STANDARDS  
 PH 5: LIHTC APPLICATION IN PROCESS - TO BE SUBMITTED - JAN 2022 - PHIUS CORE 2021 OR PHI - TBD

**LEGEND**

- - - Site Boundary
- - - MDC Property
- - - Road Connection
- Railway
- - - Stormwater Pipe
- - - Building Setbacks
- Right of Way
- Bike/Pedestrian Trail
- Home Ownership
- 3-Story Row Bldg Rental
- 2-Story Row Bldg Rental
- Apartment Bldg
- Management / Community Space
- Commercial Space
- Public Rail Station
- Green Infrastructure
- Open Space



# LIHTC (LOW INCOME HOUSING TAX CREDIT) PUBLIC FUNDING FOR PASSIVE HOUSE DESIGN IN CONNECTICUT

CHFA QAP: Sustainability Design Measures - New Construction	Points
<i>Benchmarking with EPA's Energy Star Portfolio Manager is a prerequisite for all Sustainability points</i>	
<b>Energy Conservation</b>	<b>2-4</b>
Prerequisites: DOE Zero Energy Ready Home Certification AND Balanced ventilation	
<b>Tier 1</b> Average HERS Index ≤50; OR Average % below ENERGY STAR Target Index ≥15%	2
<b>Tier 2</b> Average HERS Index ≤46; OR Average % below ENERGY STAR Target Index ≥25%	3
<b>Tier 3</b> Average HERS Index ≤42; OR Average % below ENERGY STAR Target Index ≥35%; OR Passive House; OR International Living Future Institute (ILFI) Zero Energy Ready	4
<b>Green Building</b>	<b>2-3</b>
<b>Tier 1</b> Enterprise Green Communities 2020 (EGC 2020); OR National Green Building Standard (NGBS ) Gold; OR Leadership in Energy and Environmental Design (LEED) Gold	2
<b>Tier 2</b> National Green Building Standard (NGBS ) Emerald; OR Leadership in Energy and Environmental Design (LEED) Platinum; OR Living Building Challenge (LBC) Core Ready	3
<b>Renewables, Electrification, and Resiliency</b>	<b>1-3</b>
<b>Tier 1</b> PV system to offset ≥75% of the annual energy demand for site and interior common area lighting.	1
<b>Tier 2</b> PV system to offset ≥90% of the annual energy demand for site and interior common area lighting; AND All-Electric Buildings (excludes backup generator); AND Backup Power to provide resiliency to Critical Systems, Emergency Lighting, and Access to Potable Water	2
<b>Additional Additive Point</b> All-Electric Buildings; AND Battery storage systems or fuel cell to serve as backup power to provide resiliency Critical Systems, Emergency Lighting, and Access to Potable Water	(+1)
<b>Operations and Resiliency</b>	<b>1-2</b>
<b>Tier 1</b> Owner Paid Utilities (to cover usage for- heating, cooling & hot water at a minimum); AND Commissioning	1
<b>Tier 2</b> Owner Paid Utilities (to cover usage for- heating, cooling & hot water at a minimum); AND Commissioning; AND Backup power to resiliency to Critical Systems, Emergency Lighting, and Access to Potable Water	2
<b>Sustainable Development with Digital Literacy and Connectivity</b>	<b>1</b>
High-speed Broadband access to units	1
<b>Total Possible Points</b>	<b>7-13</b>



- 7- 8 month long process
- Requires site control, zoning and all regulatory approvals, tax agreements, etc.
- Coordination with Department of Housing
- 90% drawings with full detailed construction costs with trade
- item breakdowns

FOR MORE INFORMATION:

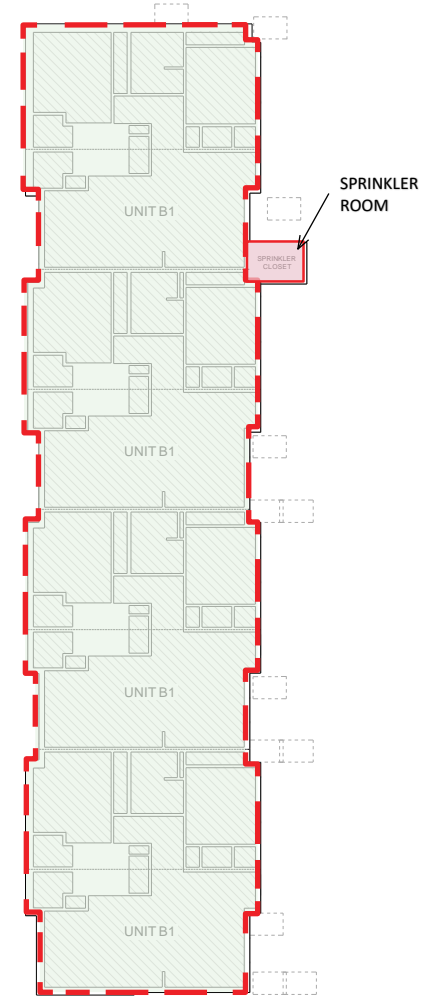
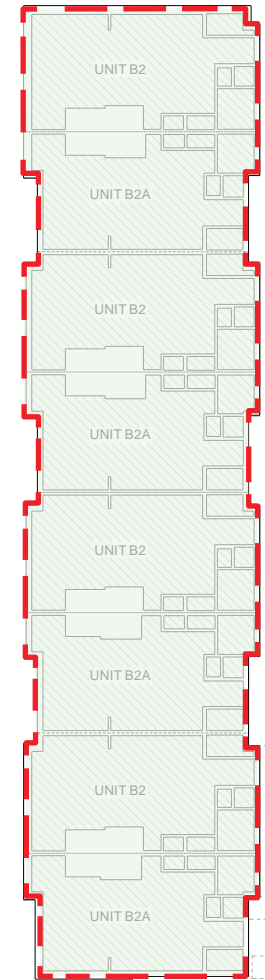
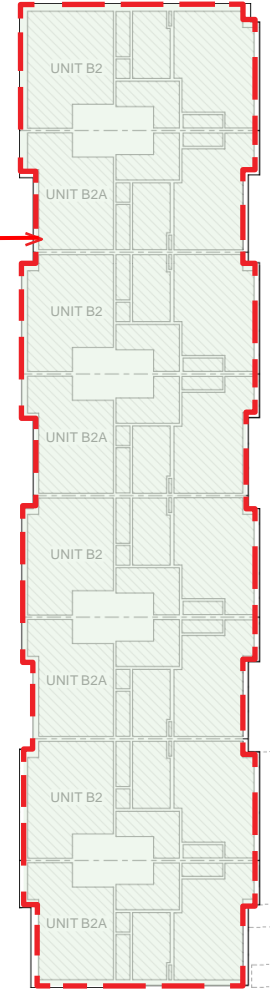
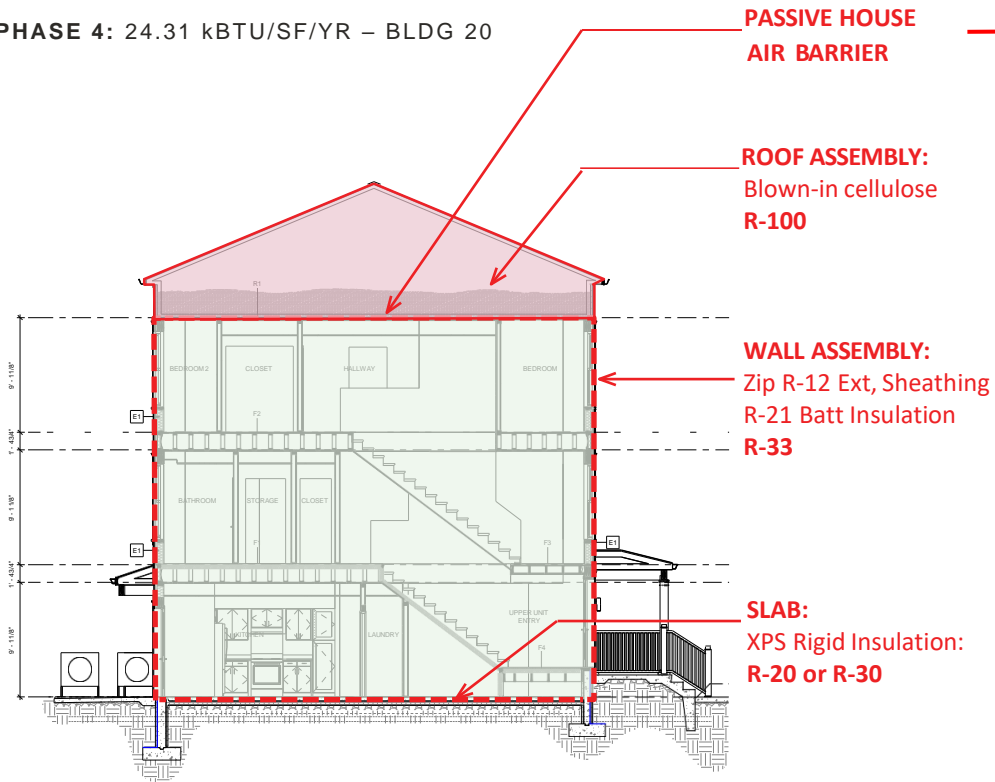
<https://www.chfa.org/developers/tax-credit-program/lihtc/>

# PASSIVE HOUSE - BUILDING ENVELOPE & PREDICTED EUI

**PREDICTED EUI  
WORST CASE PER BUILDING  
IN EACH PHASE**

- PHASE 1:** 22.30 kBTU/SF/YR – BLDG 5
- PHASE 2:** 19.87 kBTU/SF/YR – BLDG 12
- PHASE 3:** 26.51 kBTU/SF/YR – BLDG 13
- PHASE 4:** 24.31 kBTU/SF/YR – BLDG 20

- WITHIN PASSIVE HOUSE ENVELOPE
- EXCLUDED FROM PASSIVE HOUSE ENVELOPE



# PASSIVE HOUSE - ENVELOPE FEATURES



ZIP R-12-EXT. SHEATHING



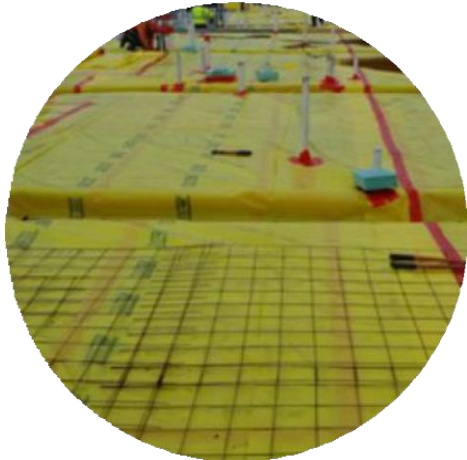
NON-PASSIVE HOUSE DOORS



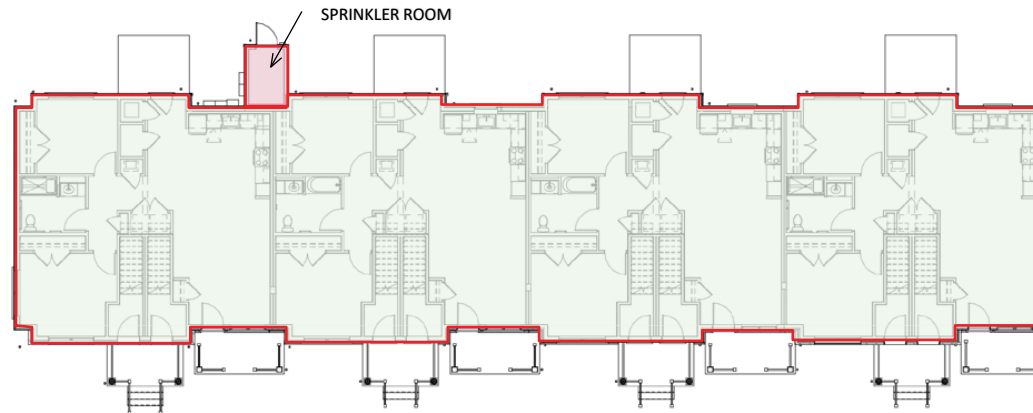
PASSIVE HOUSE WINDOWS  
AT UNITS



PASSIVE HOUSE WINDOWS  
AT MANAGEMENT SUITE



SUB-SLAB XPS (R20 OR  
R30) WITH 15 MIL.  
VAPOR BARRIER



ZIP SHEATHING AT CEILING

# PASSIVE HOUSE - MECHANICAL FEATURES



DUCTED HEAT PUMPS IN 2 & 3 BEDROOM UNITS



PHASES 1,2,3 & 4  
INDIVIDUAL GAS FIRED  
TANKLESS HOT WATER  
HEATERS / SEALED  
COMBUSTION, DIRECT VENT



PHASE 5:  
EXPLORING - INDIVIDUAL  
TANKED ELEC. HOT WATER  
HEATERS

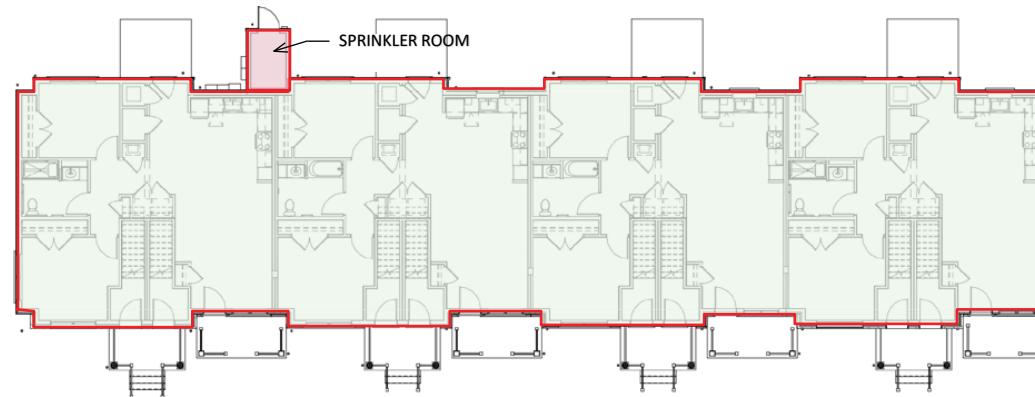
INDIVIDUAL ERV



PV SOLAR TO PARTIALLY  
PROVIDE FOR SITE LIGHTING



WALL MOUNTED HEAT PUMPS  
IN 1 BEDROOM UNITS



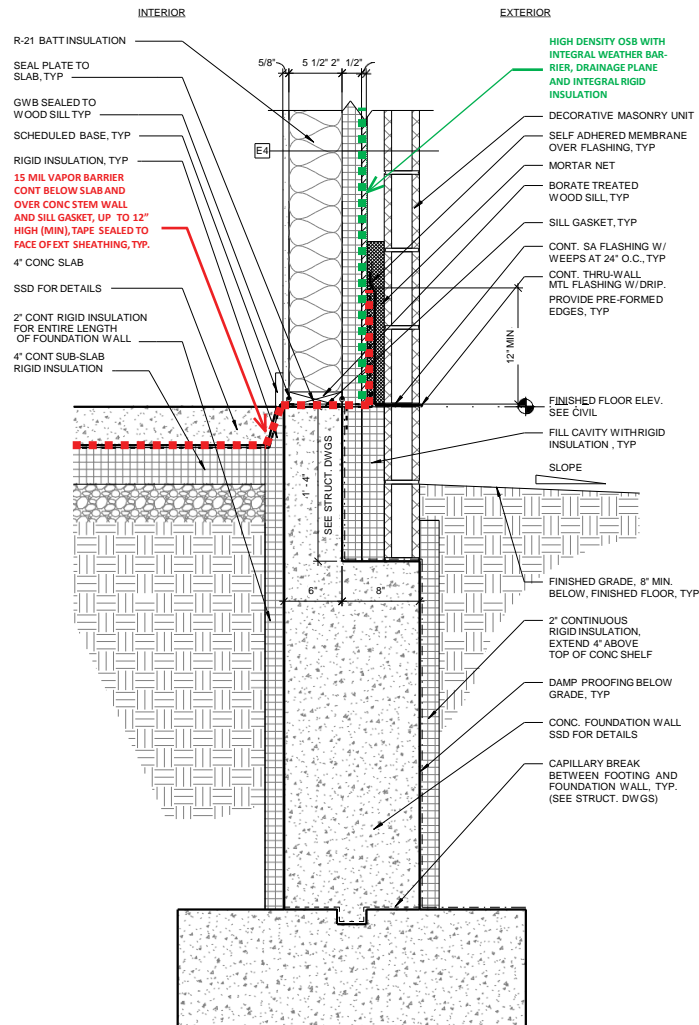
WITHIN PASSIVE  
HOUSE ENVELOPE

EXCLUDED FROM PASSIVE  
HOUSE ENVELOPE

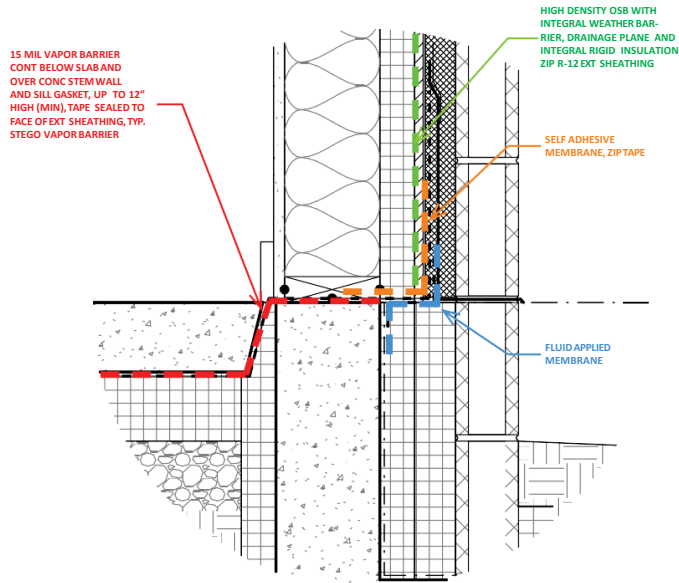


INDIVIDUAL LAUNDRY  
WITH HEAT PUMP/  
VENTLESS ELEC DRYERS

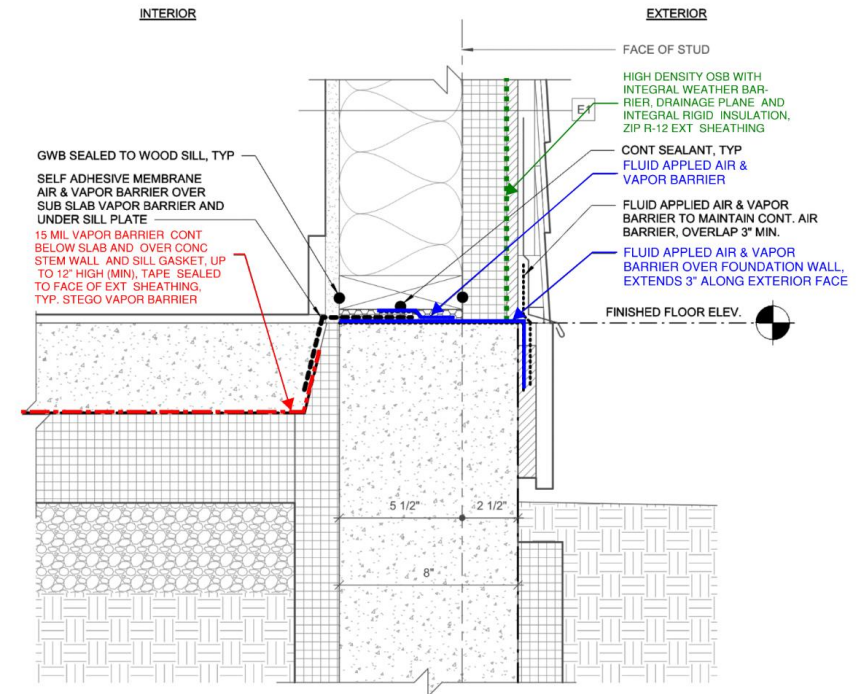
# AIR BARRIER AT FOUNDATION



DESIGNED DETAIL  
PHASES 1 & 2



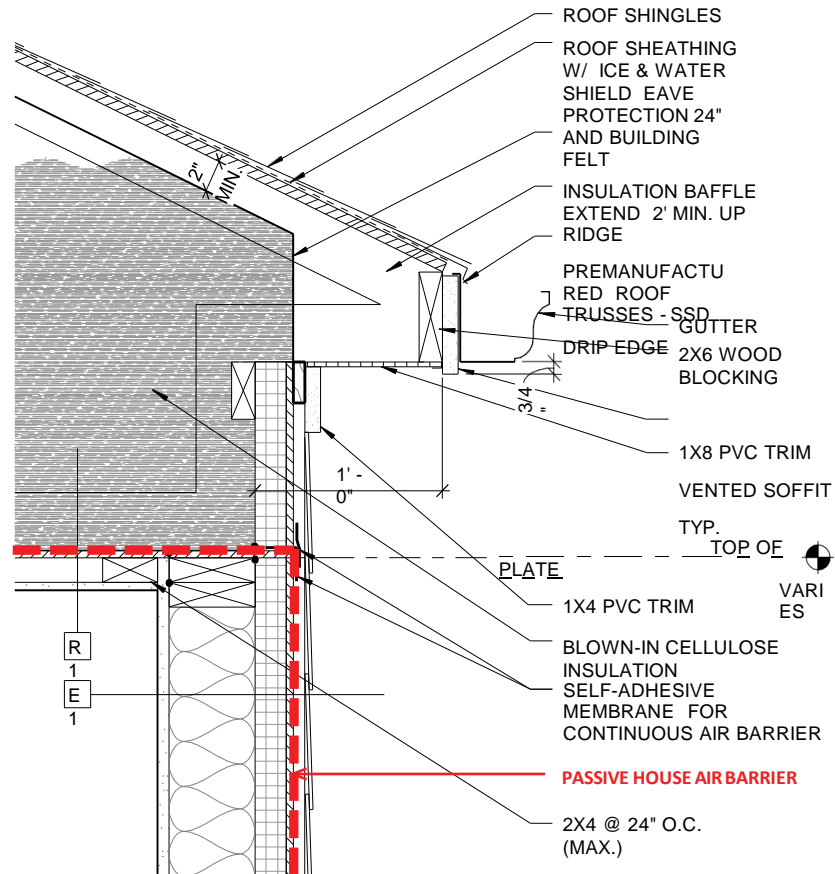
CONSTRUCTED DETAIL  
PHASES 1 & 2



CONSTRUCTED DETAIL  
PHASE 3



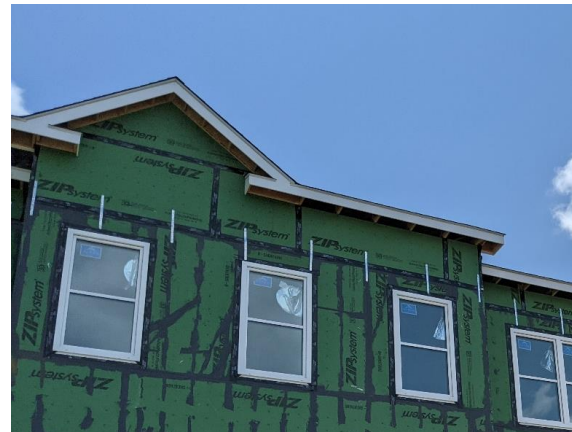
# PASSIVE HOUSE AIR BARRIER AT CEILING/ROOF



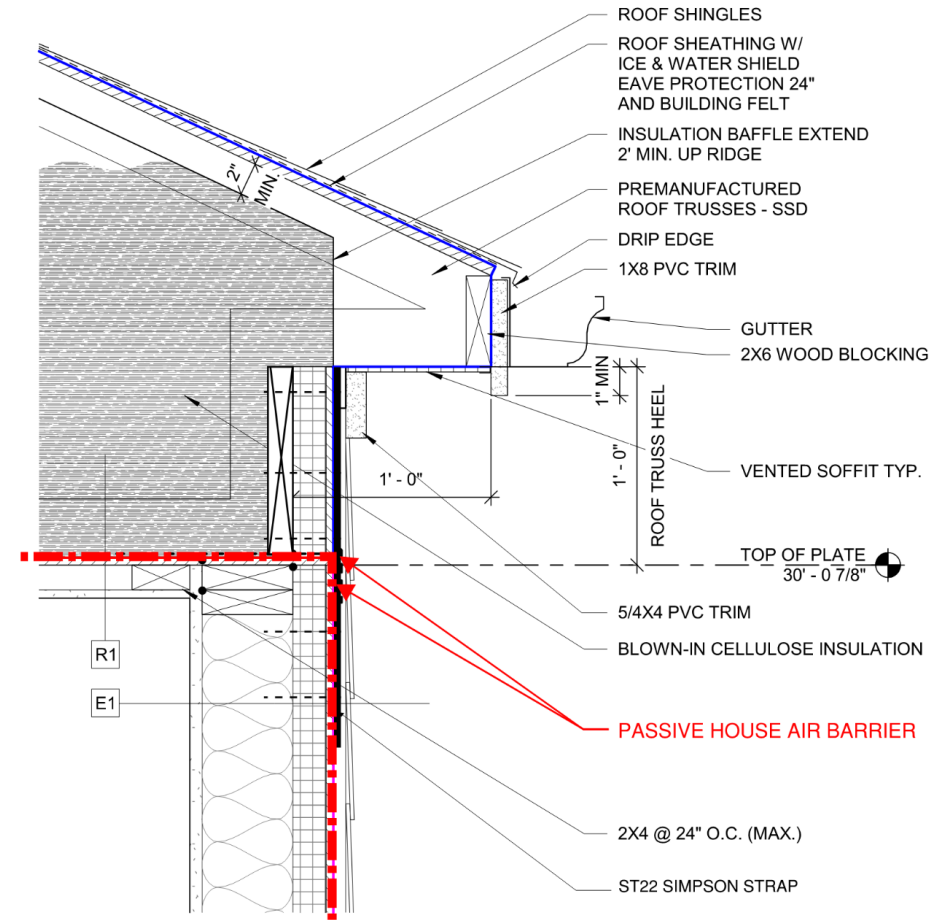
PHASE 1 & 2  
CONSTRUCTION DETAIL



PHASE 1 & 2  
CONSTRUCTION PHOTO



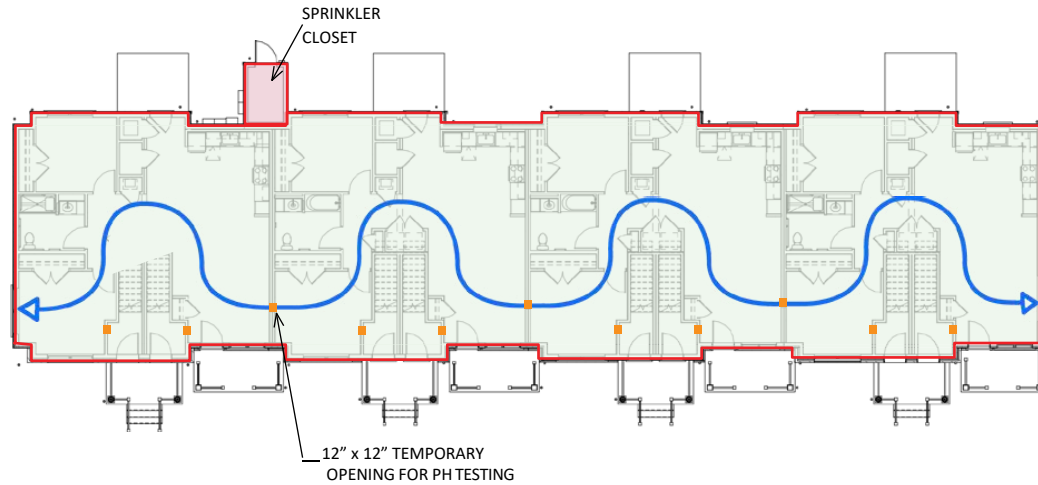
PHASE 3  
CONSTRUCTION PHOTO



PHASE 3  
CONSTRUCTION DETAIL

# PHI OR PHIUS CERTIFICATION

## CHFA REQUIRES TESTING TO PHIUS PROTOCOLS



### PRIOR TO PRELIMINARY TESTING:

- CHECK PH ENVELOPE
- CHECK AIR INFILTRATION AT SILL PLATE
- CHECK AND ADJUST WINDOWS
- CHECK FOR AIR INFILTRATION AROUND ERV VENTS / VENTS
- CHECK FOR AIR INFILTRATION AT ROOF TRUSSES

### PRELIMINARY BLOWER DOOR TEST WORST CASE:

- **PHASE 1:** 0.60 ACH 50 – ALL BUILDINGS
- **PHASE 2:** 0.50 ACH50 – ALL BUILDINGS
- **PHASE 3:** WORST & BEST CASE

0.43 ACH50 – BUILDING 17

**0.29 ACH50 – BUILDING 16**



# PHASE 1 & PHASE 2: CONSTRUCTION



PHASE 1 - MANAGEMENT SUITE



PHASE 1 - BLDG 4



PHASE 2 - BLDG 10



PHASE 2



PHASE 3 & COMMUNITY BUILDING



PHASE 3 - IN CONSTRUCTION



DESIGN BY: WRT

RENDER BY: KIRK FROMM



*Fromm 2020*









*Holzraum Wall System, Blueprint Robotics*





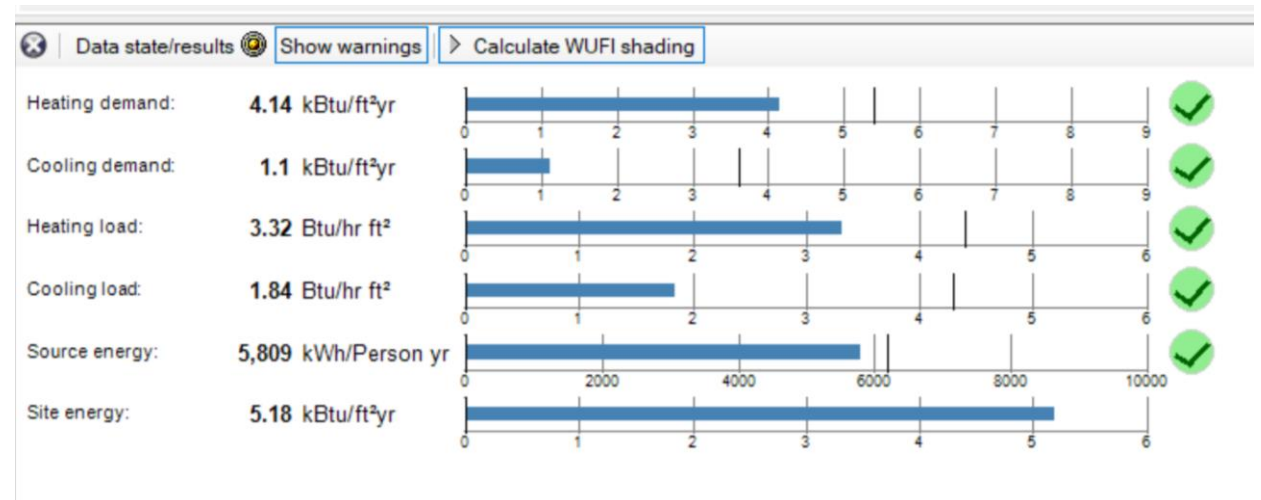
**Factory Built – Opportunity to Scale up  
Passive House**



*Holzraum Wall System, Blueprint Robotics*

***Passive House is a Performance Based Building Standard that focuses on Operational Carbon.***

***At this point, there is no Passive House certification criteria that rewards the use of building materials with low Embodied Carbon.***



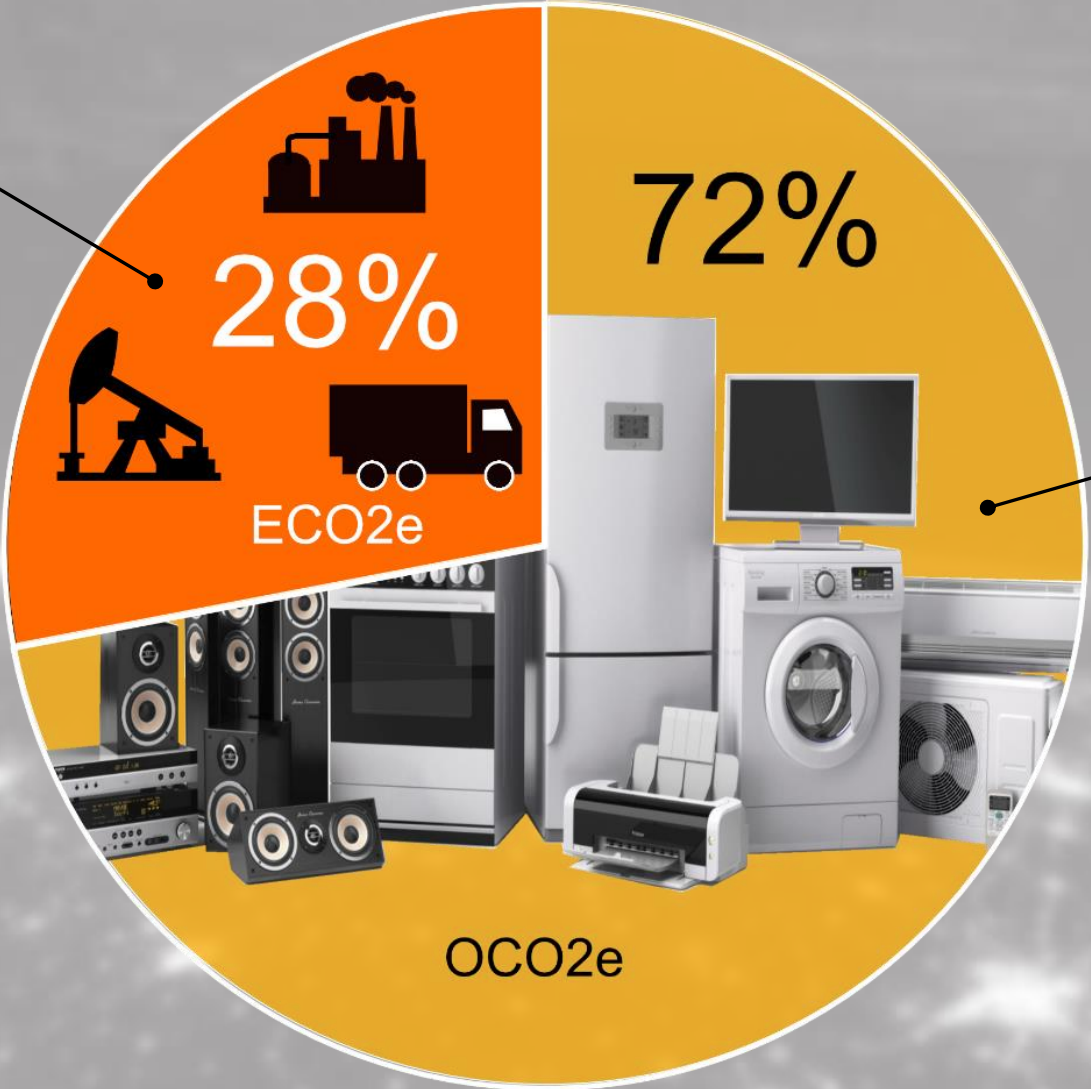
# OPERATIONAL CARBON



# EMBODIED CARBON

# Annual Global Building Sector

Embodied Carbon

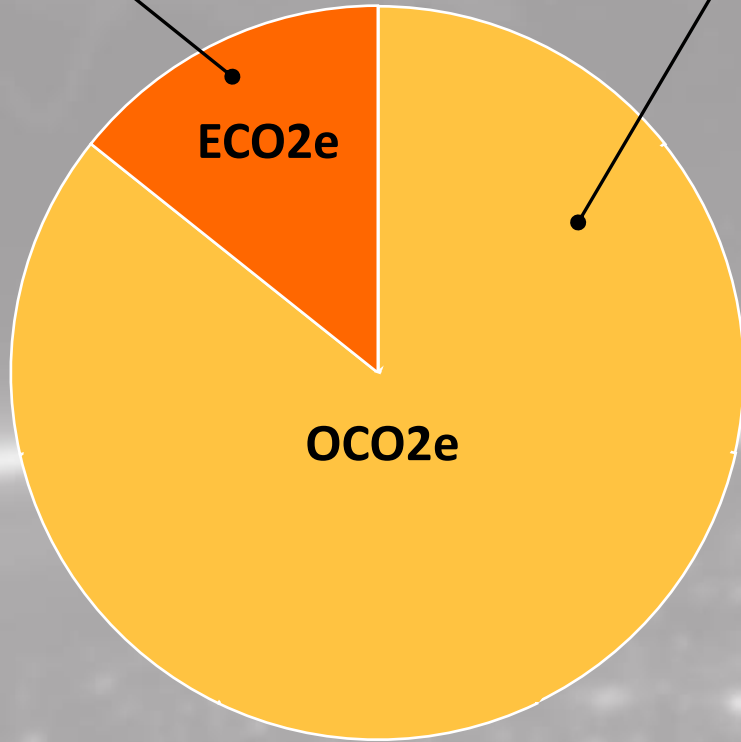


Operational Carbon

CO2e Emissions

Embodied Carbon

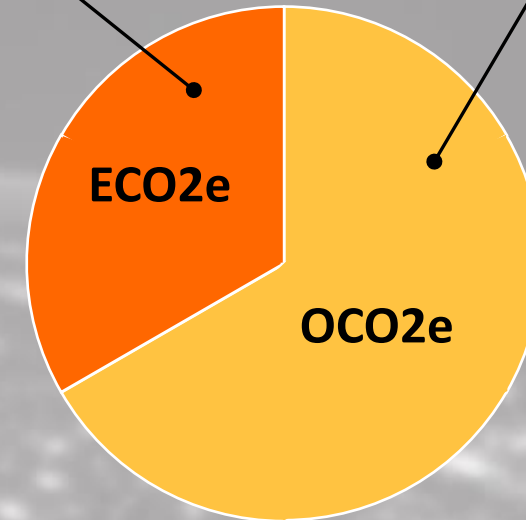
Operational Carbon



Typical Buildings

Operational Carbon

Embodied Carbon



High Performance Buildings

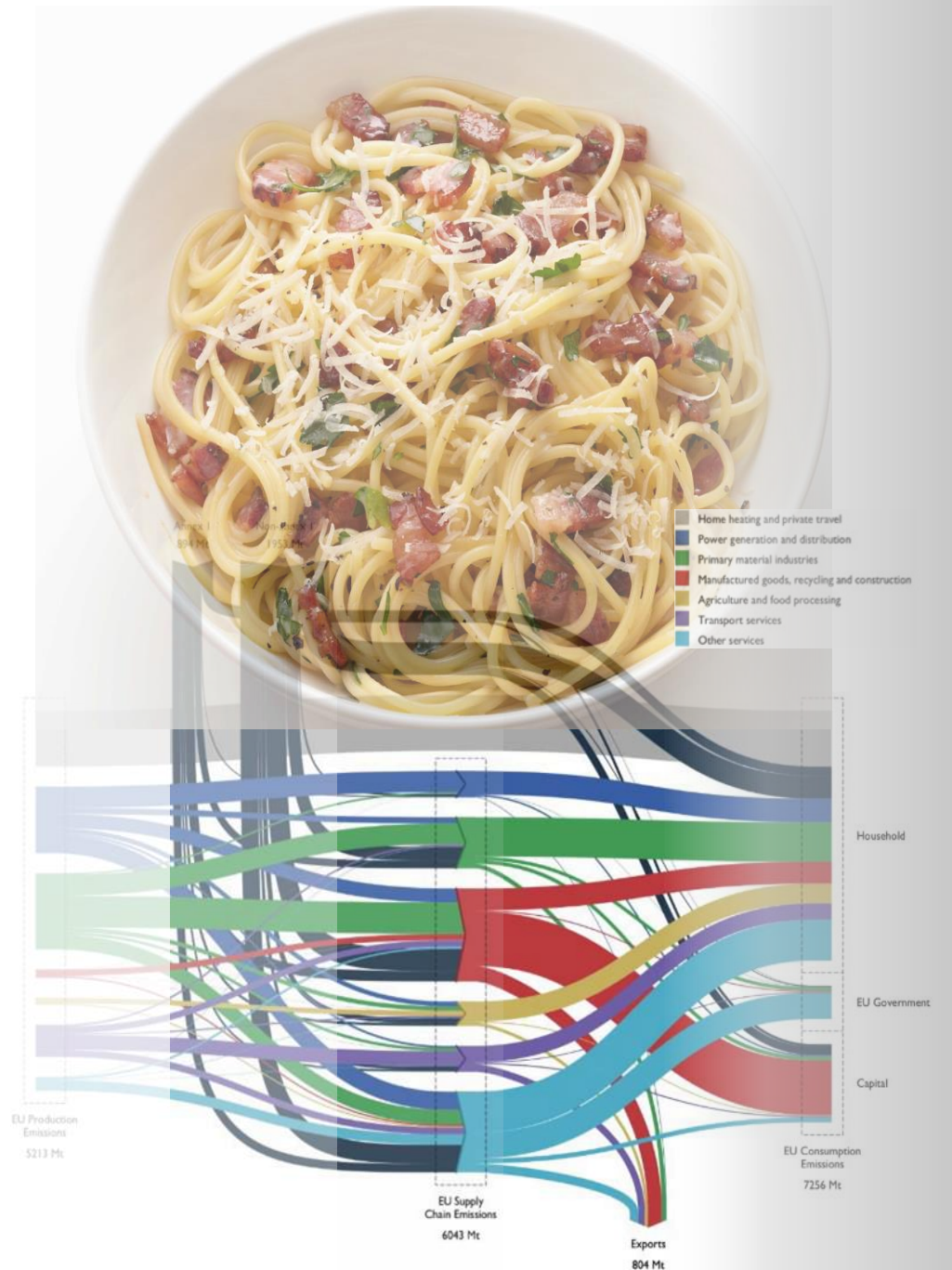
***Net Zero isn't enough....***

# Spaghetti Carbon – Era: Disentangling Operational & Embodied Carbon

**David Salamon, CPHD-CPHC**  
Re:Vision Architecture

**Ilka Cassidy, Dipl. Eng. CPHC**  
C2 Architecture  
Holzraum System, LLC

**Steve Hessler, CPHC**  
Holzraum System, LLC



Object

- Cases
  - Case 1: Code Home assemblies, ACH50 3.0 /hr, no heat pumps, regular erv
  - Case 2: Code Home assemblies, ACH50 3.0 /hr, efficient systems
  - Case 3: PHIUS+ 2015\_high embodied carbon
  - Case 4: PHIUS+ 2015\_Holzraum
  - Case 5: PHIUS+ 2015\_Holzraum\_improved carbon (basement)**

General Report data & results

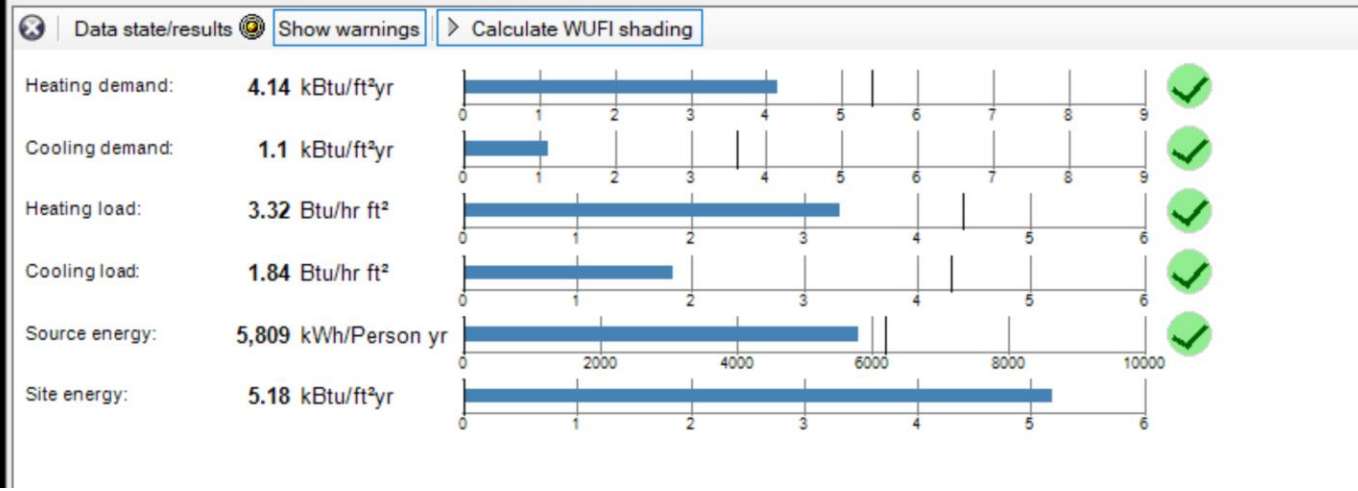
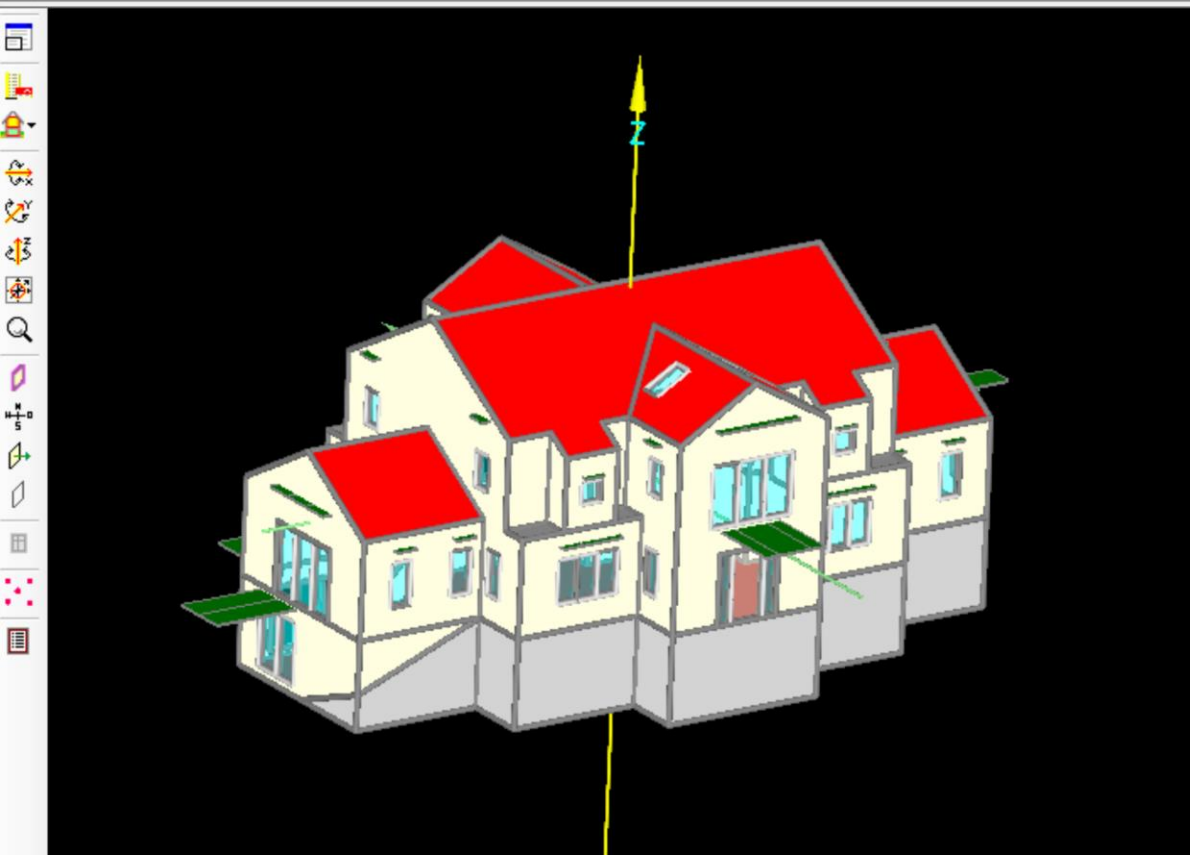
Name

Remarks

Calculation

Certificate criteria

Use WUFI month mean shading factors



Autodesk Revit 2019.2 - 1719\_Chambers Road - 2018-10-15.0001 - 3D View: {3D}

Type a keyword or phrase

File Architecture Structure Steel Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins BIMObject® Modify

Select

Modify Wall Door Window Component Column Roof Ceiling Floor Curtain System Mullion Grid Railing Ramp Stair Model Text Model Line Model Group Room Room Separator Tag Room Tag Area

Build Circulation Model Room & Area

Area Area Boundary Tag Area

By Face Shaft Vertical Dormer

Level Grid

Show Ref Plane Viewer

Datum Work Plane

Starting View {3D}

Project Browser - 1719\_Chambers Road - 2018-...

- Views (all)
- Legends
- Schedules/Quantities (all)
- Sheets (all)
- A0.0 - COVER SHEET
- A0.1 - CODE & PARTITION TYPES
- A0.2 - SCHEDULES
- A1.0 - MAIN FOUNDATION PLAN
- A1.1 - FLOOR PLAN - BASEMENT
- A1.2 - FLOOR PLAN - 1ST FLOOR
- A1.3 - FLOOR PLAN - 2ND FLOOR
- A1.4 - ROOF PLAN
- A1.5 - FLOOR PLANS - GARAGE
- A1.6 - REFLECTED CEILING PLAN - BASEME...

Properties

3D View

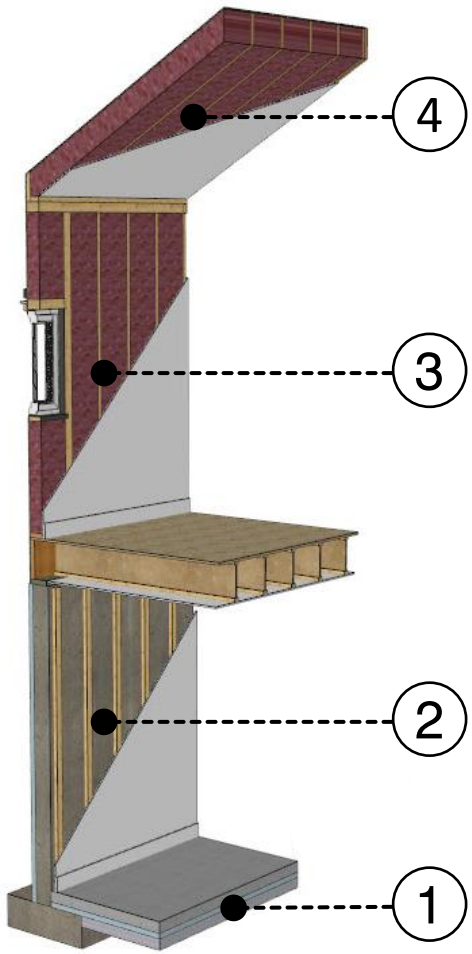
3D View: {3D} Edit Type

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Detail Level	Medium
Parts Visibility	Show Both
Visibility/Graphics O...	Edit...
Graphic Display Opti...	Edit...
Discipline	Architectural

Properties help Apply

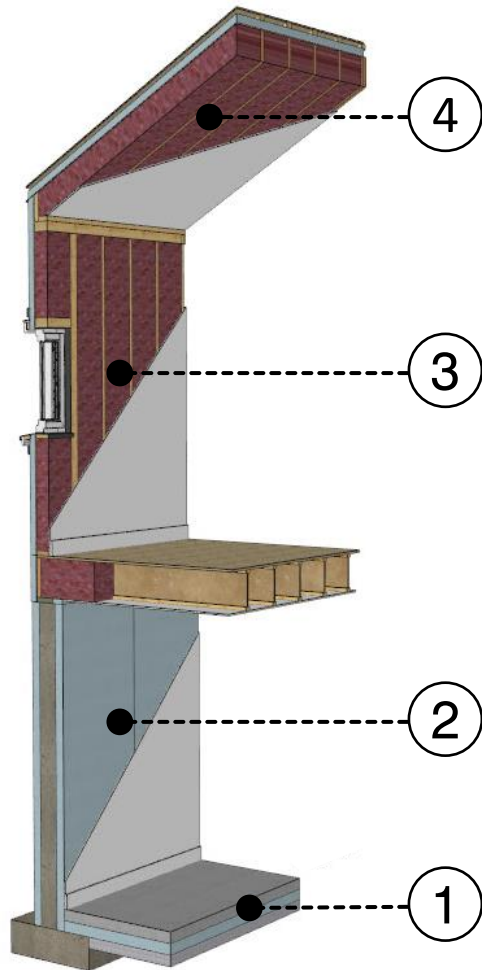






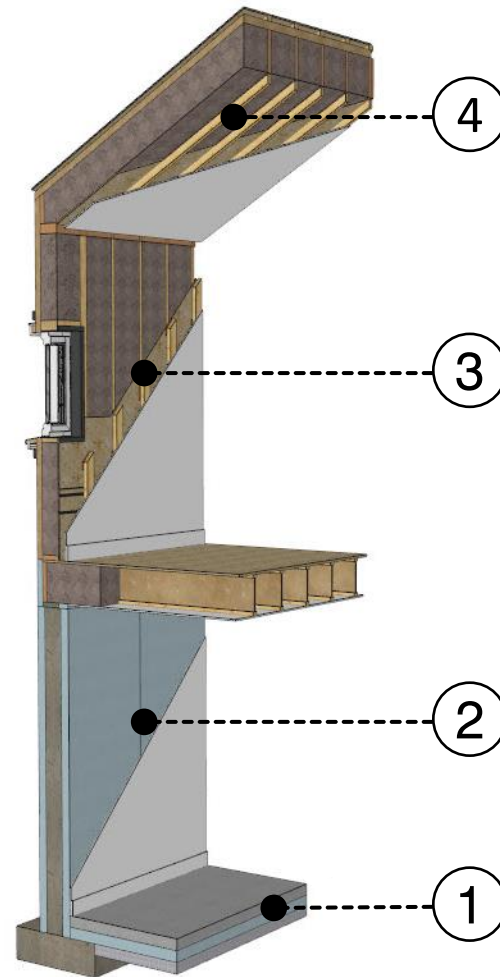
**CODE BUILDING**  
**Case 1&2**

- 4. Roof: FG (R19), LVL
- 3. AG-Wall: FG (R19), 2X6
- 2. BG-Wall: EPS (R10), 8" CMU
- 1. Slab: XPS (R10), 4" CC



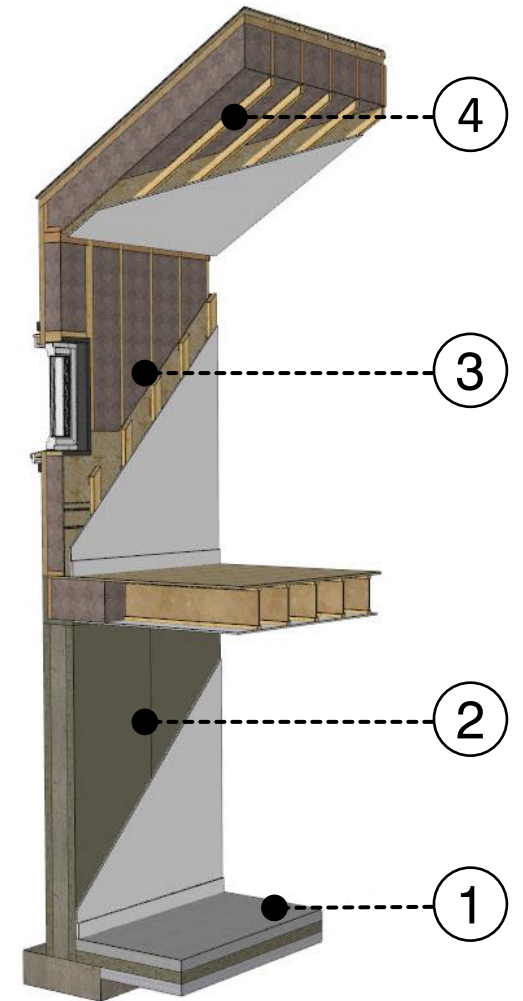
**PH (HIGH FOAM)**  
**Case 3**

- 4. Roof: XPS (R17), CLOS (R33), LVL
- 3. AG-Wall: EPS (R14.5), CLOS (R21), 2x6
- 2. BG-Wall: ICF (R27)
- 1. Slab: EPS (R14.5), 4" CC



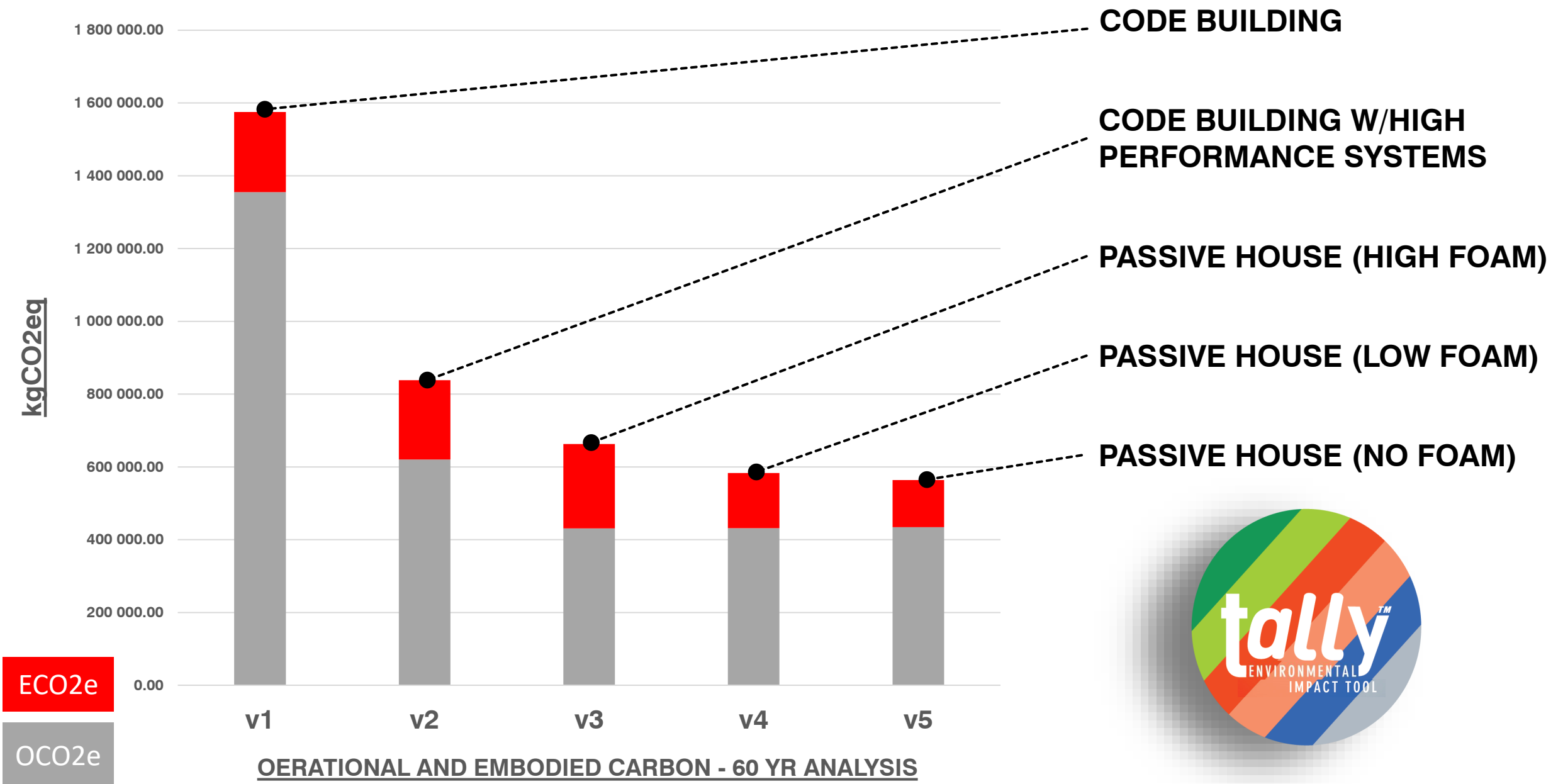
**PH (LOW FOAM)**  
**Case 4**

- 4. Roof: WF (R7.5), CLOS (R44.5), LVL
- 3. AG-Wall: WF (R7.5), CLOS (R27), 2x8
- 2. BG-Wall: ICF (R27)
- 1. Slab: EPS (R14.5), 4" CC



**PH (NO FOAM)**  
**Case 5**

- 4. Roof: WF (R7.5), CLOS (R44.5), LVL
- 3. AG-Wall: WF (R7.5), CLOS (R27), 2x8
- 2. BG-Wall: RF (R16), 8" CMU, CLOS (R13)
- 1. Slab: RF (R16), 4" CC

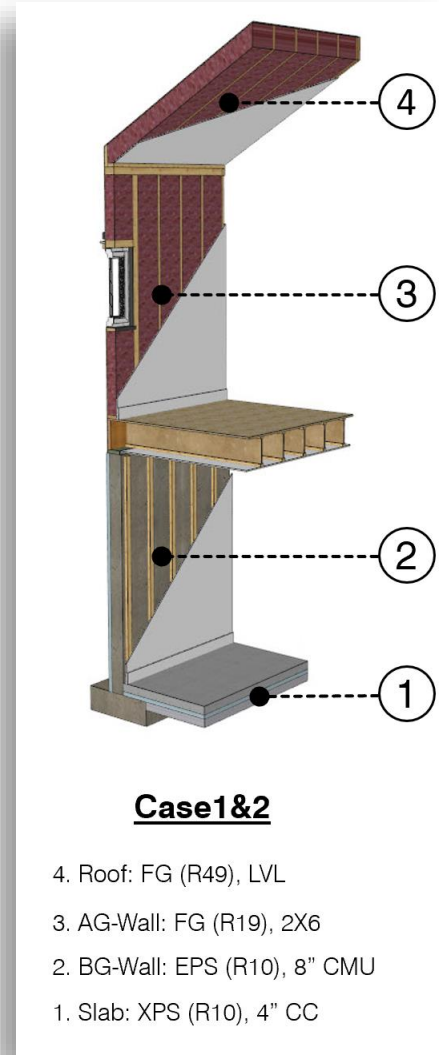
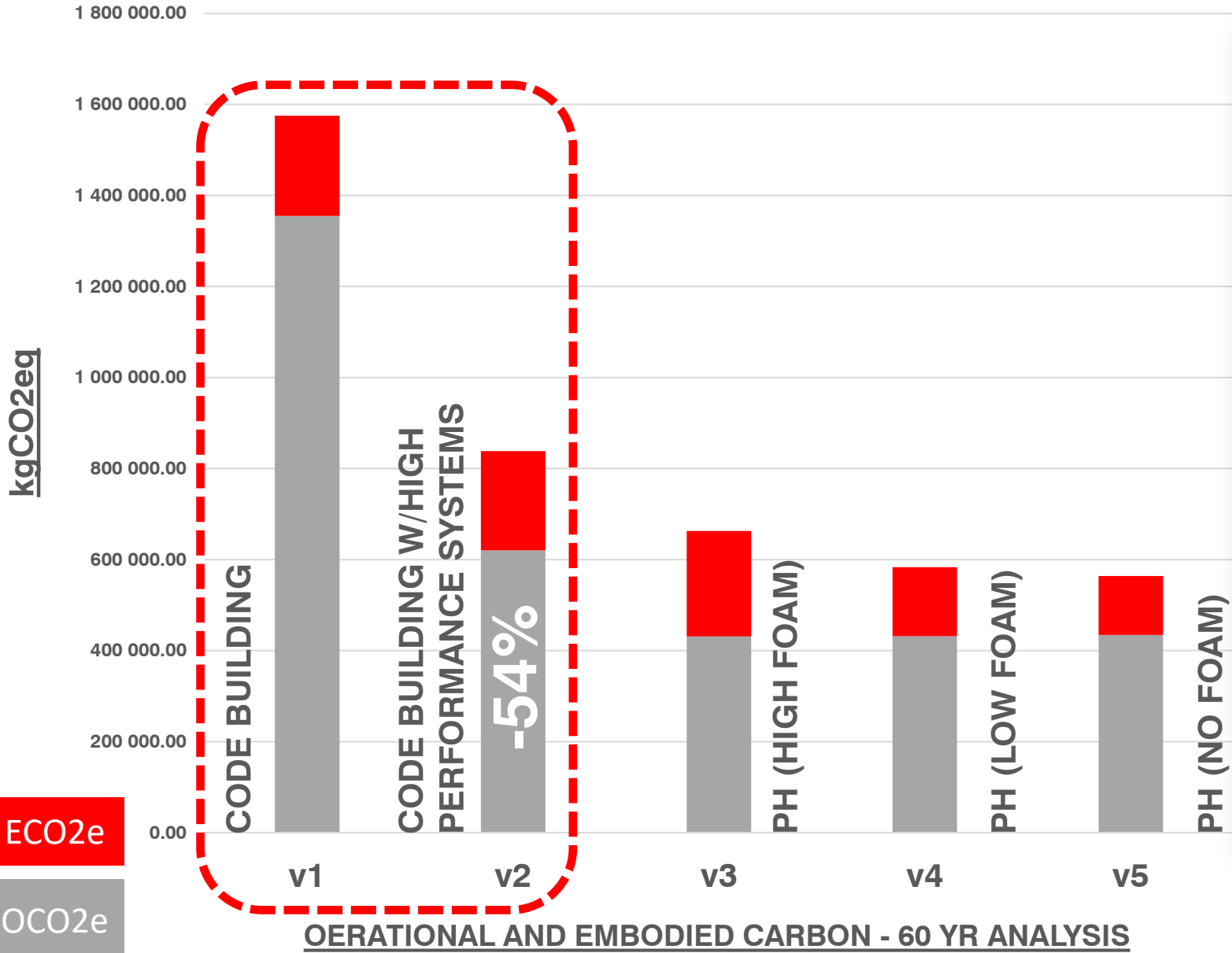


ECO<sub>2</sub>e

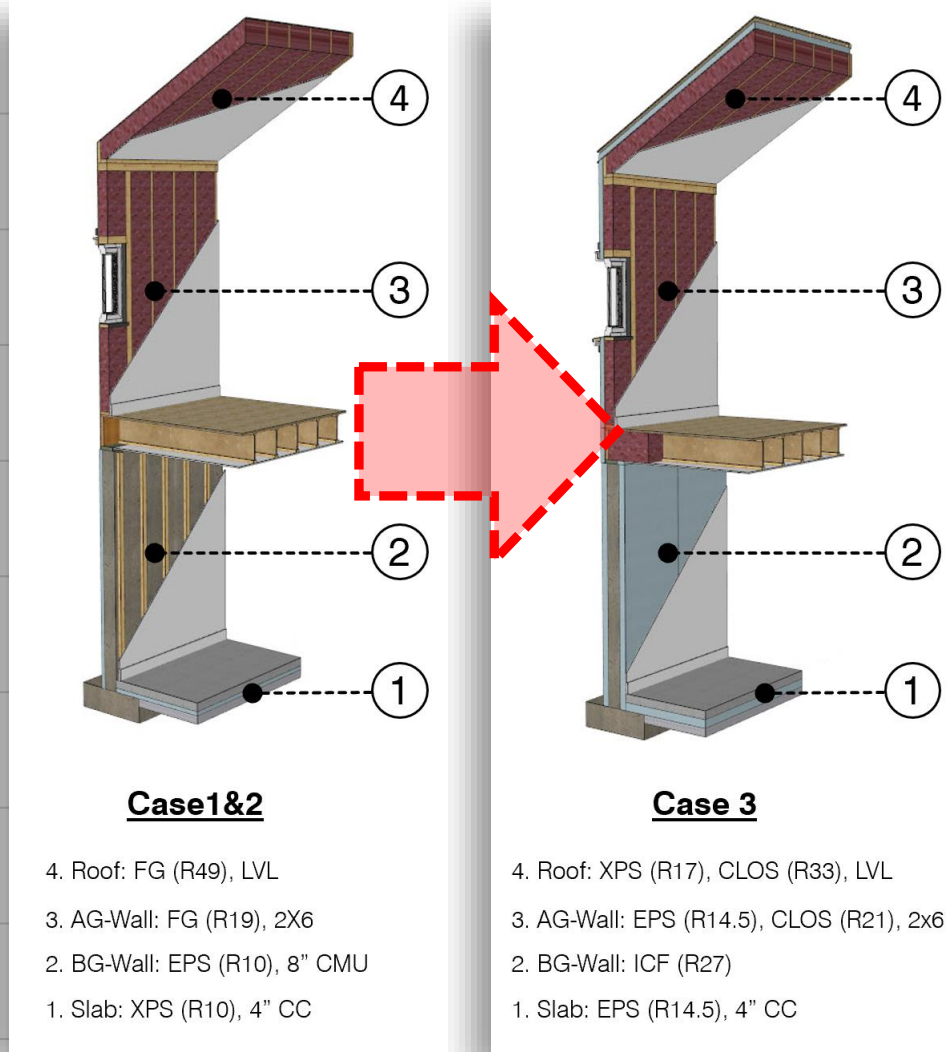
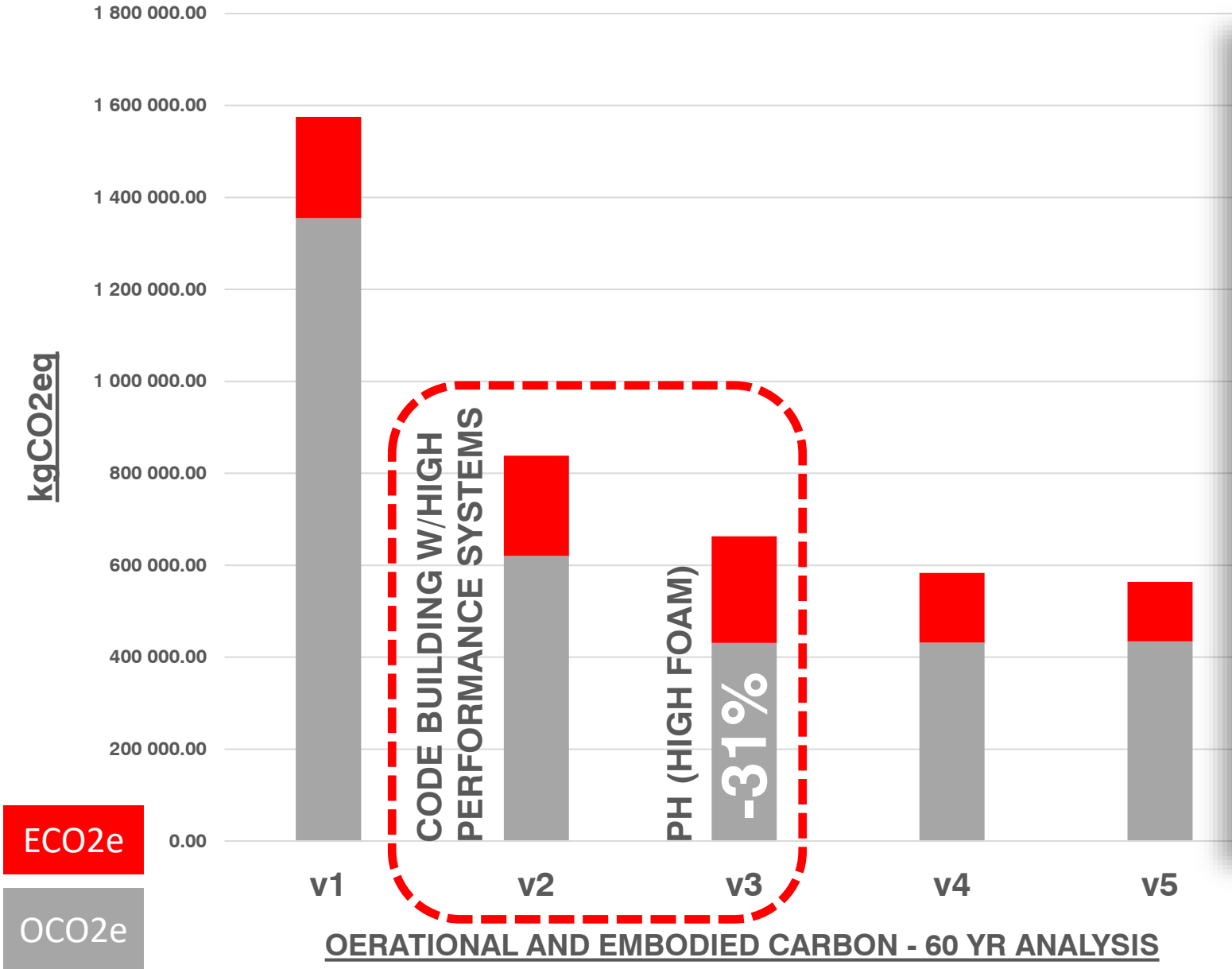
OCO<sub>2</sub>e



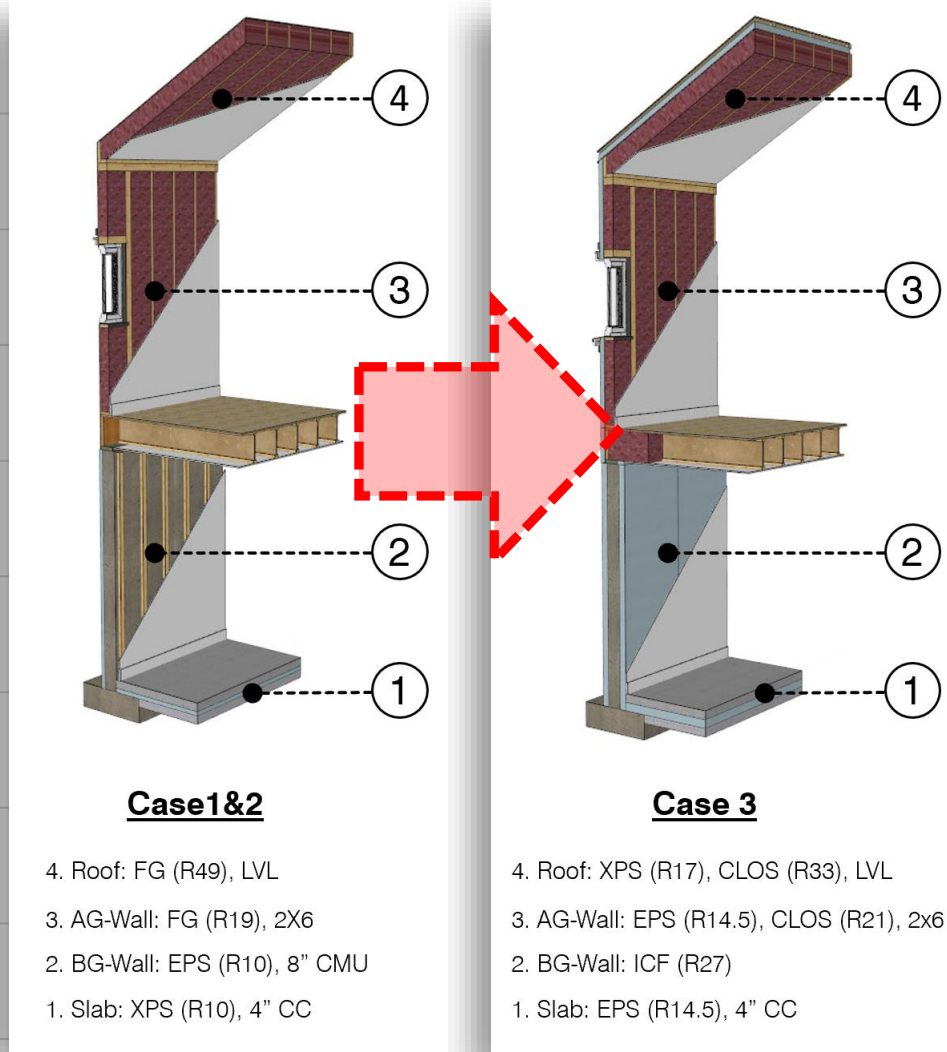
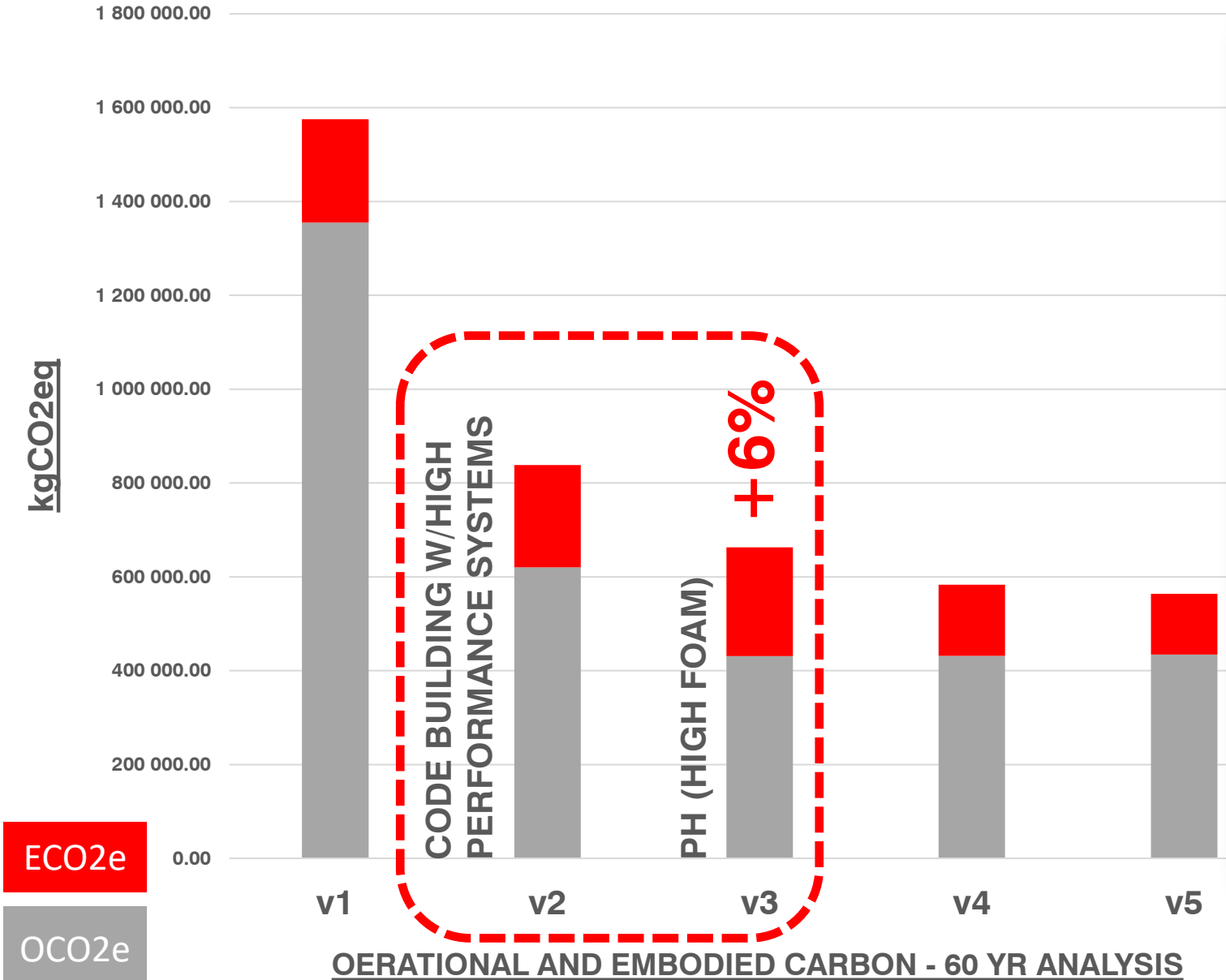
# HIGH PERFORMANCE SYSTEMS...



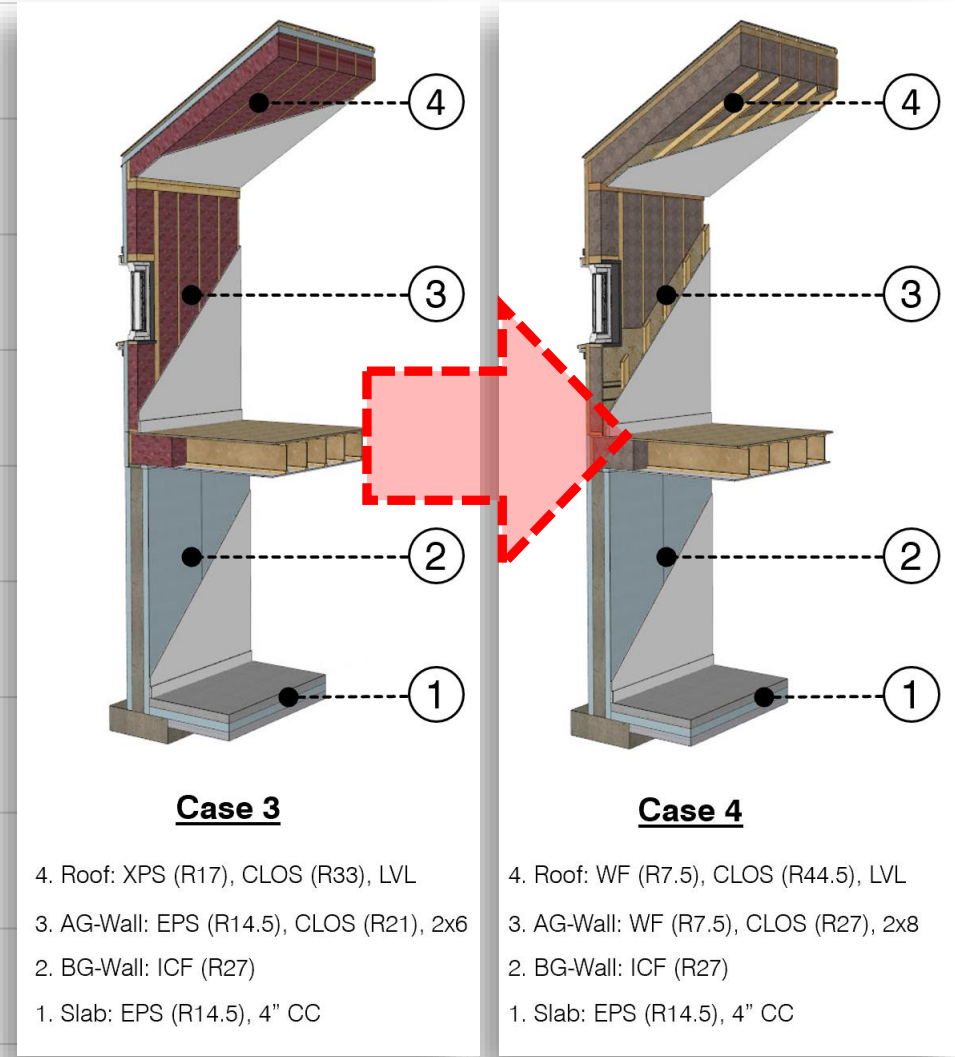
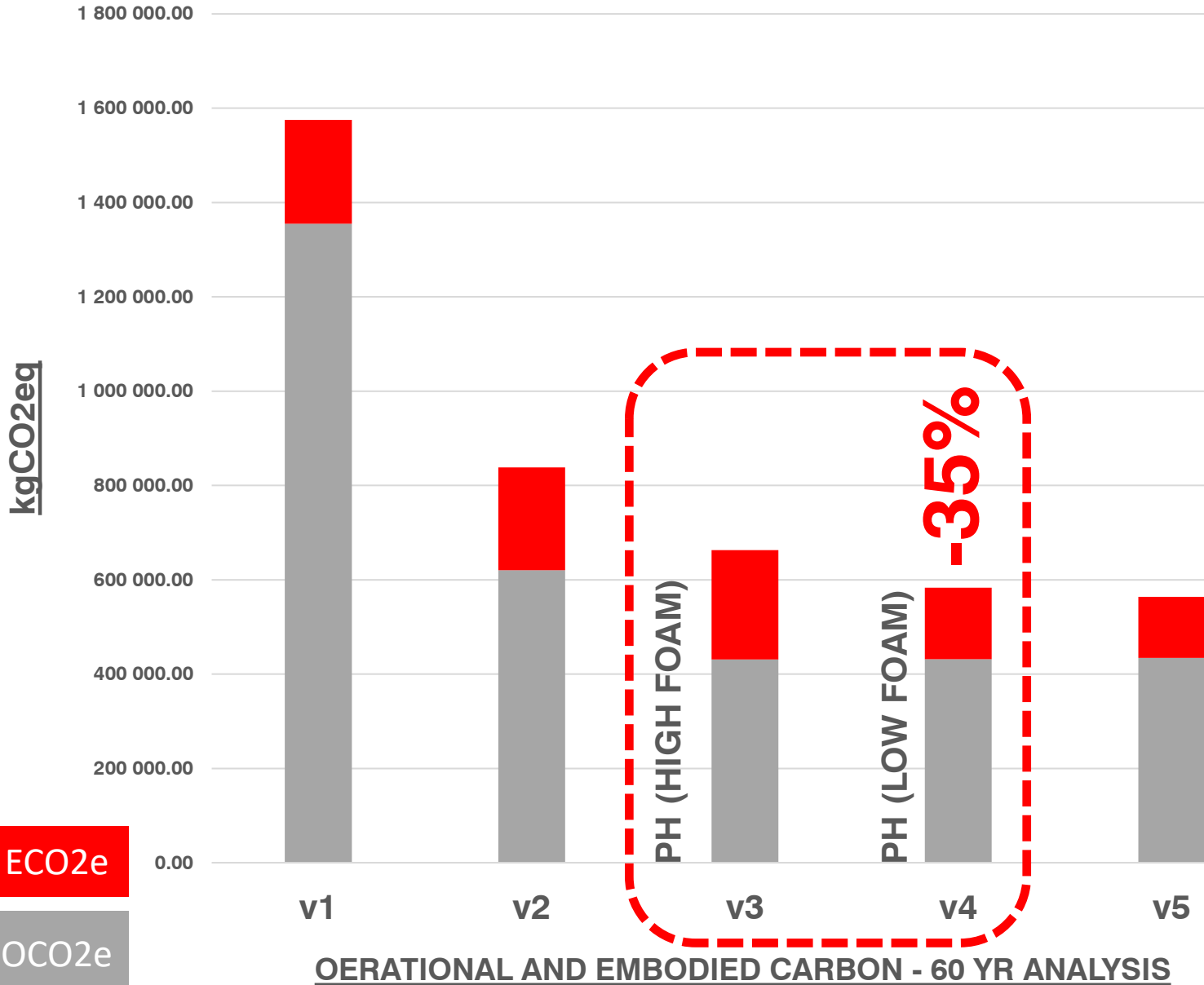
# UPGRADE CODE ENVELOPE TO PH ENVELOPE



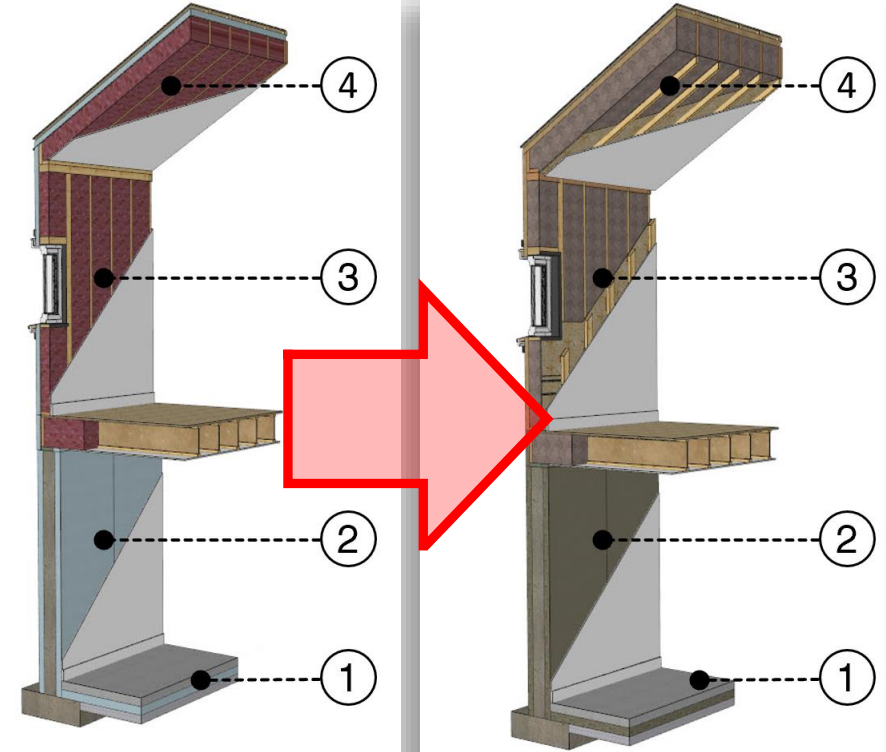
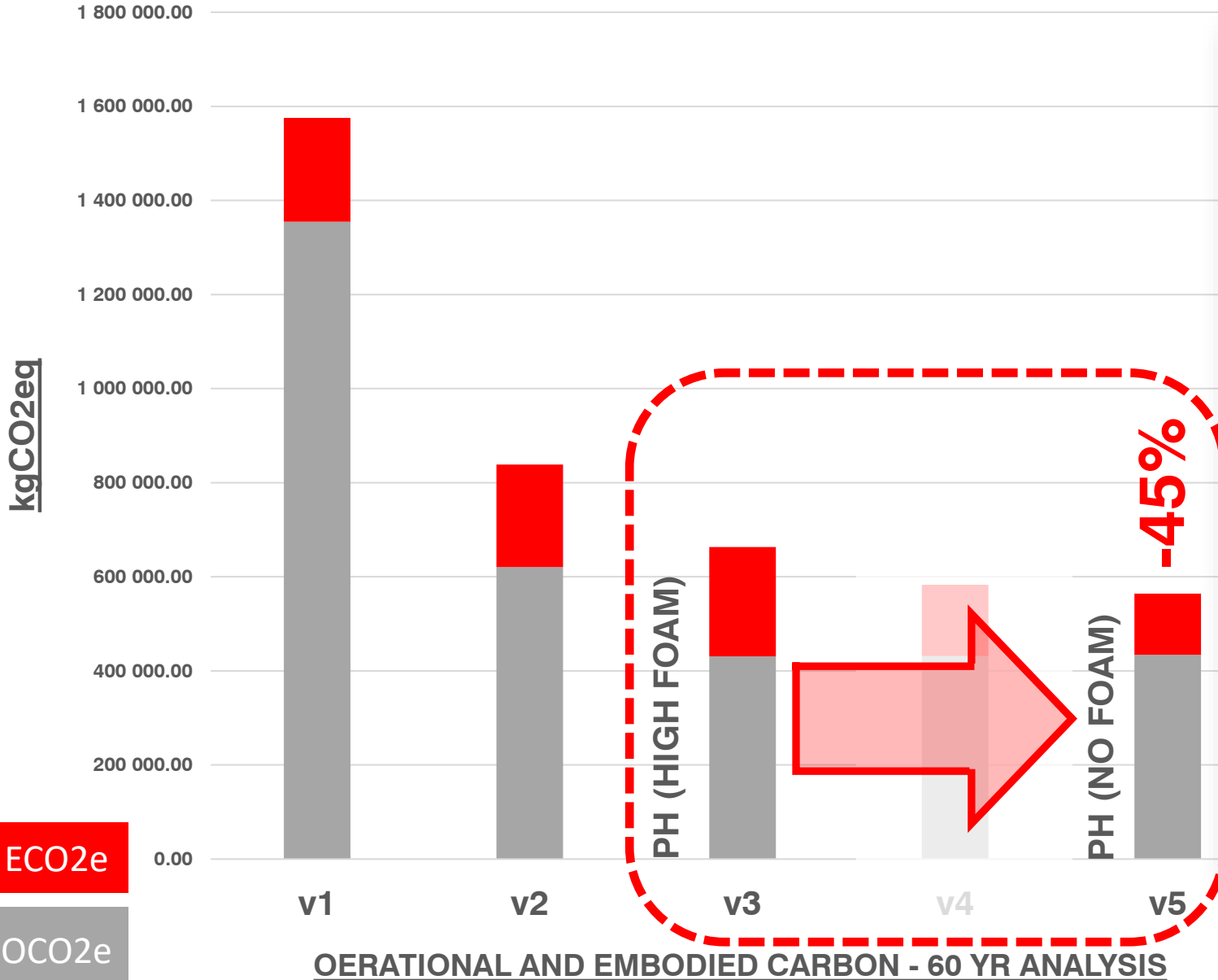
# UPGRADE CODE ENVELOPE TO PH ENVELOPE



# UPGRADE PH ENVELOPE TO LOW CO<sub>2</sub>e PH ENVELOPE

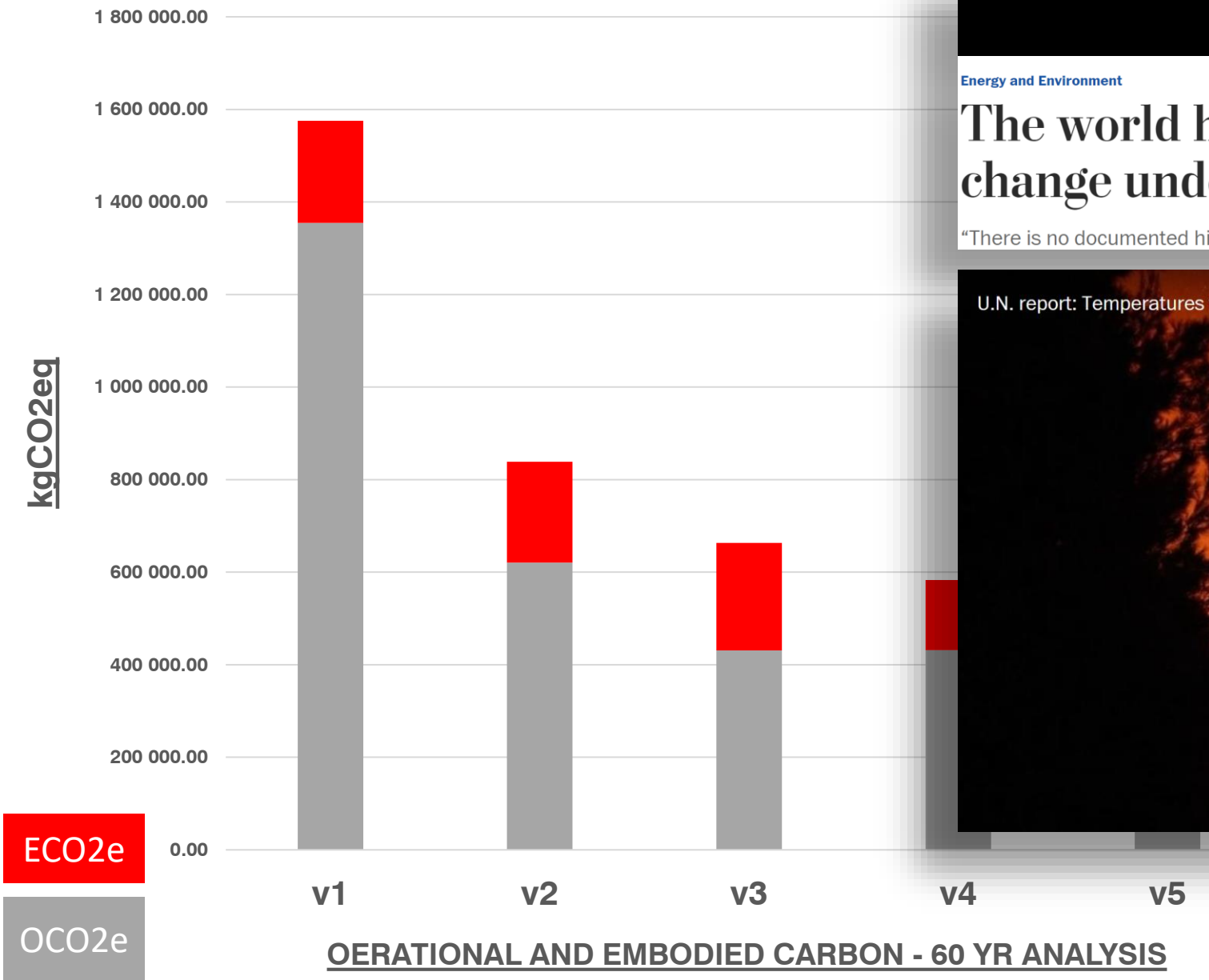


# UPGRADING THE LOW CARBON PH ENVELOPE WITH FOAM FREE MATERIALS DECREASED ECO2e ~54%



- 4. Roof: XPS (R17), CLOS (R33), LVL
- 3. AG-Wall: EPS (R14.5), CLOS (R21), 2x6
- 2. BG-Wall: ICF (R27)
- 1. Slab: EPS (R14.5), 4" CC

- 4. Roof: WF (R7.5), CLOS (R44.5), LVL
- 3. AG-Wall: WF (R7.5), CLOS (R27), 2x8
- 2. BG-Wall: RF (R16), 8" CMU, CLOS (R13)
- 1. Slab: RF (R16), 4" CC



**The Washington Post**  
*Democracy Dies in Darkness*

Energy and Environment

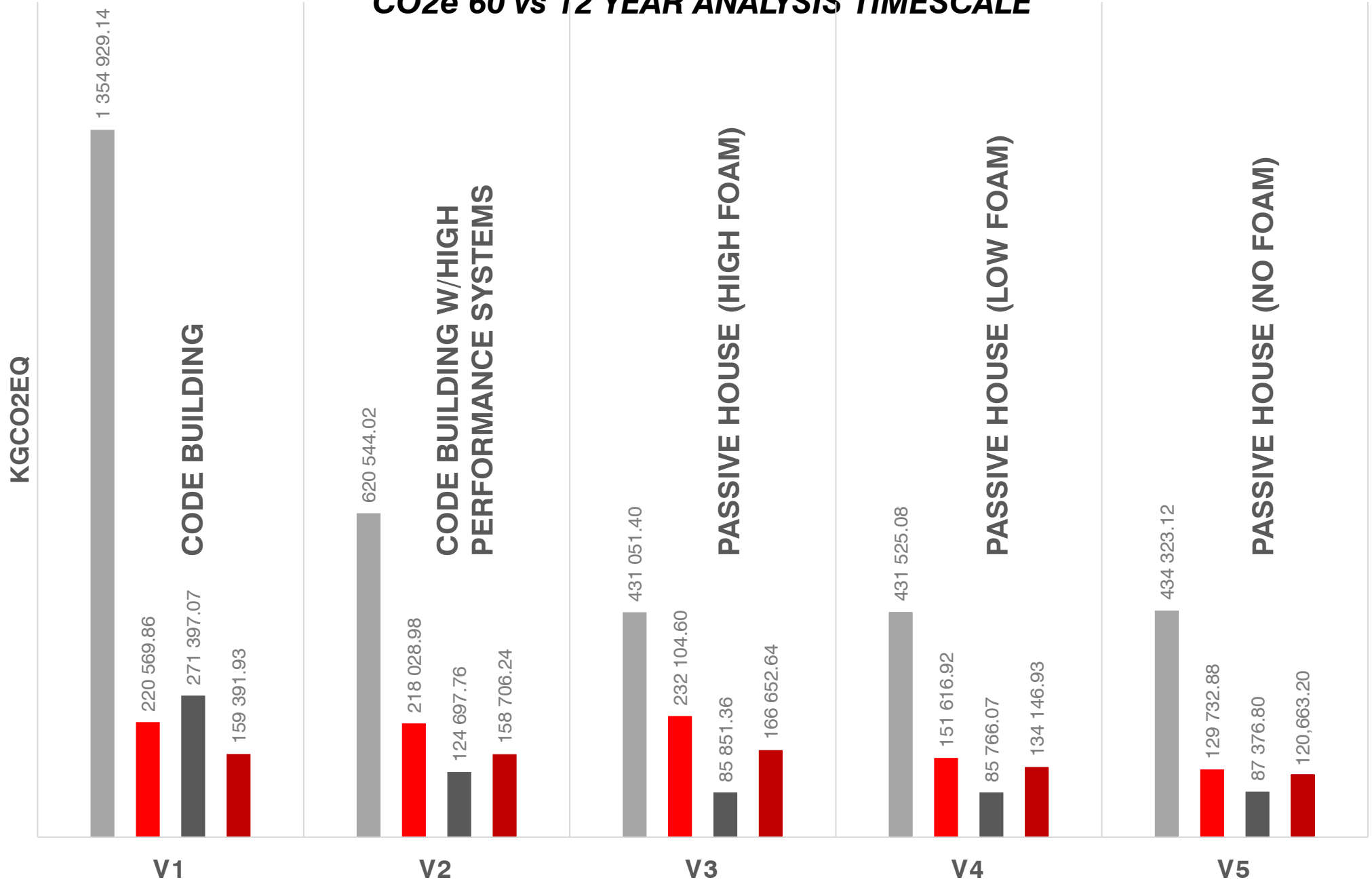
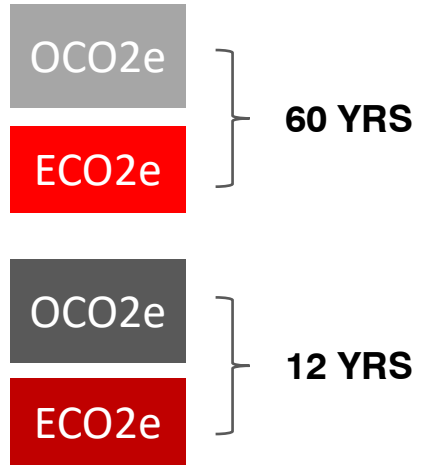
# The world has just over a decade to get climate change under control, U.N. scientists say

"There is no documented historic precedent" for the scale of changes required, the body found.

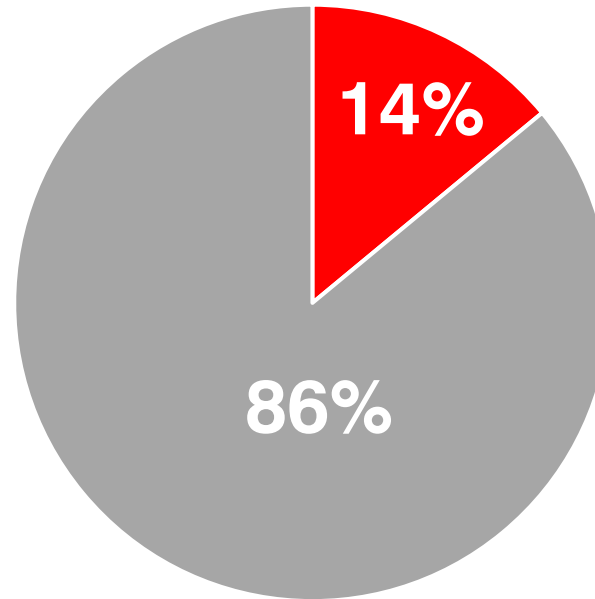
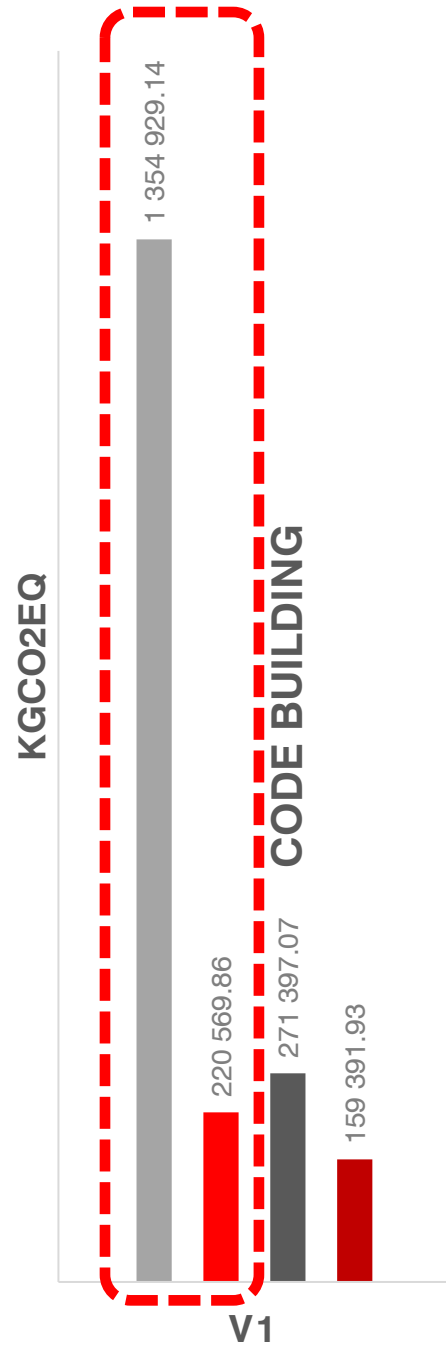
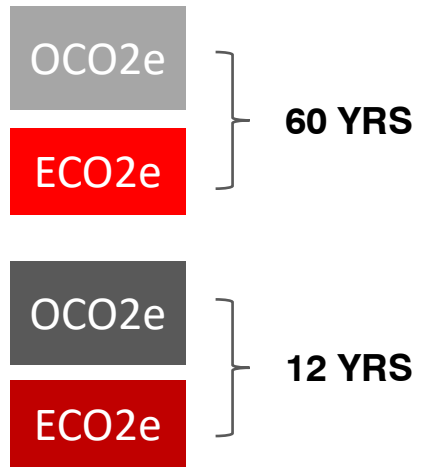




# CO2e 60 vs 12 YEAR ANALYSIS TIMESCALE

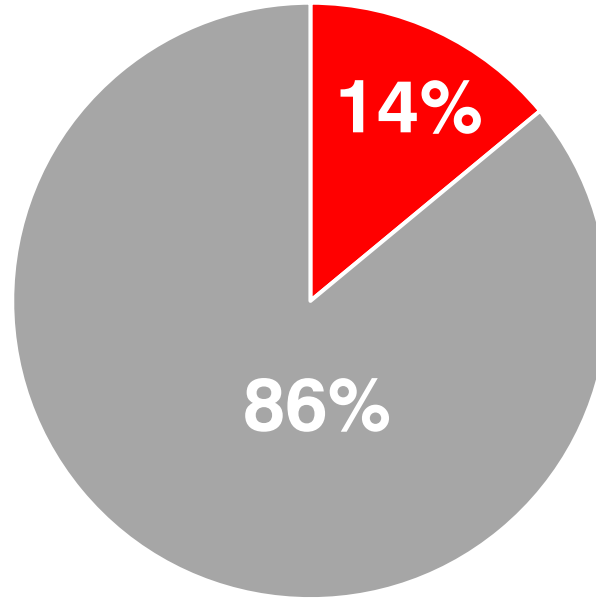
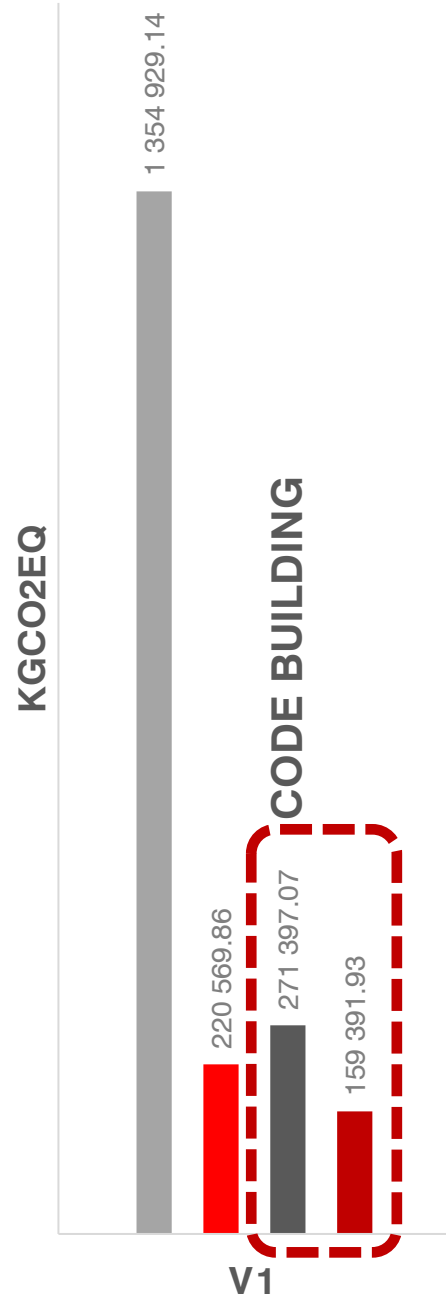
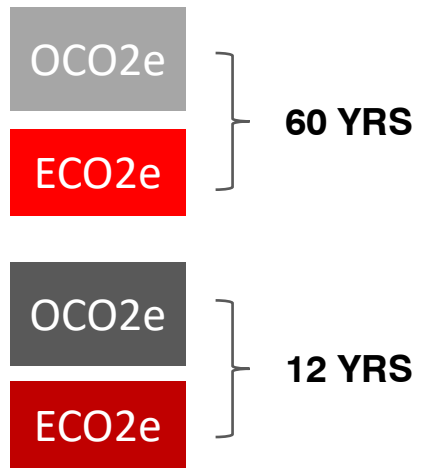


# CO2e 60 vs 12 YEAR ANALYSIS TIMESCALE

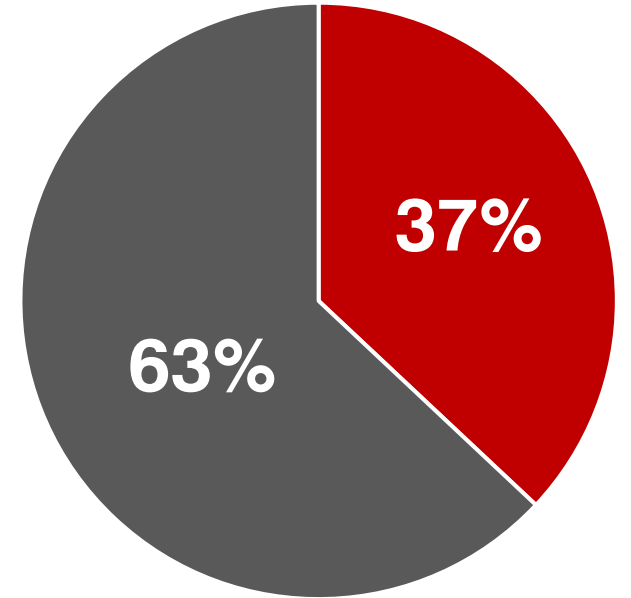


TOTAL CO2e  
60 YRS

# CO2e 60 vs 12 YEAR ANALYSIS TIMESCALE

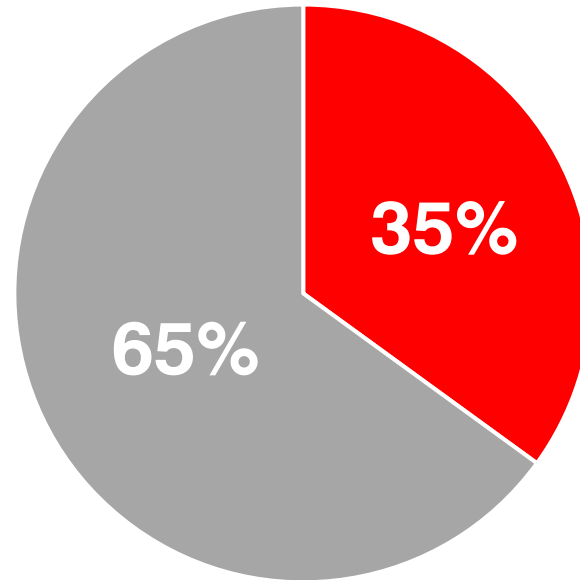
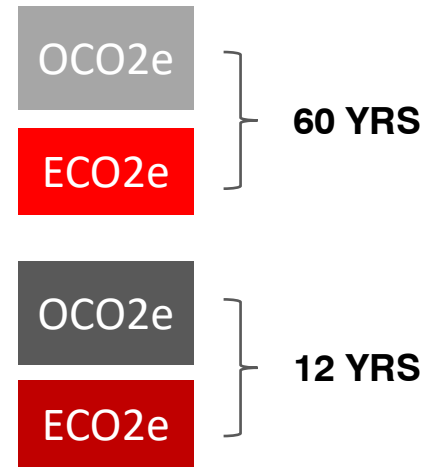


TOTAL CO2e  
60 YRS



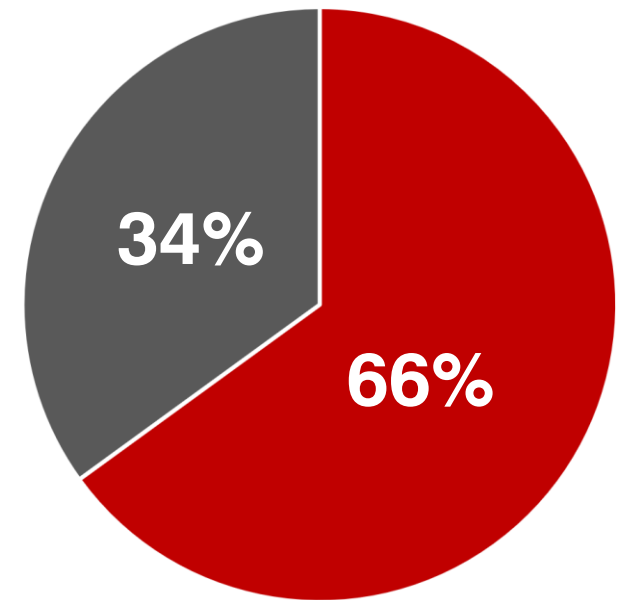
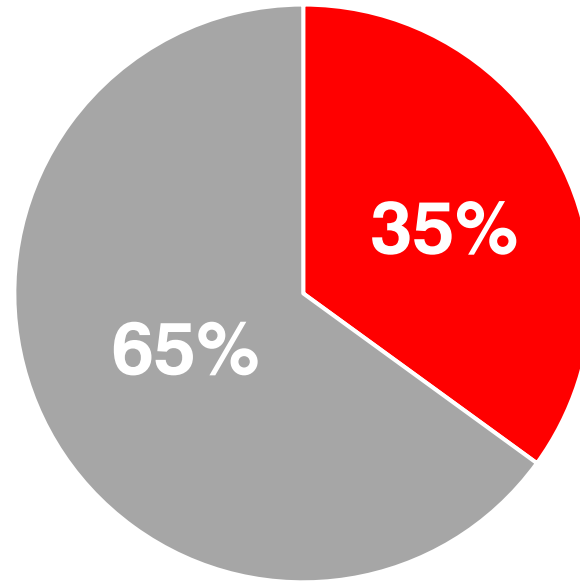
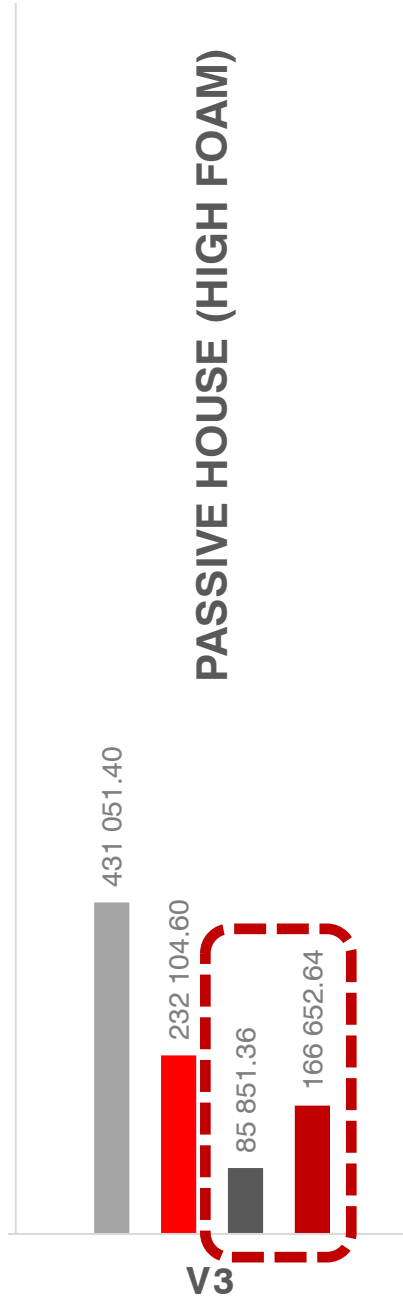
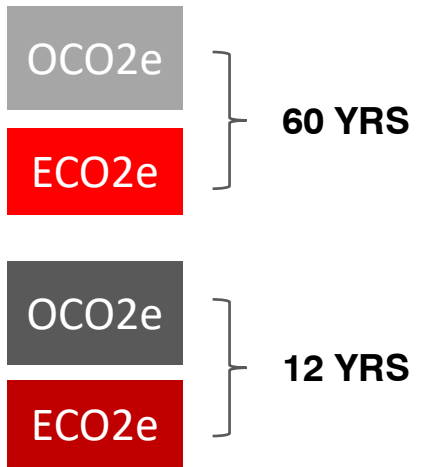
TOTAL CO2e  
12 YRS

# CO2e 60 vs 12 YEAR ANALYSIS TIMESCALE

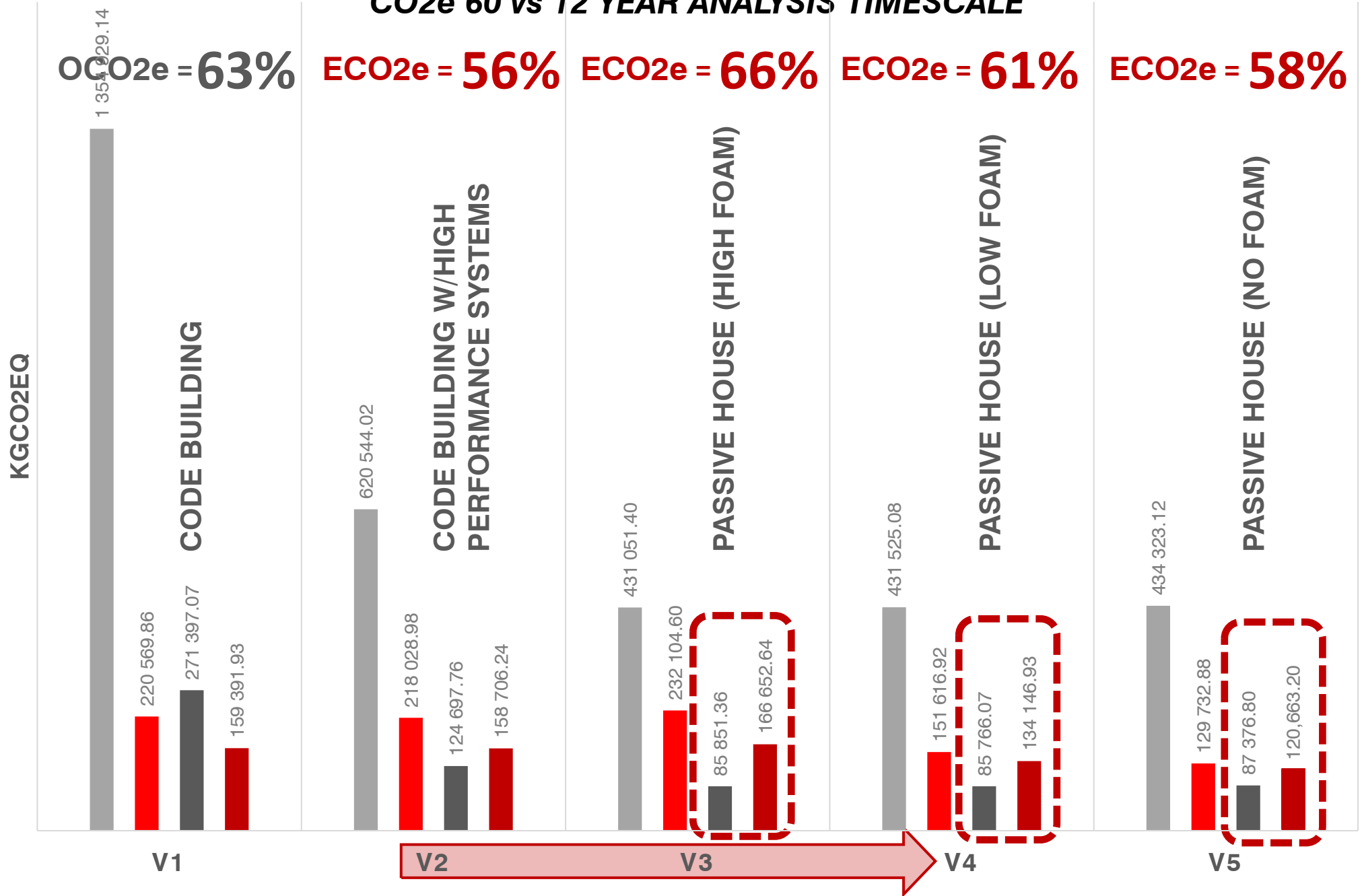
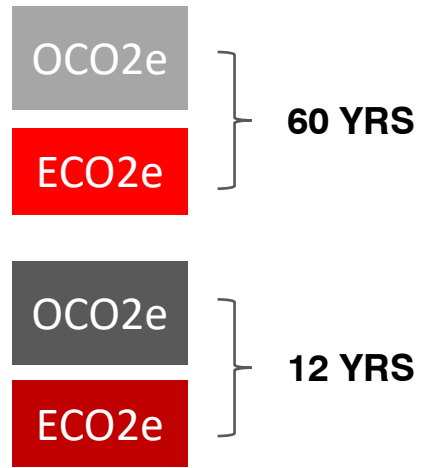


# CO2e 60 vs 12 YEAR ANALYSIS TIMESCALE

## PASSIVE HOUSE (HIGH FOAM)



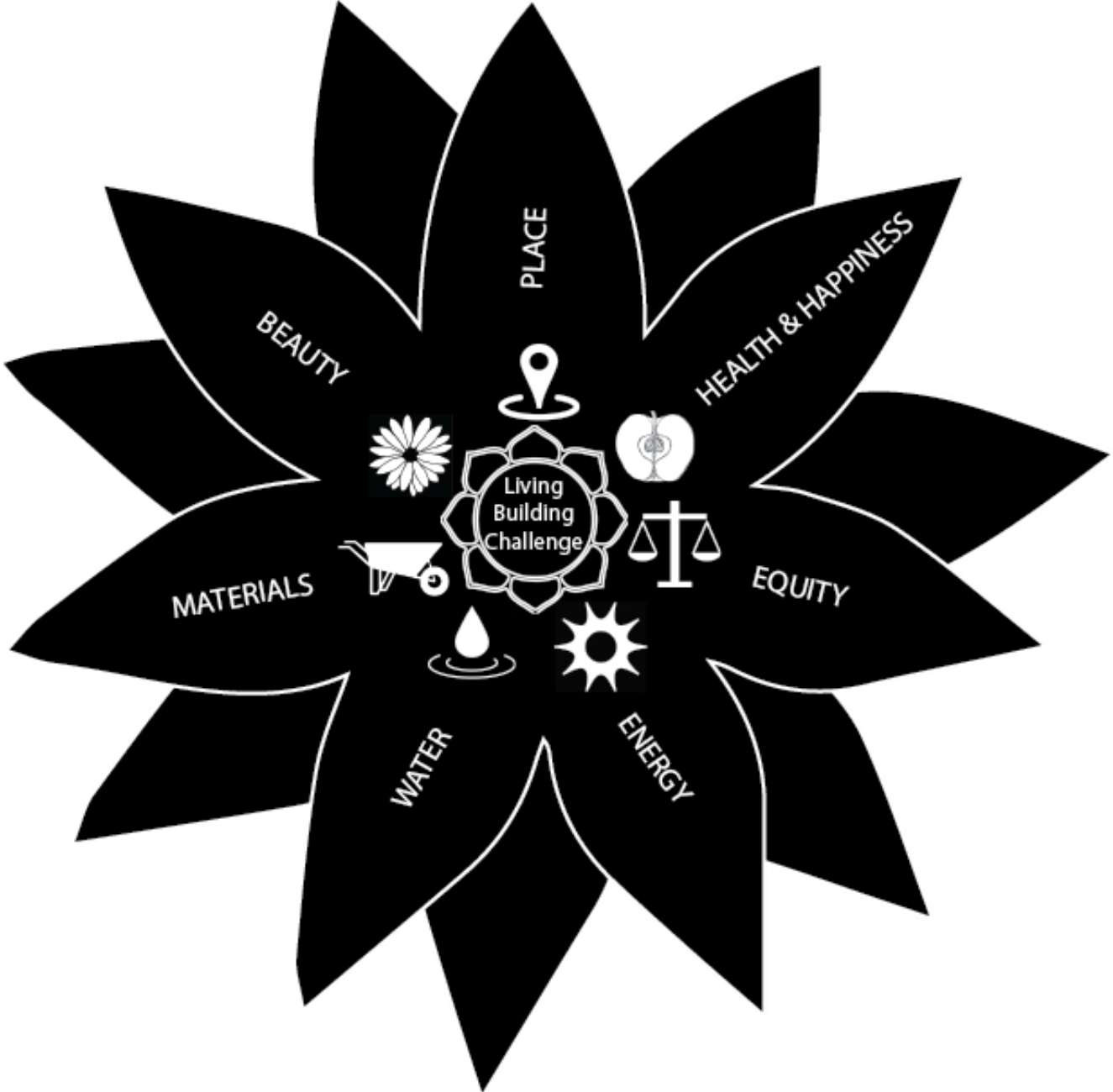
# CO2e 60 vs 12 YEAR ANALYSIS TIMESCALE



# NUTHATCH HOLLOW A Living Building Challenge and Passive House Project

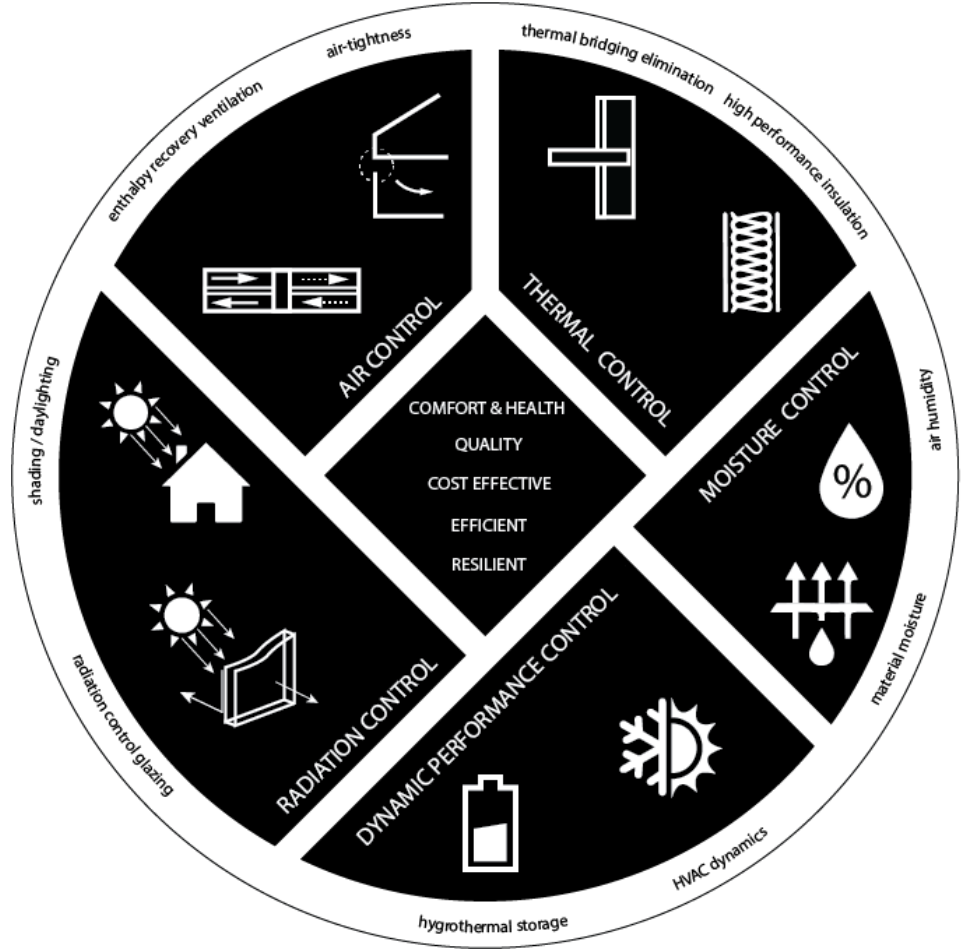
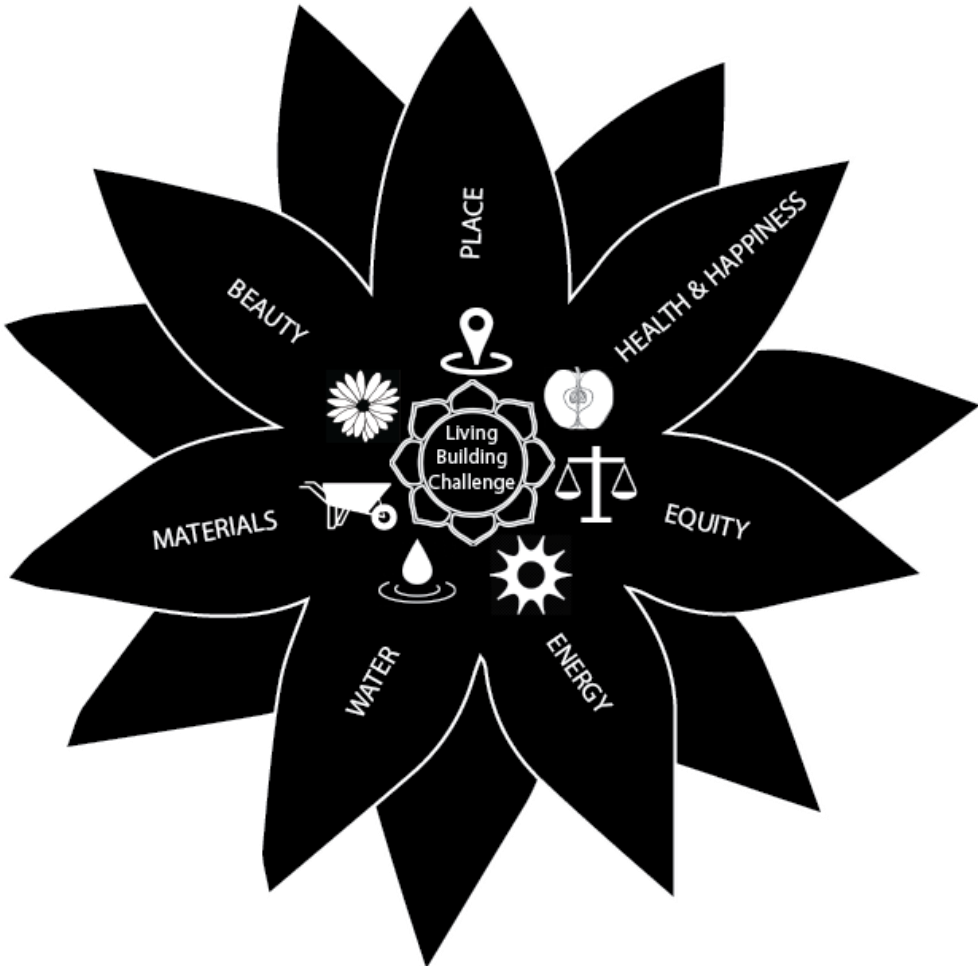


Living Building Challenge





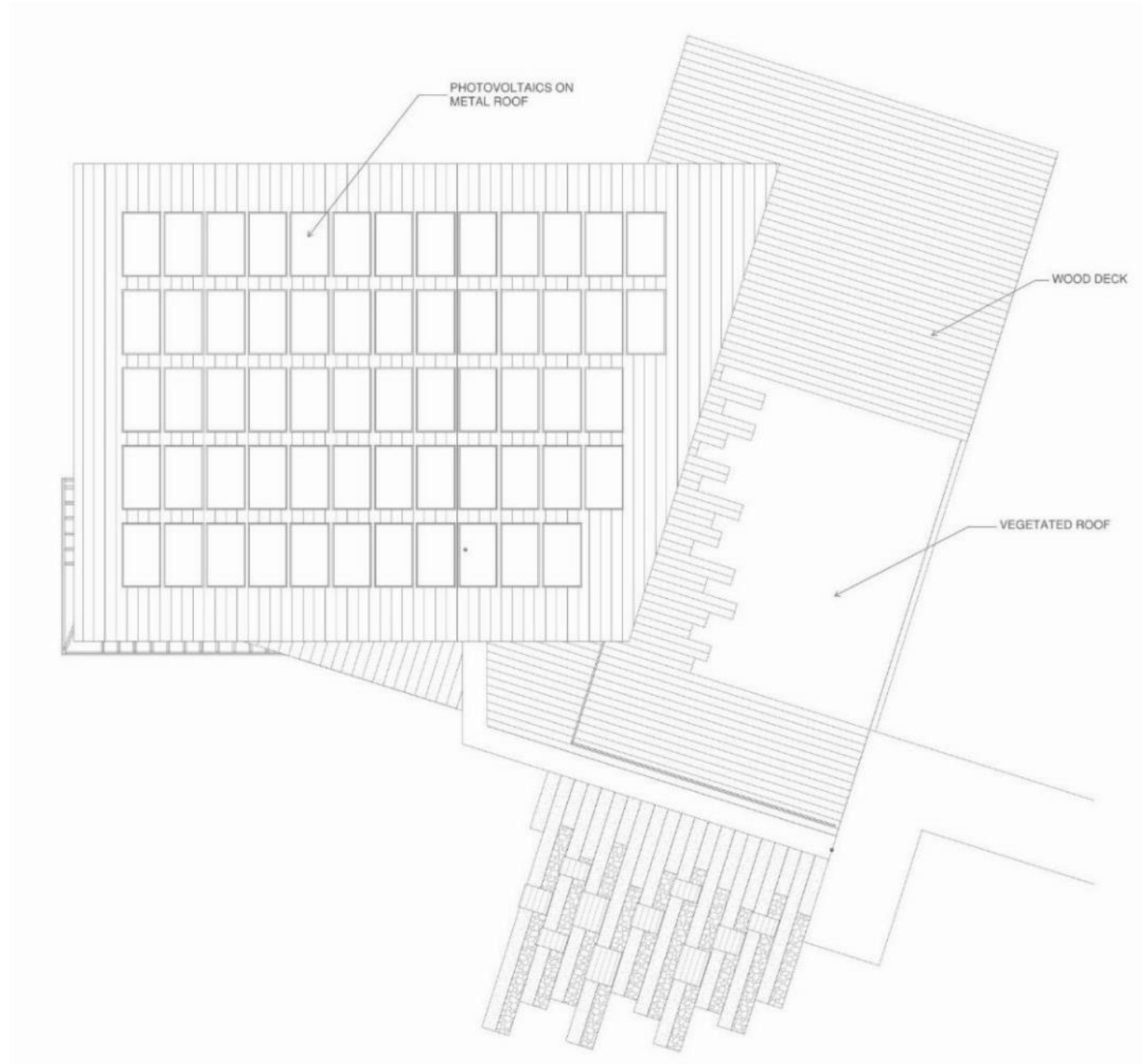
# Living Building Challenge and Passive House



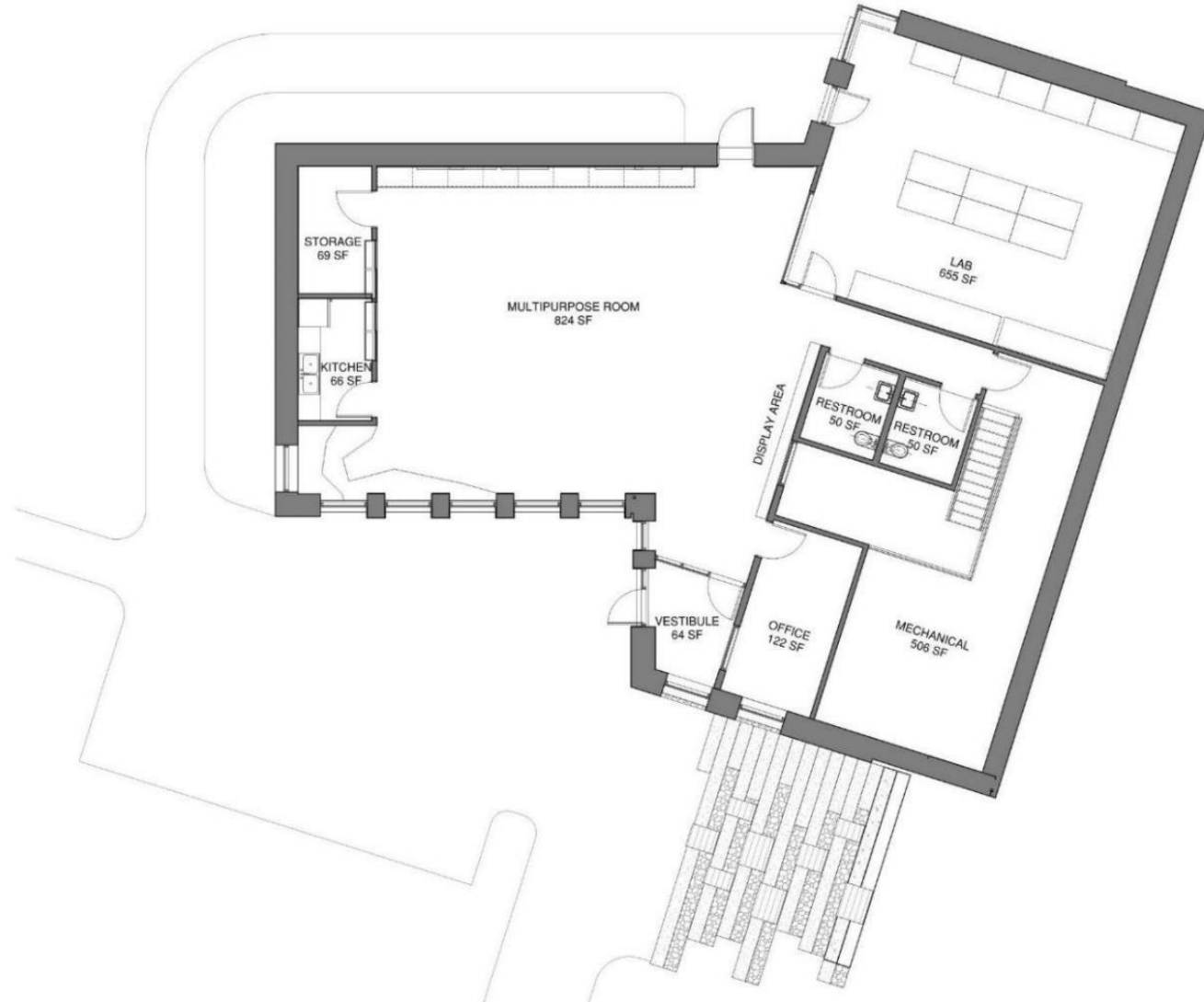
# NUTHATCH HOLLOW A Living Building Challenge and Passive House Project



# NUTHATCH HOLLOW Roof Plan



# NUTHATCH HOLLOW Floor Plan



# NUTHATCH HOLLOW A Living Building Challenge and Passive House Project



# KELLER CENTER



Harris School of Public Policy  
THE KELLER CENTER

The Harris School of Public Policy  
University of Chicago

# BUILDING HISTORY

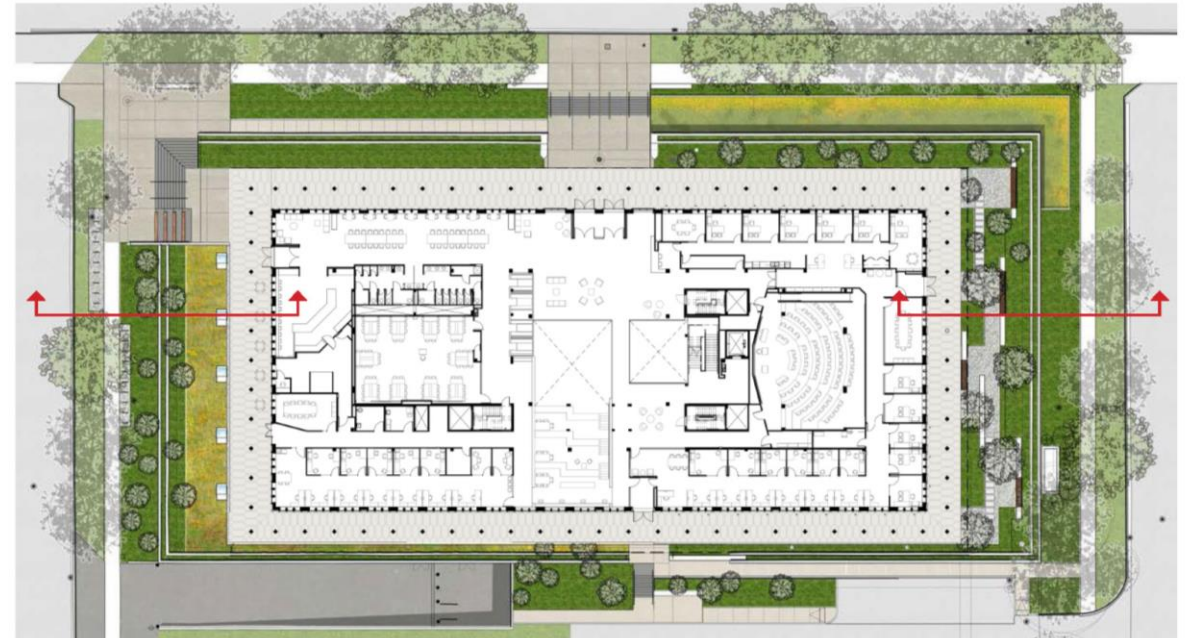
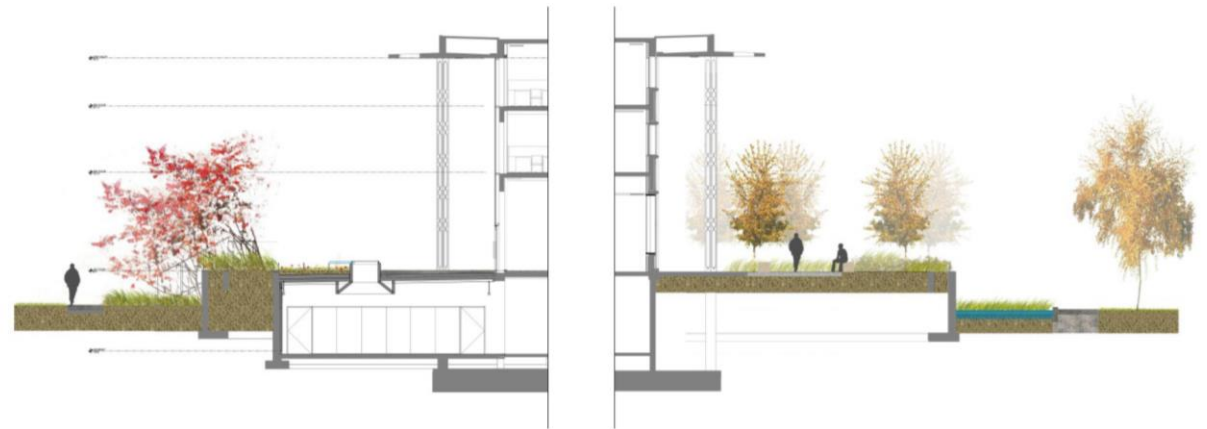
1963, EDWARD DURRELL STONE – KELLOGG CENTER





## DESIGN OVERVIEW

WELCOMING SITE APPROACH

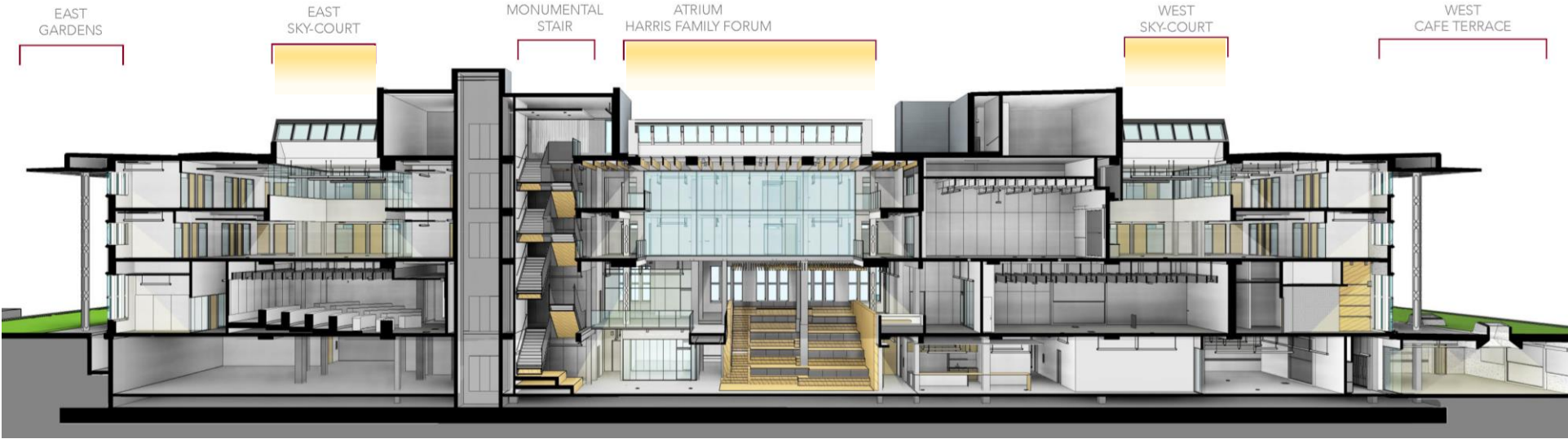




# DESIGN OVERVIEW

## NATURAL DAYLIGHTING

### NEW EAST-WEST SECTION



288'

### EXISTING BUILDING SECTION





**MATERIALS**



**EQUITY**



**BEAUTY**



**LIVING BUILDING CHALLENGE<sup>SM</sup>**  
**PETAL CERTIFICATION**



**LEED PLATINUM**

# SUSTAINABILITY CERTIFICATION

LBC PETAL + LEED PLATINUM

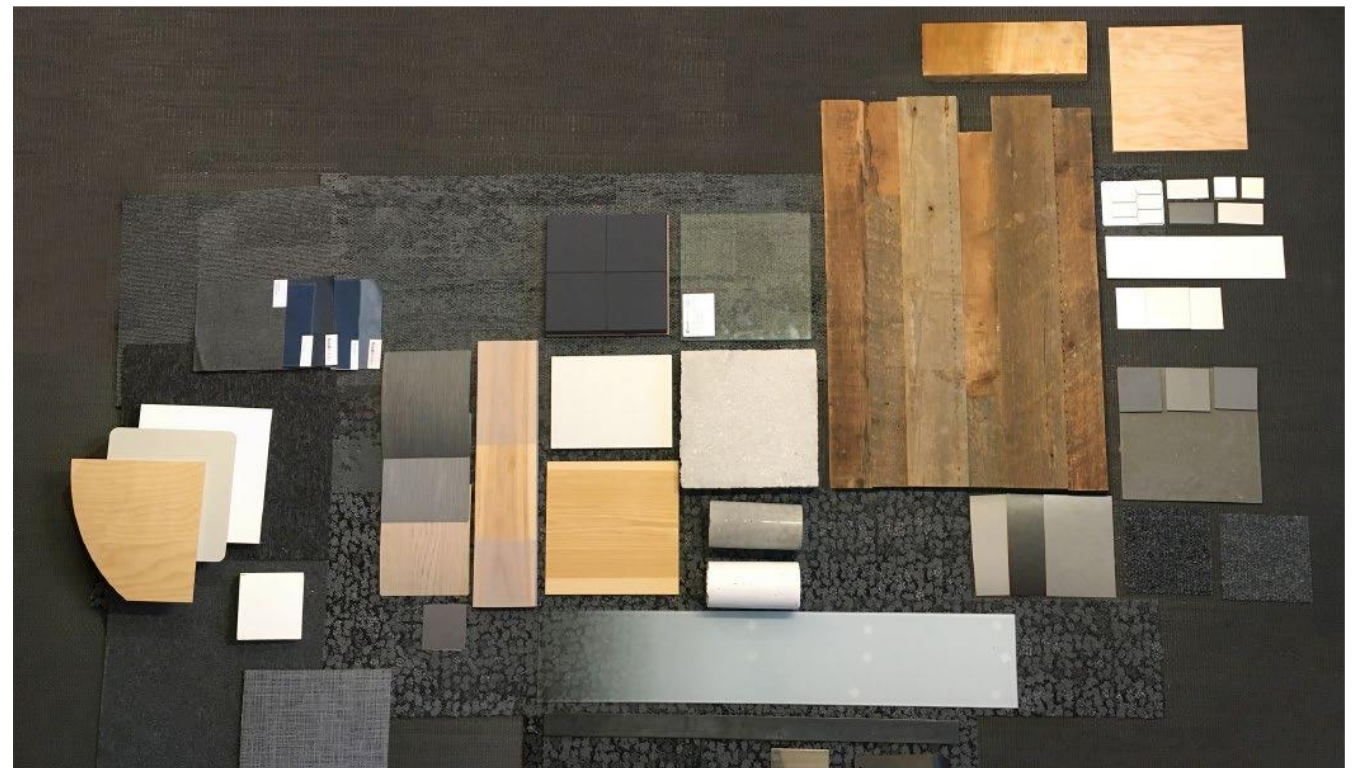
PETAL	IMPERATIVE
PLACE	01. LIMITS TO GROWTH
	02. URBAN AGRICULTURE
	03. HABITAT EXCHANGE
	04. HUMAN-POWERED LIVING
WATER	05. NET POSITIVE WATER
ENERGY	06. NET POSITIVE ENERGY
HEALTH & HAPPINESS	07. CIVILIZED ENVIRONMENT
	08. HEALTHY INTERIOR ENVIRONMENT
	09. BIOPHILIC ENVIRONMENT
MATERIALS	10. RED LIST
	11. EMBODIED CARBON FOOTPRINT
	12. RESPONSIBLE INDUSTRY
	13. LIVING ECONOMY BUILDING
EQUITY	14. NET POSITIVE WASTE
	15. HUMAN SCALE + HUMANE PLACES
	16. UNIVERSAL ACCESS TO NATURE + PLACE
	17. EQUITABLE INVESTMENT
BEAUTY	18. JUST ORGANIZATIONS
	19. BEAUTY + SPIRIT
	20. INSPIRATION + EDUCATION



**MATERIALS RED LIST**

## INTERIOR MATERIAL PALETTE

- NATURAL MATERIALS
- EXPOSED STEEL
- EXPOSED CONCRETE
- SALVAGED WOOD

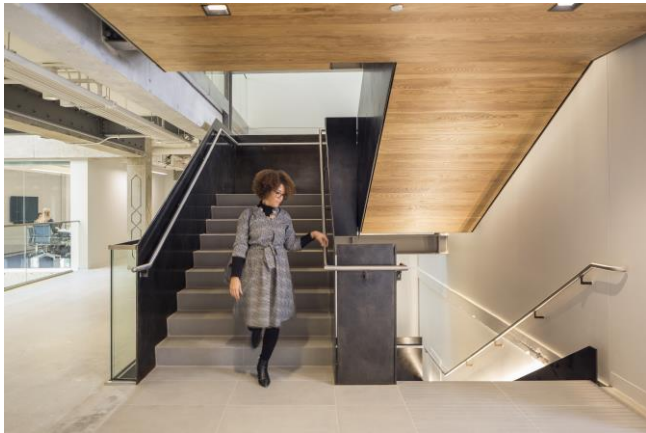
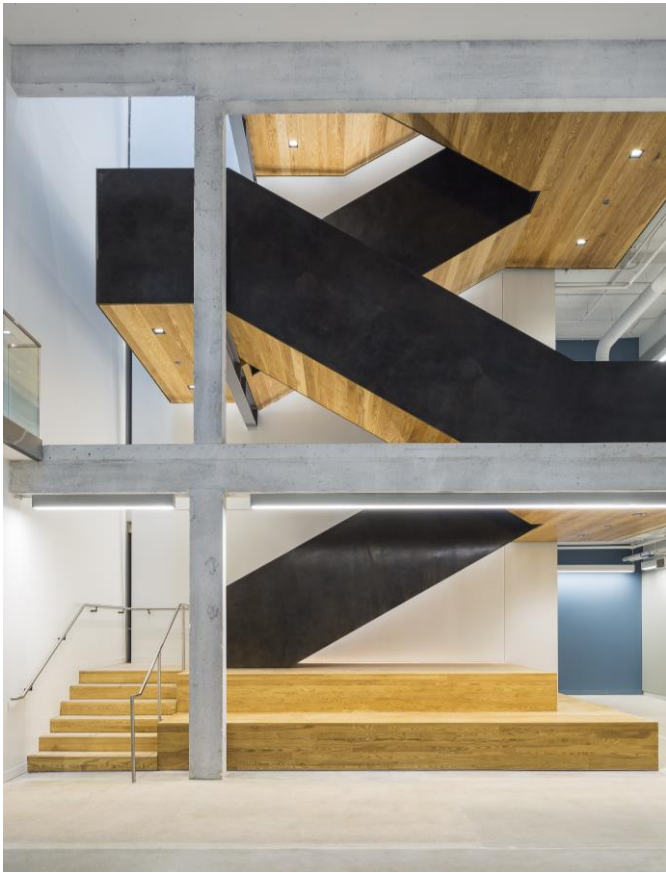


## EXTERIOR MATERIAL PALETTE

- NATURAL MATERIALS
- ZINC 100 YEAR MATERIAL
- COPPER RADIANT CEILING
- RESTORE LIMESTONE





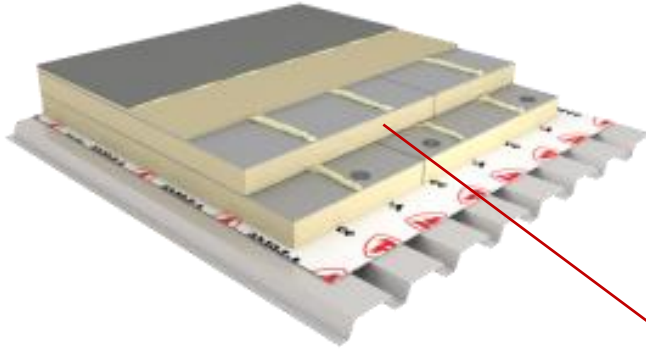


# Firestone

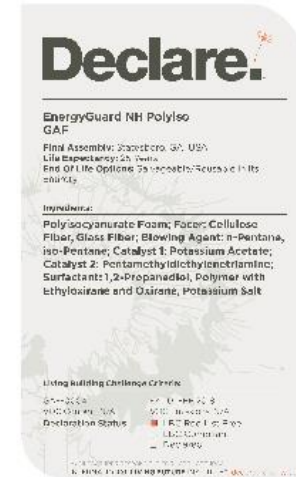
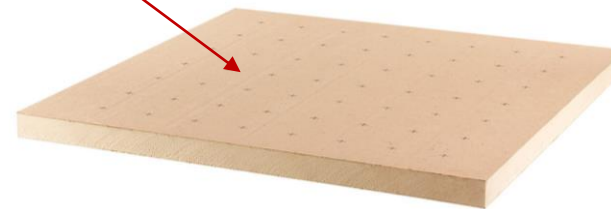
## BUILDING PRODUCTS

## ROOFING SYSTEM WARRANTY MODIFICATION

EPDM ROOFING SYSTEM = 25 PRODUCTS = 23 COMPLIANT  
345 Page Submittal PRODUCTS



- SUBSTITUTE POLYISO INSULATION
- MAINTAIN WARRANTY
- **PRODUCT INSTALLED**



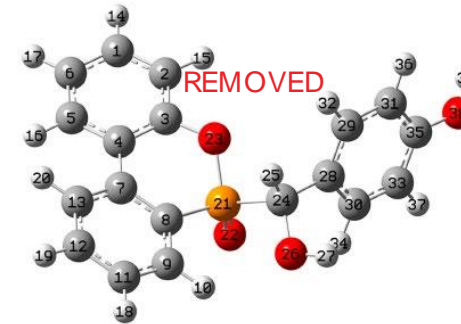


**The REDLIST**

The Living Building Challenge publishes a "Red List" of materials to be avoided in buildings seeking certification under the Living Building Challenge. What's on it?

- Asbestos ● Cadmium ● Chlorinated Polyethylene and Chlorosulfonated Polyethylene ● Chlorofluorocarbons (CFCs) ● Chloroprene (Neoprene) ● Formaldehyde ● **Halogenated Flame Retardants** ● Hydrochlorofluorocarbons (HCFCs) ● Lead ● Mercury ● Petrochemical Fertilizers and Pesticides ● Phthalates ● Polyvinyl Chloride (PVC) ● Wood treatments containing creosote, arsenic or pentachlorophenol ●

FIRST CONTACT : APRIL 2016



COMPLIANT DOCUMENTATION : APRIL 2016

RESULTED IN 4 DECLARE  
LABELED FIREPROOFING  
SYSTEM PRODUCTS !!!

MONOKOTE PRODUCT LINE

**Declare.**

**Monokote MK-6/HY**  
GCP- Applied Technologies  
Final Assembly: Santa Ana, California, USA  
Life Expectancy: Life of Structure  
End of Life Options: Landfill (100%)

Ingredients:  
Calcium Sulfate, Cellulosic Fiber, Expanded Polystyrene, Calcium Carbonate, Proprietary Ingredients (<1%)\*

\*LBC Temp Exception I10-E4 Proprietary Ingredients <1%

**Living Building Challenge Criteria:**

WRG-2001 VOC Content: 0 g/L	EXP: 01 FEB 2020 VOC Emissions: CDPH Compliant
<b>Declaration Status</b>	<input type="checkbox"/> LBC Red List Free
	<input checked="" type="checkbox"/> LBC Compliant
	<input type="checkbox"/> Declared

MANUFACTURER RESPONSIBLE FOR LABEL ACCURACY  
INTERNATIONAL LIVING FUTURE INSTITUTE™ [declareproducts.com](http://declareproducts.com)

**Declare.**

**Monokote Z-106/HY**  
GCP- Applied Technologies  
Final Assembly: Santa Ana, California, USA  
Life Expectancy: 50 Years  
End of Life Options: Landfill (100%)

Ingredients:  
Portland Cement, Calcium Sulfate, Cellulosic Fiber, Fullers Earth, Expanded Polystyrene, Chopped Glass Fiber, Proprietary Ingredients (<1%)\*

\*LBC Temp Exception I10-E4 Proprietary Ingredients <1%

**Living Building Challenge Criteria:**

WRG-2004 VOC Content: 0 g/L	EXP: 01 FEB 2020 VOC Emissions: N/A
<b>Declaration Status</b>	<input type="checkbox"/> LBC Red List Free
	<input checked="" type="checkbox"/> LBC Compliant
	<input type="checkbox"/> Declared

MANUFACTURER RESPONSIBLE FOR LABEL ACCURACY  
INTERNATIONAL LIVING FUTURE INSTITUTE™ [declareproducts.com](http://declareproducts.com)

**Declare.**

**Monokote MK-10/HB**  
GCP- Applied Technologies  
Final Assembly: Santa Ana, California, USA  
Life Expectancy: Life of Structure  
End of Life Options: Landfill (100%)

Ingredients:  
Calcium Sulfate, Calcium Carbonate, Cellulosic Fiber, Expanded Polystyrene, Quartz

**Living Building Challenge Criteria:**

WRG-2011 VOC Content: 0 g/L	EXP: 01 FEB 2020 VOC Emissions: CDPH Compliant
<b>Declaration Status</b>	<input checked="" type="checkbox"/> LBC Red List Free
	<input type="checkbox"/> LBC Compliant
	<input type="checkbox"/> Declared

MANUFACTURER RESPONSIBLE FOR LABEL ACCURACY  
INTERNATIONAL LIVING FUTURE INSTITUTE™ [declareproducts.com](http://declareproducts.com)

**Declare.**

**Monokote Z-146**  
GCP- Applied Technologies  
Final Assembly: Santa Ana, California, USA  
Life Expectancy: 50 Years  
End of Life Options: Landfill (100%)

Ingredients:  
Aluminium Ore, Fuller's Earth, Cellulosic Fiber, Expanded Polystyrene, Portland Cement, Chopped Glass Fiber, Quartz

**Living Building Challenge Criteria:**

WRG-2007 VOC Content: 0 g/L	EXP: 01 FEB 2020 VOC Emissions: CDPH Compliant
<b>Declaration Status</b>	<input checked="" type="checkbox"/> LBC Red List Free
	<input type="checkbox"/> LBC Compliant
	<input type="checkbox"/> Declared

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# KELLER CENTER

Policy and Social Impact  
On Display

