CreekView Phase II

Using Passive House as a Guide for DeCarbonization

phius con
MILWAUKEE 2025

SUSTAINABLE COMFORT

CreekView Phase II: Using Passive House as a Guide for DeCarbonization

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Outline

- Project Overview
- 8-Plex Design
- MEP Overview
- Why Ground Source Heat Pump?
- Carbon Emissions
- PV Comparison – Phius vs Code
- Predicting Building Performance
- Building Envelope
- What Could a Future Project Do
- Questions?

Project Overview

The Journey


RiverKnoll at Radisson
CreekView Apartments Phase I
CreekView Apartments Phase II

Project Team

BALDWIN

a DiMarco Group company

DIMARCO GROUP

DiMarco Constructors

Phase I

Glasow Architecture

EC4B engineering, p.c.

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Phase II

SWBR

VANHEE Mechanical

RiverKnoll at Radisson

80-unit 8-Plex project in Baldwinsville, NY
10 buildings – 1, 2, 3 bedrooms
Completed in 2015

Funding:
Homes and Community Renewal (HCR)
9% LIHTC
NYSERDA Low-rise Residential New Construction Program
$200,000 total incentives, $2,000/unit with $500/unit affordable housing adder.

Riverknoll Construction

HERS Index	64
Carbon Index	128
Wall	R-21 batt advanced framing
Windows	U-0.3, SHGC-0.26
Air Barrier	Taped Tyvek
Roof	R-38 Batts
Slab	R-10 4' Depth
Heating/Cooling	Gas Furnaces, 14 SEER AC
Ventilation	Exhaust Only
Hot Water	0.67 EF Gas Storage
Appliances	Energy Star Appliances
Lighting	LED/CFL Lighting

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LEED® FOR HOMES

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CreekView Apartments Phase I

1st affordable upstate NY Phius certified project

96-unit 8-Plex project in Canandaigua, NY
12 buildings – 1, 2, 3 bedrooms
Completed in 2019

CreekView I Construction

HERS Index	46
Carbon Index	51
Wall	R-37 Total: R-21 Cavity + R-19ci
Windows	U-0.15, SHGC-0.33 Casements
Air Barrier	Fluid applied air barriers
Roof	R-59-78 Blown in
Slab	R-15 continuous under slab
Heating/Cooling	Ductless Mini Splits, 10 HSPF 18 SEER
Ventilation	Unitary Energy Recovery Ventilation
Hot Water	1 BR: Instant Gas, 2-3BR: Electric Resistance
Appliances	Energy Star Appliances
Lighting	LED Lighting

Funding:
Homes and Community Renewal (HCR)
9% LIHTC
NYSERDA Low-rise Residential New Construction Program
$78,600 total incentives, $1,000/unit for the first 50, $600 for the remaining 46.

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ZERO ENERGY READY HOME U.S. DEPARTMENT OF ENERGY
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CreekView Apartments Phase II

Continuation of prior development project
72-unit 8-Plex project in Canandaigua, NY
9 buildings – 1, 2, 3 bedrooms
Under Construction

NEW YORK STATE OF OPPORTUNITY. Buildings of Excellence Award Winner

CreekView II Construction

HERS Index	11
Carbon Index	20
Wall	R-37 Total: R-21 Cavity + R-19ci
Windows	U-0.15, SHGC-0.33 Casements
Air Barrier	Fluid applied air barriers
Roof	R-59-78 Blown in
Slab	R-15 continuous under slab
Heating/Cooling	Ground Source Heat Pumps
Ventilation	Central Energy Recovery Ventilation
Hot Water	Ground Source Heat Pumps
Appliances	Energy Star Appliances
Lighting	LED Lighting
Solar	Rooftop PV
EV Charging	EV Charging

Funding:
Homes and Community Renewal (HCR) 9% LIHTC
NYSERDA:
- Low-rise Residential New Construction Program
    - $288,000 total incentives, $4,000/unit
- Building of Excellence – Demonstration Winner
    - $1 Million
- Building of Excellence – Early Design Support Winner
    - $150,000

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The Importance of Funding

NYSERDA, HCR, CEI, Stretch Code, State Initiatives / Mass Save, Mass Stretch. Mortgage industry.
Property Assessed Clean Energy Financing (PACE)

NYSERDA Funding

- **Buildings of Excellence (BOE) - Demonstration Award**
- **NYSERDA New Construction – Housing Program**
- **NY-SUN (solar incentives)**
- **Buildings of Excellence - Early Design Support (EDS)**
  - Funds early integration of carbon-neutral strategies.
  - Targets the initial design stage for maximum impact.
  - Supports testing of new systems, materials, and tools.

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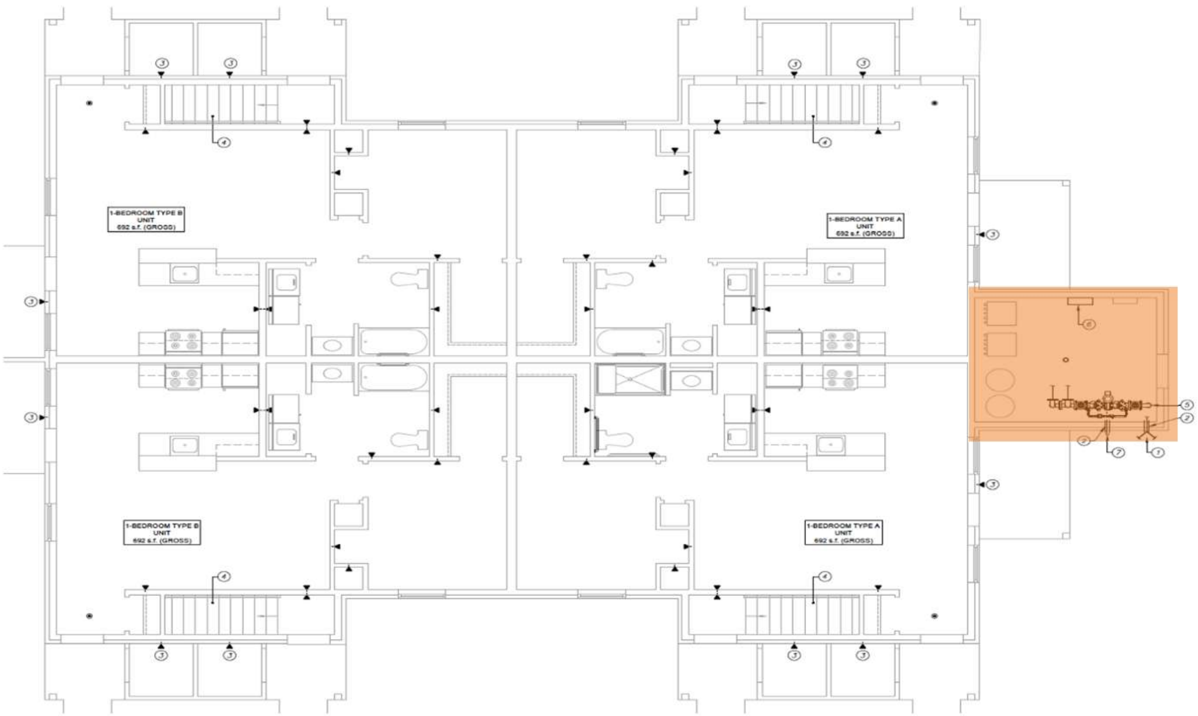
8-Plex Design

Floor Plans

1-BEDROOM TYPE B
UNIT
692 s.f. (GROSS)
1-BEDROOM TYPE A
UNIT
692 s.f. (GROSS)
1-BEDROOM TYPE B
UNIT
692 s.f. (GROSS)
1-BEDROOM TYPE A
UNIT
692 s.f. (GROSS)

Floor Plans – Phase II



Property	Riverknoll	CreekView Phase I	CreekView Phase II
Location	Baldwinsville, NY	Canandaigua, NY	**Canandaigua, NY**
Year Completed	2015	2019	**2026**
Wall	R 21 total. Batt plus advanced framing	R 37 total. R 21 cavity plus R 19 ci	**R 37 total. R 21 cavity plus R 19 ci**
Windows	U 0.3, SHGC 0.26. Double hung	U 0.15, SHGC 0.33. Casements	**U 0.15, SHGC 0.33. Casements**
Air Barrier	Taped Tyvek	Fluid applied air barriers	**Fluid applied air barriers**
Roof	R 38 batts	R 59 to 78 blown	**R 59 to 78 blown cellulose**
Slab	R 10 perimeter	R 20 under slab	**R 20 under slab**
Heating and Cooling	Gas furnaces, SEER AC	Ductless mini splits. 10 HSPF, 18 SEER	**GSHP to ducted air handler. 3.3 COP**
Ventilation	Exhaust only	Unitary ERV. 77% eff	**Shared ERV. 77% eff**
Hot Water	0.67 EF gas storage	1 BR gas. 2 to 3 BR electric resistance	**Central GSHP. 3.3 COP**
Appliances	Energy Star appliances	Energy Star appliances	**Energy Star appliances**
Lighting	LED and CFL lighting	LED lighting	**LED lighting**
Solar	-	-	**339 kW rooftop PV**
EV Charging	-	-	**(6) EV stations plus (36) EV capable**

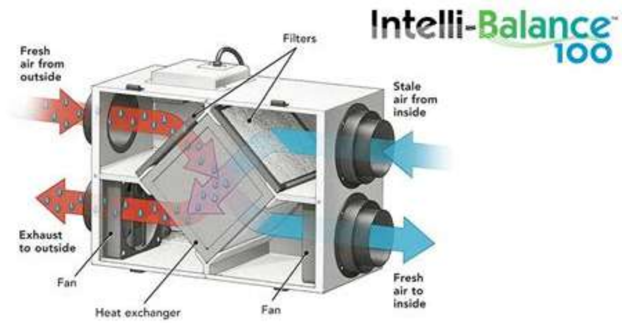
MEP Overview

RiverKnoll at Radisson: MEP Overview

- **Gas Furnaces**
  - Fuel-fired air distribution, Natural gas, 96.5 AFUE.
- **Electric Air Conditioning**
  - 14 SEER
- **Gas Domestic Hot Water**
  - 80% Gas 40-gallon storage tank
- **Bath Fans**
  - Broan Intermittent Bath Fan with smart switch

CreekView Apartments Phase I: MEP Overview

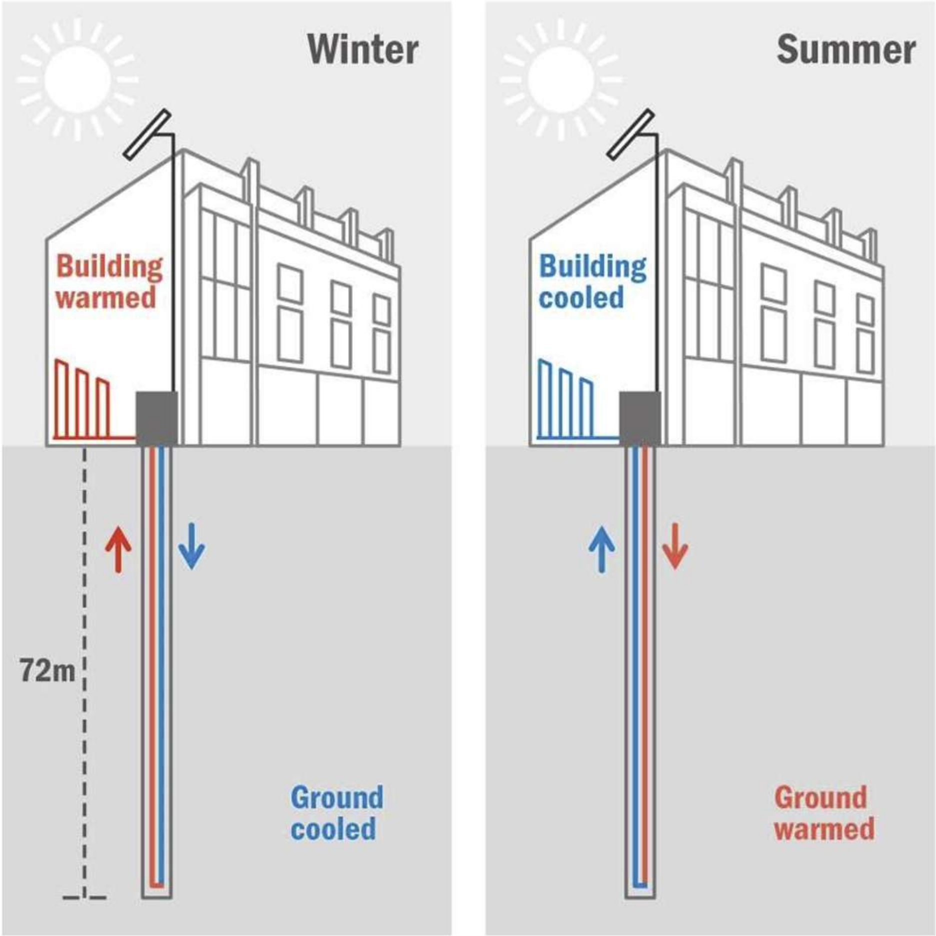
- **Air Source Heat Pumps**
  - 10 HSPF/18 SEER Ductless multi-splits
- **Gas/Electric Domestic Hot Water**
  - 1 Beds: On-demand gas, 93% Eff
  - 2-3 Beds: Electric resistance 40-gallon storage tank
- **ERV Ventilation**
  - ~80% SRE
  - Unitary



CreekView Apartments Phase II: MEP Overview

- **Ground Source Heat Pump Heating, Cooling, & DHW**
  - COP 3.45 water to water geothermal services heating cooling and DHW
- **ERV Ventilation**
  - ~80% SRE
  - Semi-central
- **Solar Power**
  - 339 combined kW
- **EV Charging**
  - 6 EV stations
  - 36 EV capable

Why Ground Source Heat Pump?


Winter
Building warmed
72m
Ground cooled
Summer
Building cooled
Ground warmed

Peak Load Shaving

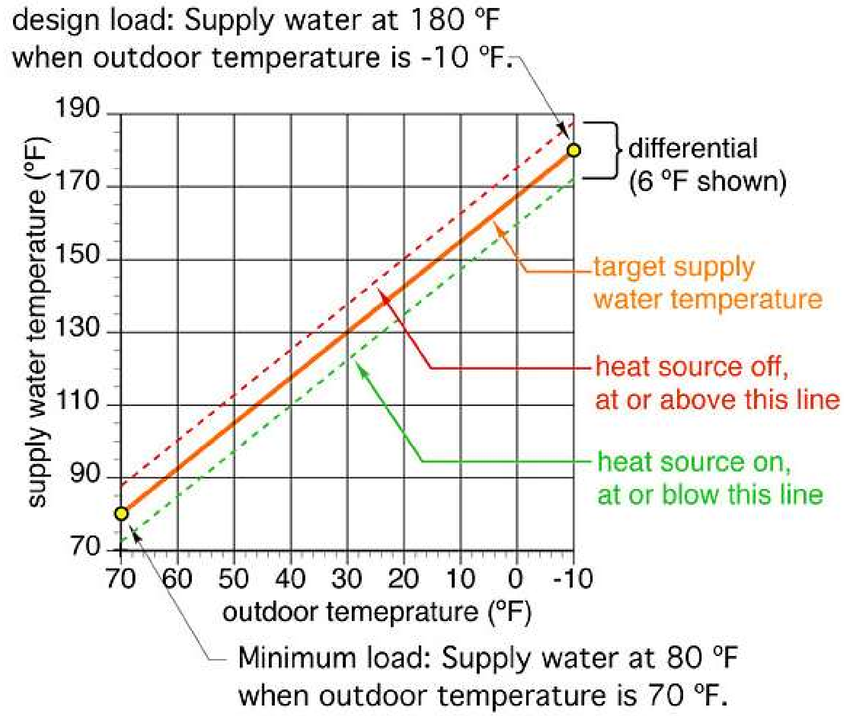
Graphic provided by GridX. https://www.gridx.ai/de/knowledge/peak-shaving

Advanced Controls

Outdoor Reset

- Links outdoor temperature with indoor heat pump, allowing heat pump to control water temp

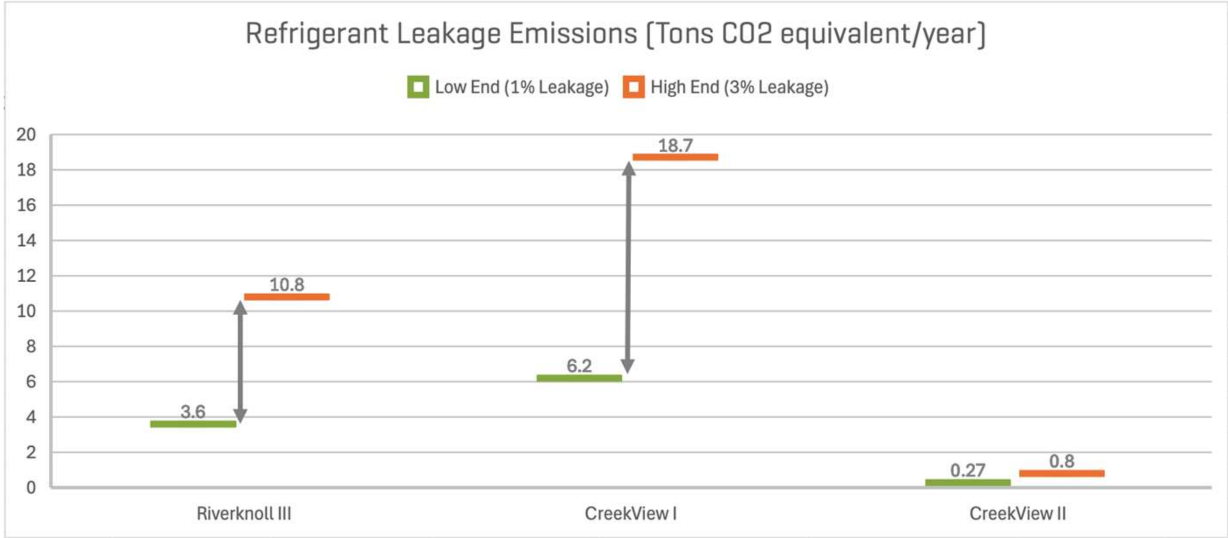
Vecteezy.com

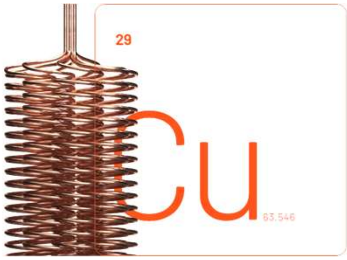


Refrigerant Reduction

97% annual reduction in predicted refrigerant emissions

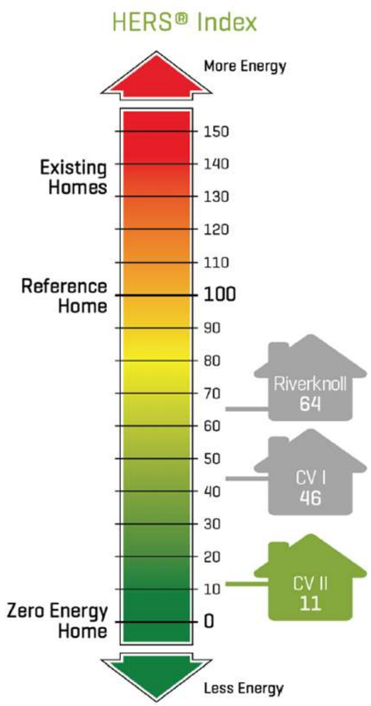
- Minimized leakage
- Less refrigerant used
- Lower Global Warming Potential (GWP) refrigerant (R-454B)

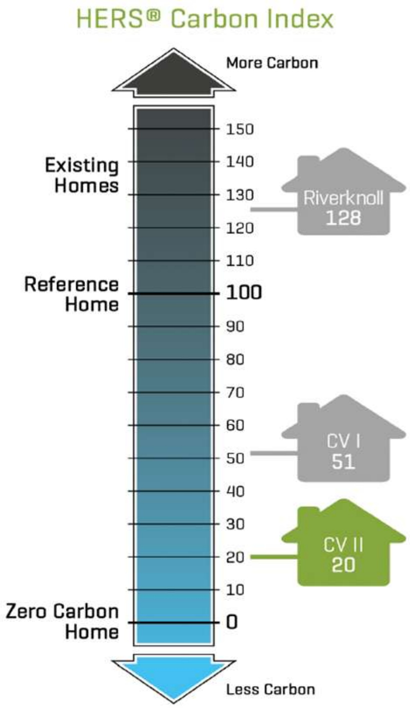




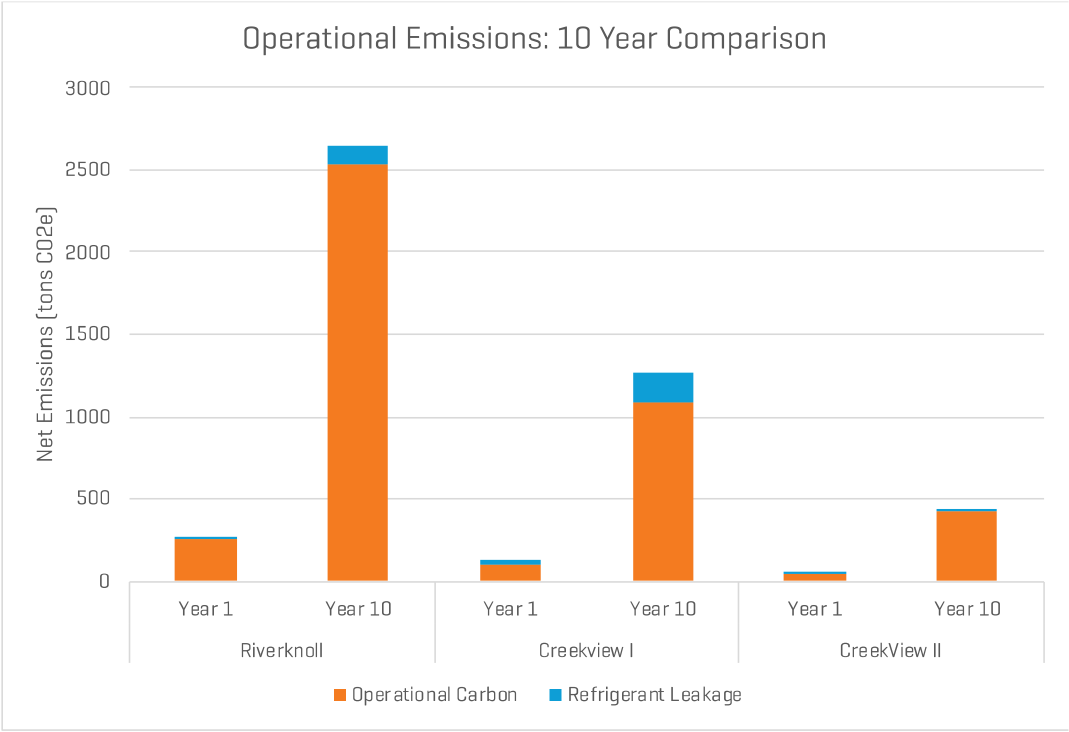
Carbon Emissions

Operational Carbon Emissions

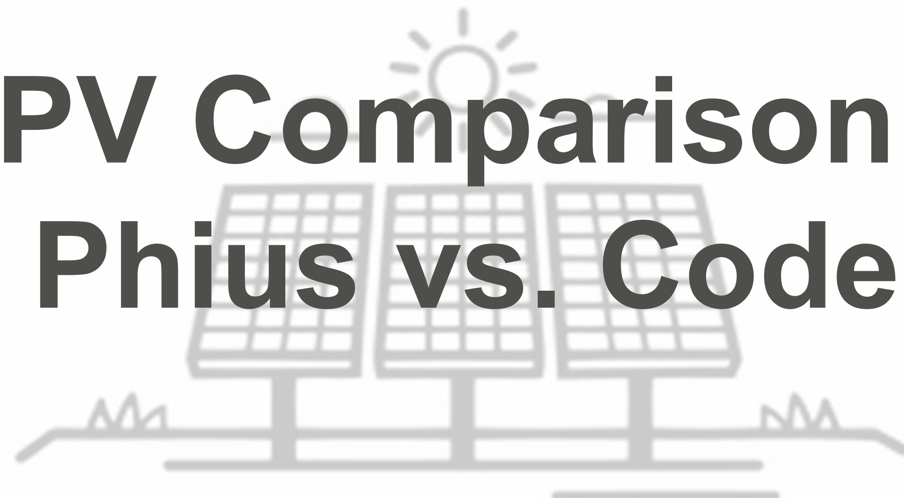




Operational Carbon Emissions



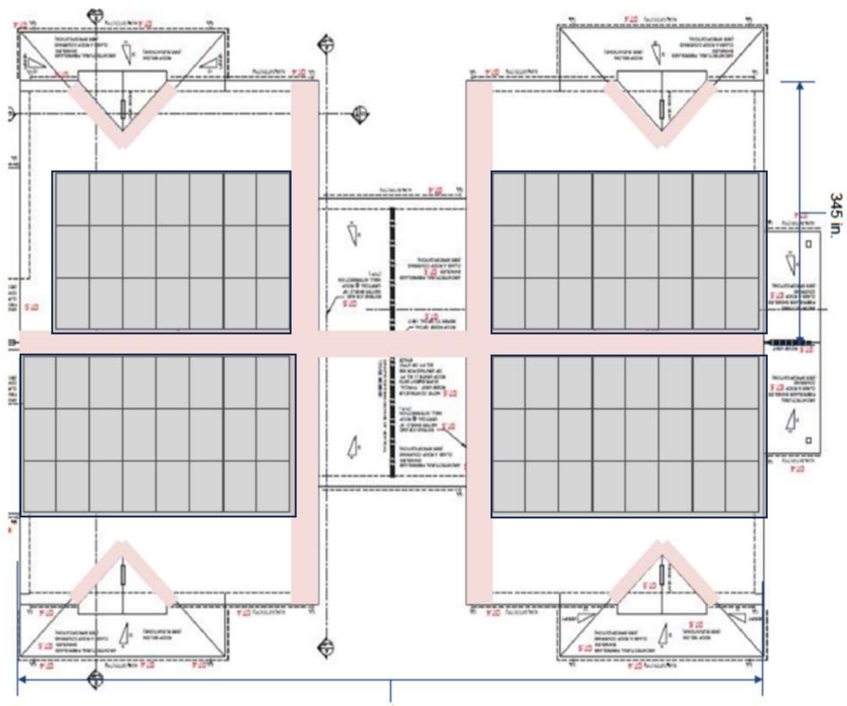
PV Comparison: Phius vs. Code

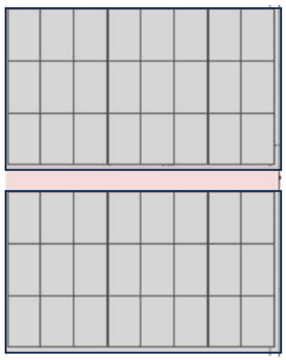


Benefits of Phius Load Reduction

Three Bedroom Solar needs

- Passive Building
  - Per unit 5.6 kW
  - Per building 44.8 kW
- Code Building
  - Per unit 9.5 kW
  - Per building 76 kW
- 41% increase in solar needs





Additional solar needed for code-built building

WUFI vs. Ekotrope:

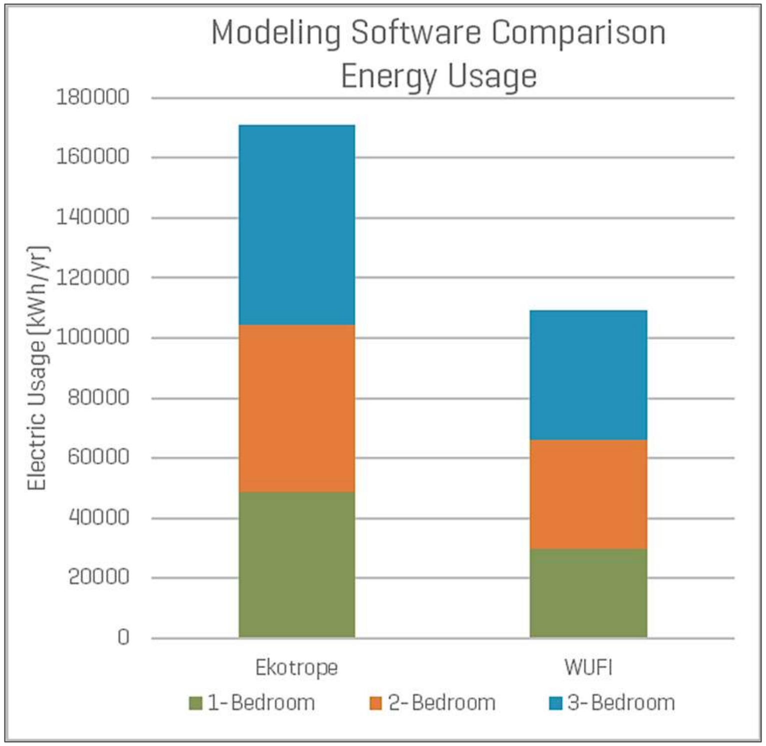
Predicting Building Performance

Energy Modeling Software Comparison

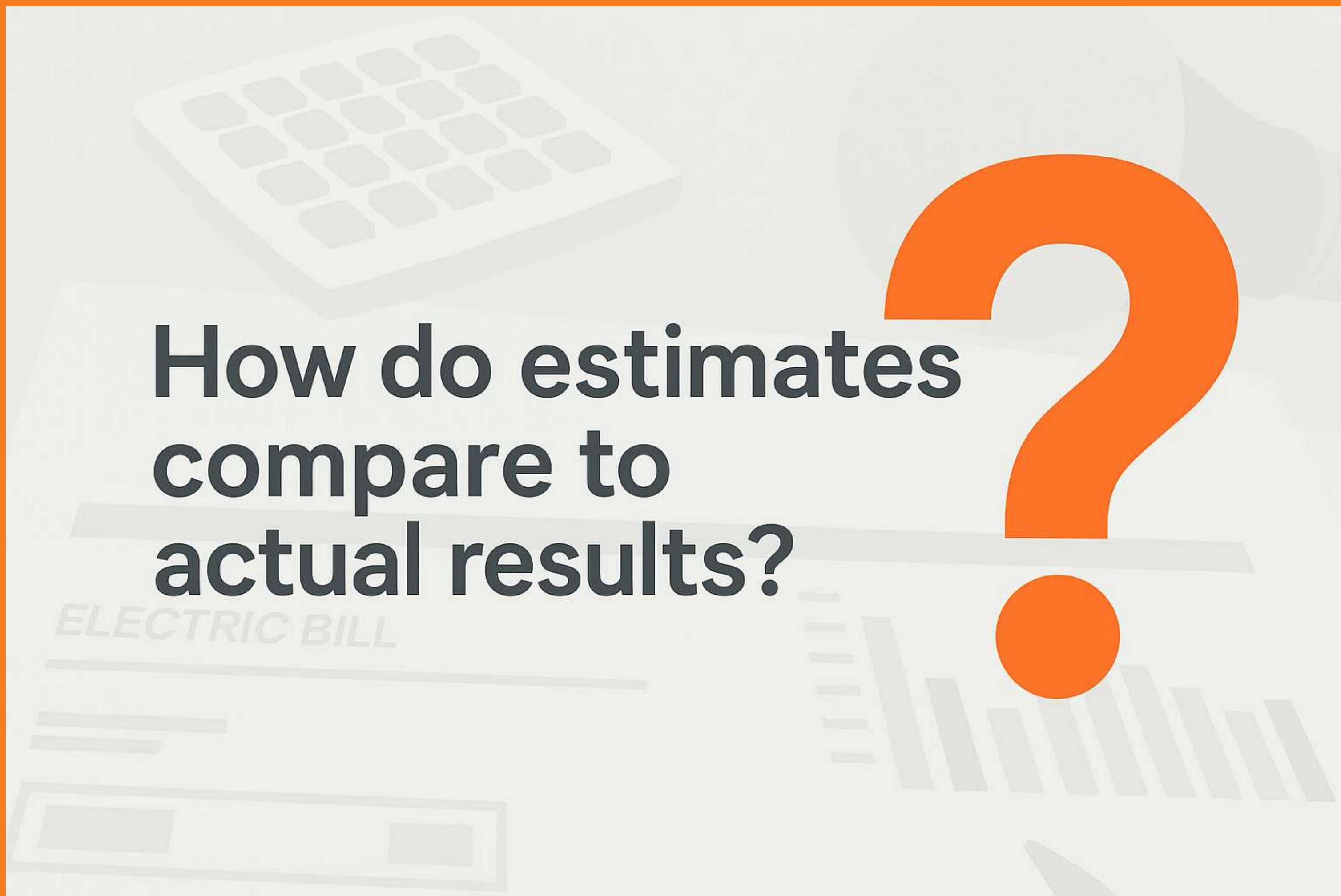
Ekotrope vs WUFI for CreekView Phase II

	ELECTRIC USAGE	
UNIT TYPE	Ekotrope (kWh/yr)	WUFI Model (kWh/yr)
Creekview II 1BR Building	48,560	29,628
CreekView II 2BR Building	56,044	36,649
CreekView II 3BR Building	66,420	43,133
CreekView II Total	513,072	328,230
Difference	36%	

Estimated PV production: 353,808 kWh/yr



How do estimates compare to actual results?



CreekView Phase I - Utility Allowances

Utility Allowance vs. Predicted Performance

Utility Allowance Comparison			
	2024 Actual Utility Allowances	Ekotrope Model	WUFI Model
1 Bedroom ($/Unit/Month)	$ 71	$ 91	$ 76
2 Bedroom ($/Unit/Month)	$ 97	$ 104	$ 83
3 Bedroom ($/Unit/Month)	$ 146	$ 123	$ 106
Total Property ($/Year)	$ 90,562	$ 91,584	$ 76,278
Difference		1%	-16%

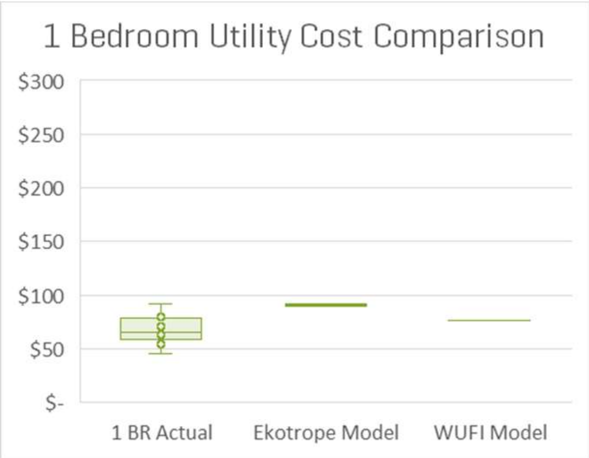
CreekView Phase I - Energy Use Comparison

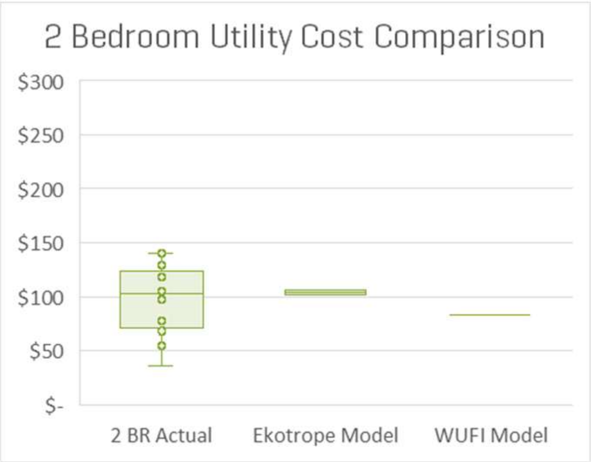
3 sample units extrapolated into the entire property

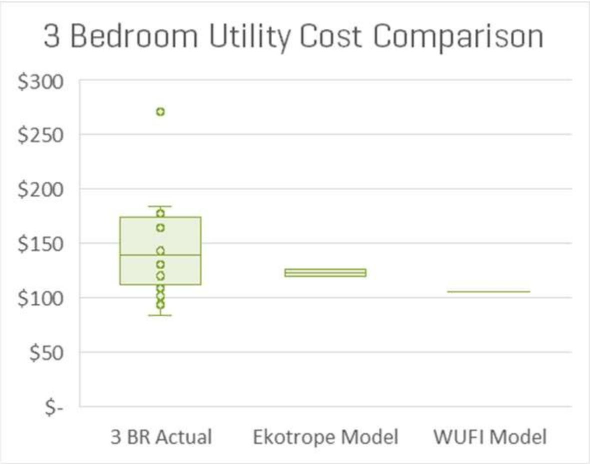
Electric Energy Use Comparison			
	Actual kWh	Ekotrope Model kWh	WUFI Model kWh
Unit 113 - 1 Bedroom	5,959	4,468	3,196
Unit 52 - 2 Bedroom	9,610	7,556	5,629
Unit 45 - 3 Bedroom	11,171	9,301	7,748
Total Property (kWh/Year)	7,700,832	6,141,600	4,773,132
Difference		-20%	-38%

CreekView Phase I – Utility Cost Comparison

Cost Variations







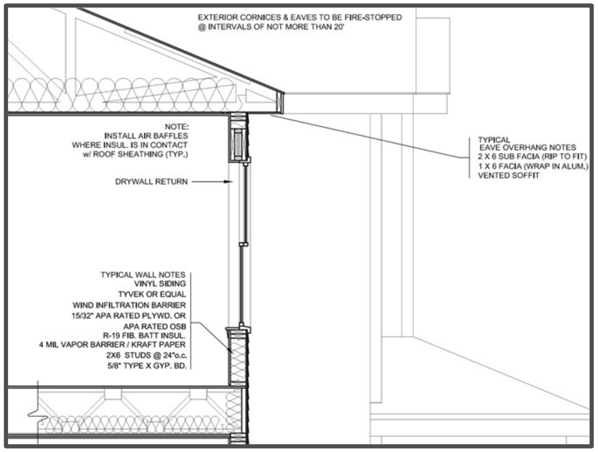
- **Not dependent on building level.**
- **Occupancy dependent**
- **1 Bedroom utility cost allowances may not be inclusive of all cost, because the energy usage in kWh was higher than the energy modeling, but overall cost was lower.**

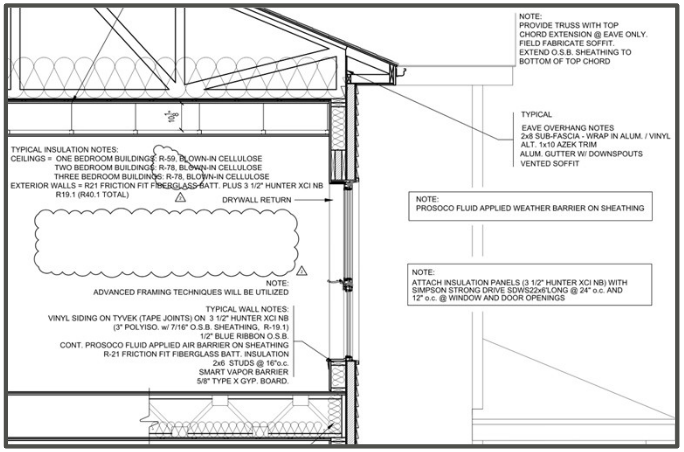
Building Envelope

Envelope Comparison

Assembly Details		
Item	**RiverKnoll**	**CreekView Phase I & II**
Slab	R-10 to 4' Depth	R-15 Continuous Below Slab
Wall	R-19 Batt, Advanced Framing	R-37 Total; R-21 Cavity + R-19 ci
Air Barrier (wall)	Taped Tyvek	Fluid Applied
Windows	Whole Window U-0.30	Whole Window U-0.16 & U-0.17
Roof	R-38 Batt	R-59 – R-79 Blown in

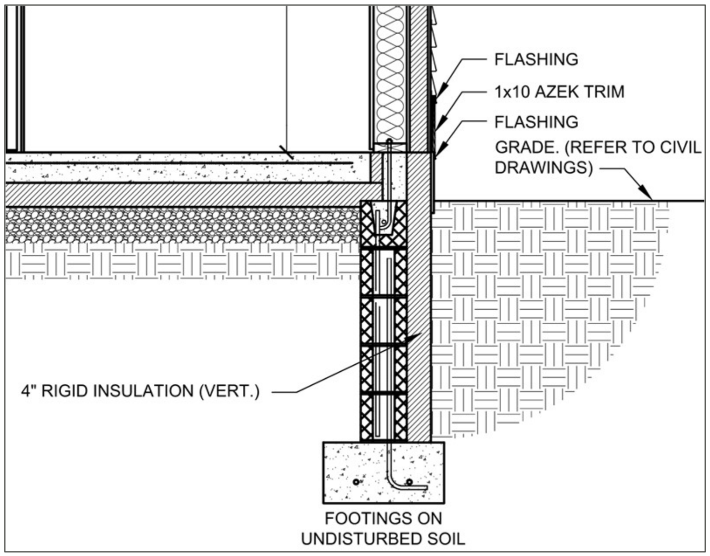
RiverKnoll



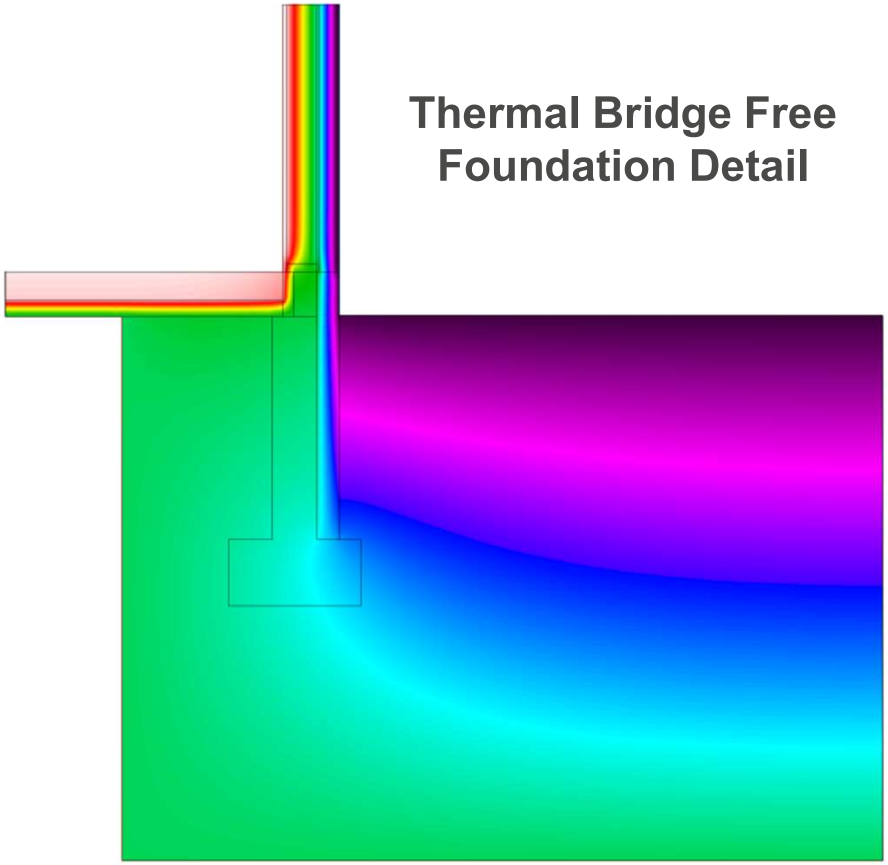


CreekView Phase I & II

Slab and Foundation



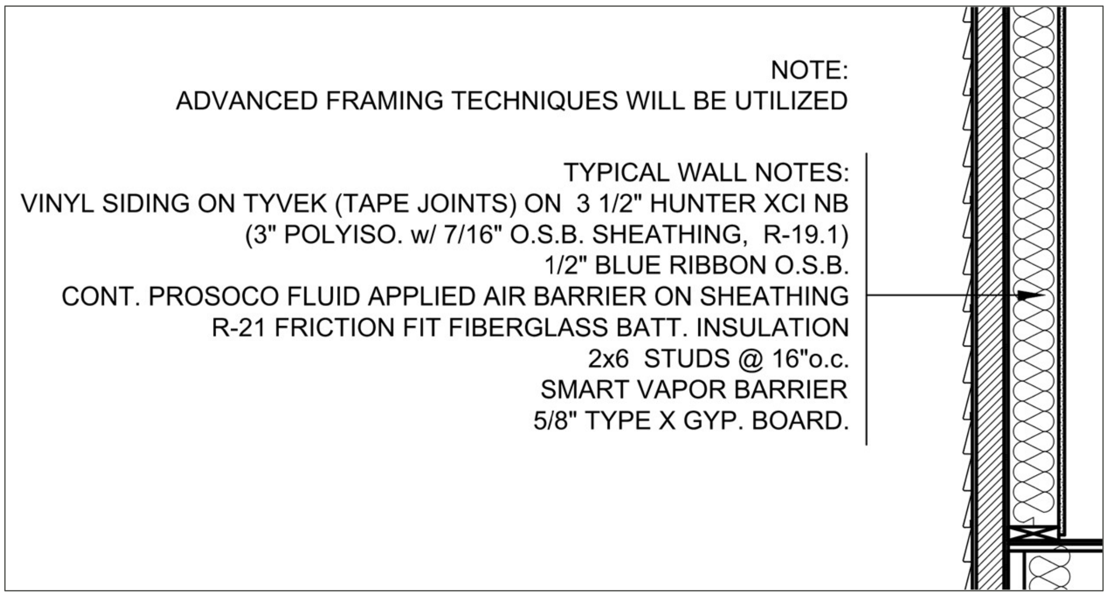
Thermal Bridge Free Foundation Detail

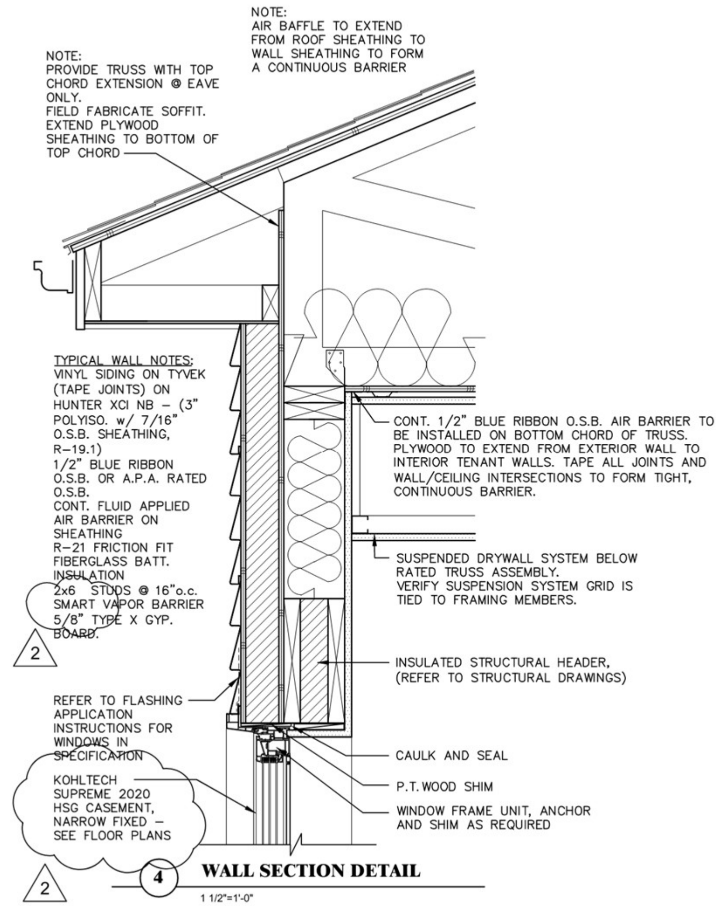


- **Foundation: 4” thick XPS (R-5/inch)**
- **Slab: 3” thick XPS (R-5/inch) under slab**
- **Slab Break: 2” thick XPS (R-5/inch)**

Above Grade Walls

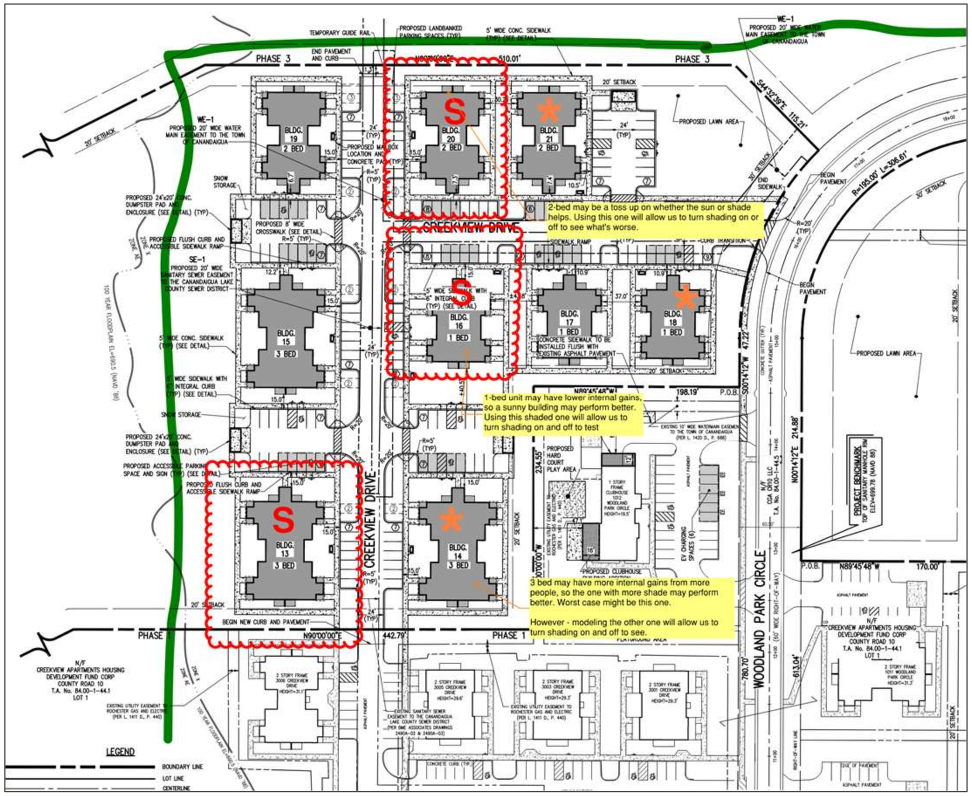
Primary air barrier at inner layer of sheathing



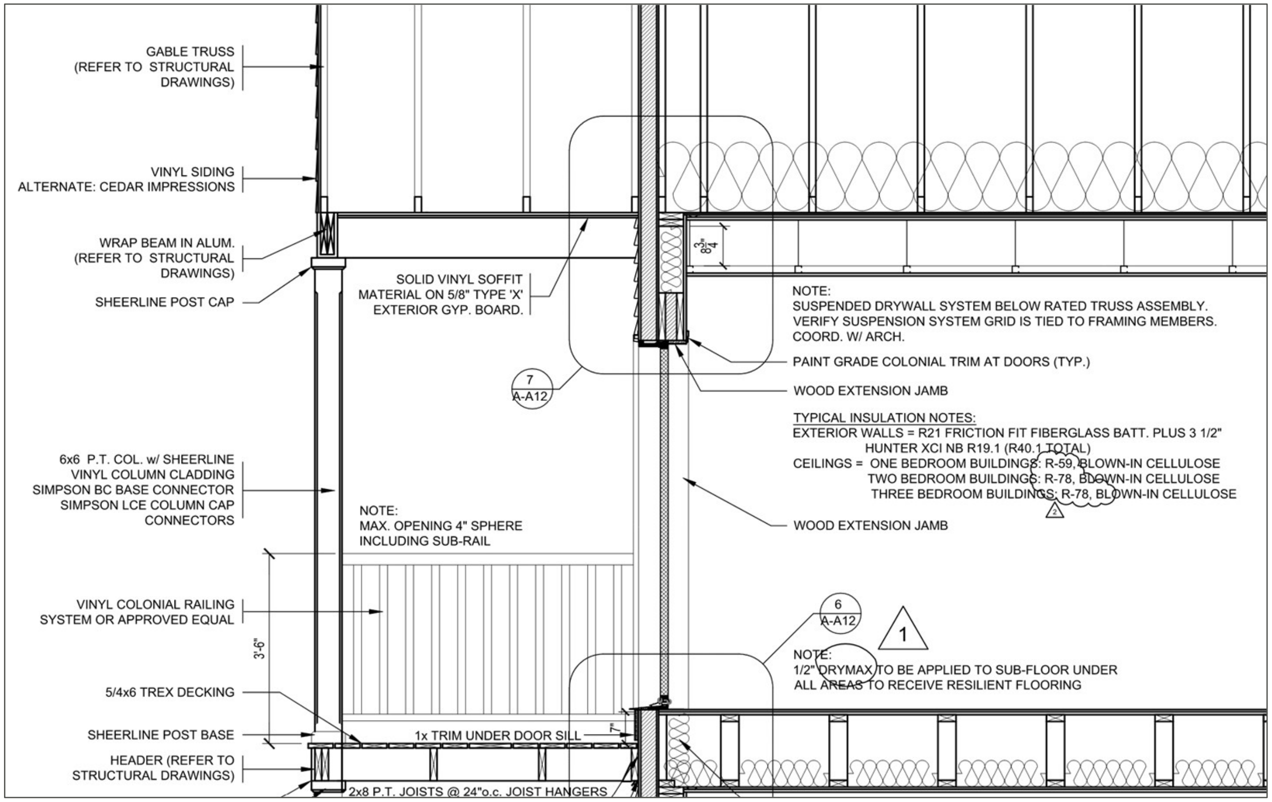


Modeling Different Shading Conditions

- **Modeled one building from each occupancy type in early design.**
- **Chose the building with the most shading for simulation.**
- **Set specific shading to "transparent" in WUFI to model the least-shaded case.**
- **Secured design certification for one building of each type before submitting the rest.**



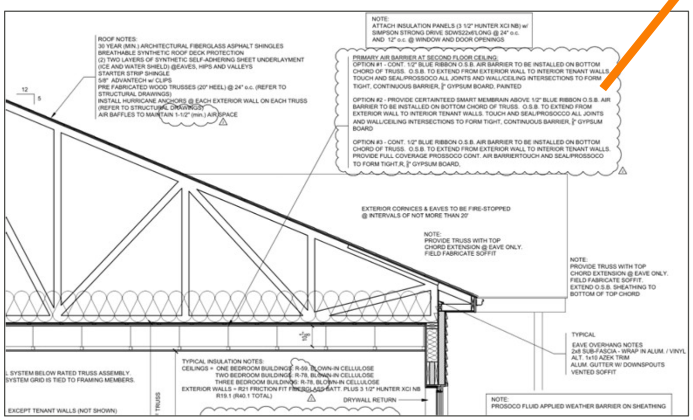
Porch Connection



- **Reduced thermal bridging.**
- **Porch roof connections are made at the outermost sheathing layer.**
- **Deck connection also at outermost layer.**
- **Requires columns at grade level.**

Vented Attic

- **Truss connection at the exterior wall posed air sealing challenges during phase I.**
- **Proposed three different attic air barrier options for contractor consideration.**



PRIMARY AIR BARRIER AT SECOND FLOOR CEILING:

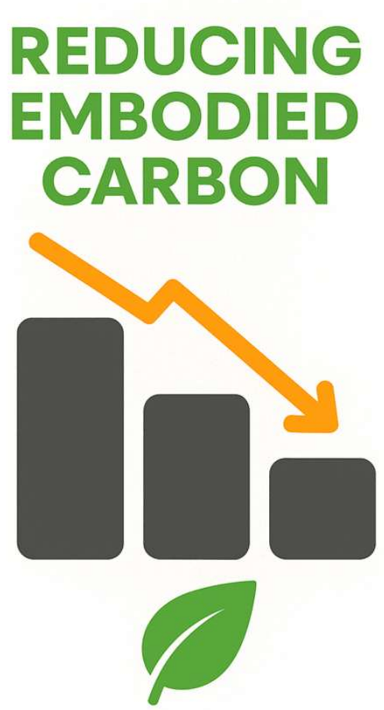
OPTION #1 - CONT. 1/2" BLUE RIBBON O.S.B. AIR BARRIER TO BE INSTALLED ON BOTTOM CHORD OF TRUSS. O.S.B. TO EXTEND FROM EXTERIOR WALL TO INTERIOR TENANT WALLS. TOUCH AND SEAL/PROSSOCO ALL JOINTS AND WALL/CEILING INTERSECTIONS TO FORM TIGHT, CONTINUOUS BARRIER, $\frac{5}{8}$" GYPSUM BOARD, PAINTED

OPTION #2 - PROVIDE CERTAINTEED SMART MEMBRAIN ABOVE 1/2" BLUE RIBBON O.S.B. AIR BARRIER TO BE INSTALLED ON BOTTOM CHORD OF TRUSS. O.S.B. TO EXTEND FROM EXTERIOR WALL TO INTERIOR TENANT WALLS. TOUCH AND SEAL/PROSOCCO ALL JOINTS AND WALL/CEILING INTERSECTIONS TO FORM TIGHT, CONTINUOUS BARRIER, $\frac{5}{8}$" GYPSUM BOARD

OPTION #3 - CONT. 1/2" BLUE RIBBON O.S.B. AIR BARRIER TO BE INSTALLED ON BOTTOM CHORD OF TRUSS. O.S.B. TO EXTEND FROM EXTERIOR WALL TO INTERIOR TENANT WALLS. PROVIDE FULL COVERAGE PROSSOCO CONT. AIR BARRIERTOUCH AND SEAL/PROSSOCO TO FORM TIGHT,R, $\frac{5}{8}$" GYPSUM BOARD,

Where could we go next?

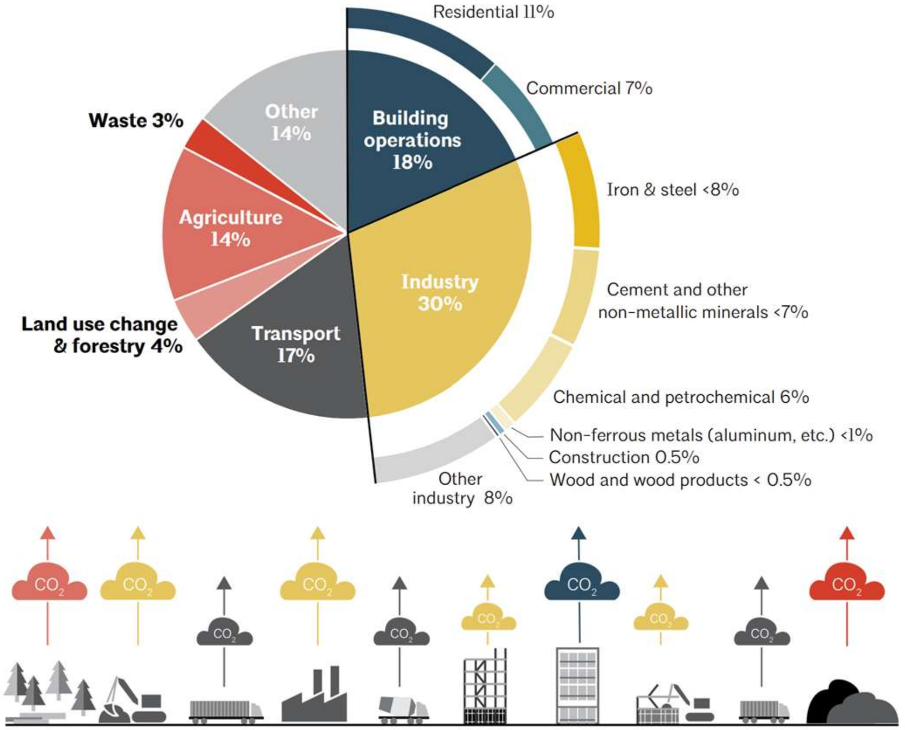
Embodied Carbon



- **Buildings produce greenhouse gas (GHG) emissions in two main ways:**
  - Operational carbon: Emissions from the energy used to run the building.
  - Embodied carbon: Emissions from materials and construction processes across the building’s entire life cycle.
- **Greenhouse gases like carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are contributors to global warming.**
- **CO_2 accounts for about 76% of global GHG emissions — being such a big contributor, “carbon” is often used as shorthand for all GHG emissions.**

Embodied Carbon and Buildings

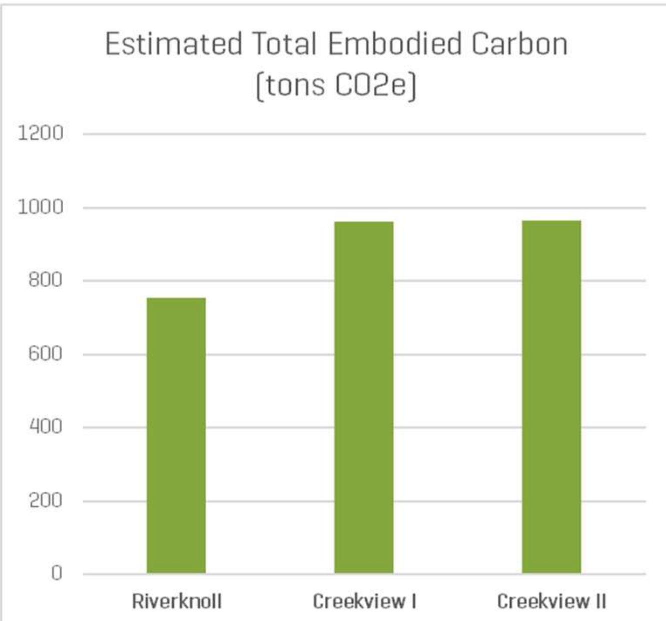
- **Transportation – Includes emissions from building materials shipping to processing facilities, construction sites, or landfills.**
- **Land Use Change & Foresty – Includes the growth and harvest of wood and other bio-based building products.**
- **Waste – Includes demolition and materials in landfills or incinerators.**
- **Industry as a makes up the largest percentage of GHG emissions.**
- **Building materials are a large source of industrial emissions.**
- **Steel and cement are a large part of that.**



When considered over their full life cycle, the building industry influences nearly every major sector of global GHG emissions.

Graphic from AIA Carbon Leadership Forum

Embodied Carbon Estimates



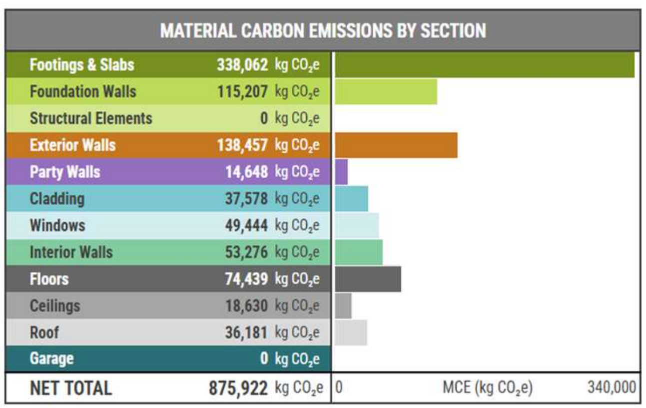
- **Riverknoll – Embodied Carbon**
  - 684 tons CO_2e.
  - Less insulation = lower embodied carbon
    - No under-slab insulation
    - No continuous exterior insulation
    - Double-pane windows instead of triple-pane
  - Lower embodied carbon upfront, but higher operational emissions from mechanical systems.

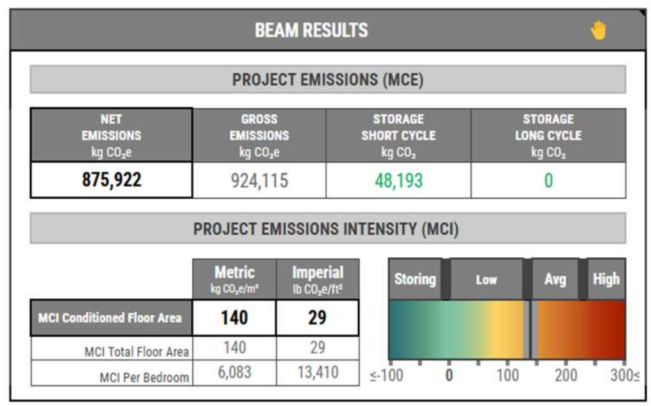
- **CreekView Phase I – Embodied Carbon**
  - 876 tons CO_2.
  - Embodied carbon similar to Phase II, except exterior sheathing/insulation manufacturer change.
  - Mechanical system changes may affect embodied carbon but not captured in this, only construction materials.

- Mechanical system changes may affect embodied carbon totals but not captured in this, only construction materials.

Creekview Phase II – Embodied Carbon

- **Biggest sources: footings and slabs, then exterior and foundation walls.**
- **Main drivers: standard concrete mixes and high-carbon insulation.**
- **With low operational carbon, embodied carbon is a larger share of total emissions (even after 10 years).**
- **Performs well compared to similar projects despite not targeting embodied carbon reduction.**
  - Aided by small unit sizes and use of cellulose insulation in the attic.

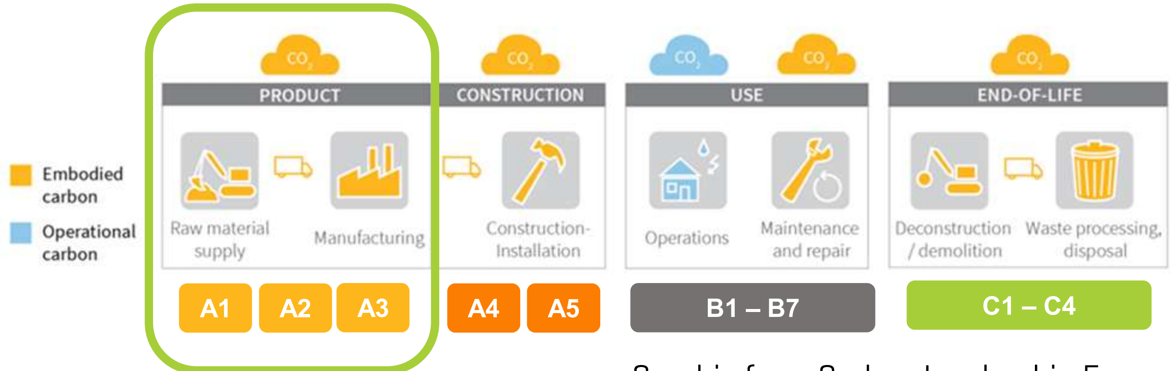




BEAM Embodied Carbon Results

Life Cycle Assessment Phases

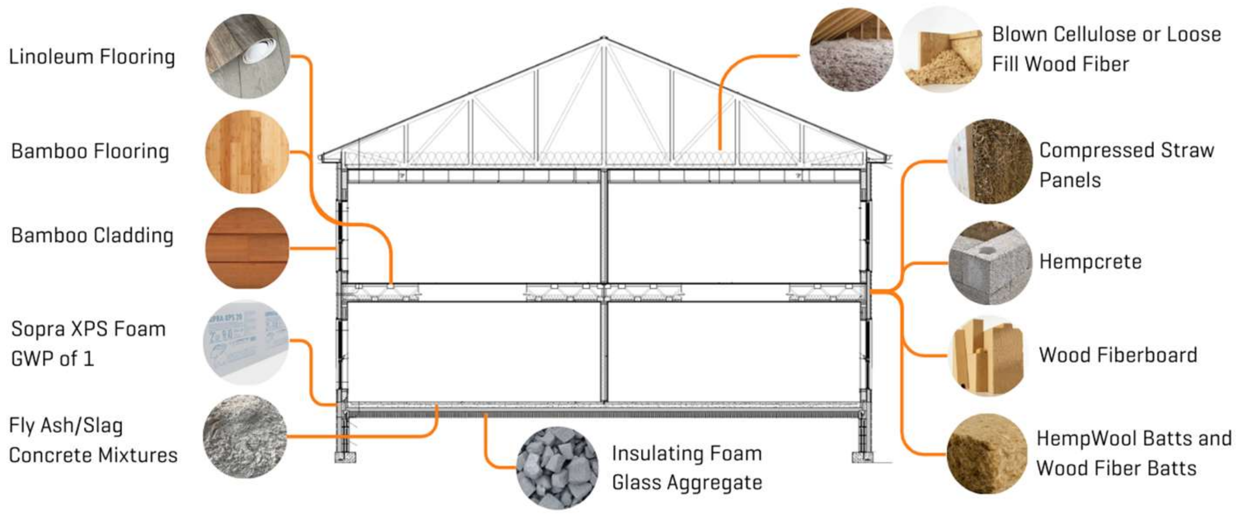
- **Life Cycle Assessment (LCA) Protocol – "cradle-to-grave" or "cradle-to-cradle"**
  - A1-A3, A4-A5, B1-B7, C1-C4 plus D (Beyond the Building)
- **BEAM Estimator – Phases A1-A3 or "cradle-to-gate"**
- **Athena – Phases A-D or full LCA**



Graphic from Carbon Leadership Forum

Bio-Based Materials

- **Bio-based materials reduce manufacturing emissions and store carbon that would otherwise enter the atmosphere.**
- **These materials trap atmospheric carbon within buildings for long periods, acting as long-term carbon storage.**

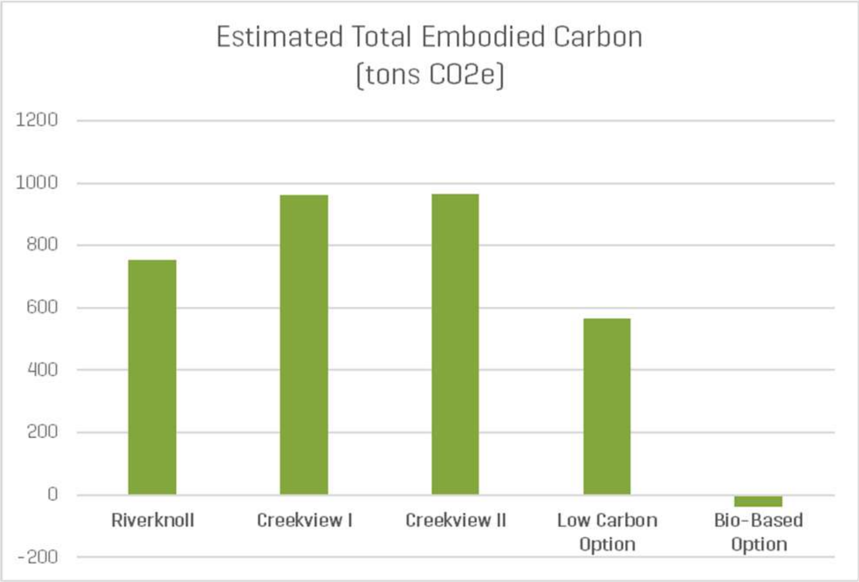


Comparing Scenarios

Considered two theoretical scenarios:

- **Low-Carbon Option:** Focuses on easily available material swaps and reduced use of foams, while maintaining conventional construction practices.
- **Bio-Based Option:** Prioritizes deeper carbon storage using materials made from agricultural or forestry byproducts, keeping carbon out of the atmosphere and stored in the building.

Total Net Emissions			
	CreekView II	Low-Carbon Option	Bio-Based Option
Net Emissions (Tons CO_2e)	**965**	**567**	**-38**



Footings, Slabs, and Foundations

Footings, Slabs, & Foundation			
	CreekView II	Low-Carbon Option	Bio-Based Option
	CONCRETE FOOTINGS, SLABS, AND FILL FOR CMU WALL		
Material	Concrete - 3001-4000 psi, Standard mix / NRMCA [Industry Avg | US & CA]	Concrete - 3001-4000 psi, 20-29% Fly Ash / NRMCA [Industry Avg | US & CA]	Concrete - 2501-3000 psi, >50% SCM mix / NRMCA [Industry Avg | US & CA]
Net Emissions (Tons CO_2e)	**271**	**233**	**170**
	SUB-SLAB INSULATION & AGGREGATE		
Material	XPS foam board / Owens Corning / Foamular NGX 250 / R 5.0/inch, 25 psi Aggregate / NRMCA / US Average [Industry Avg]	Foam glass aggregate / Glasopor AS / R 1.7-inch, 10-60 mm [EU]	Foam glass aggregate / Glasopor AS / R 1.7-inch, 10-60 mm [EU]
Net Emissions (Tons CO_2e)	**122**	**8**	**8**
	CONTINUOUS INSULATION		
Material	XPS foam board / Owens Corning / Foamular NGX 250 / R 5.0/inch, 25 psi	XPS foam board / SOPREMA / SOPRA-XPS (entire product line) / R 5.0-inch	XPS foam board / SOPREMA / SOPRA-XPS (entire product line) / R 5.0-inch
Net Emissions (Tons CO_2e)	**30**	**7**	**7**

- **Concrete:**
  - Alternative concrete mixes with >50% SCMs can cut emissions by nearly half.
  - Using performance-based specs and engaging the concrete supplier earlier can help meet carbon goals.
- **Insulation**
  - Foam glass aggregates provide insulation and slab stabilization while simplifying construction.
  - Lower-emission XPS options can be used at slab edges and foundation walls.
- **Newer materials may face cost and availability challenges during specification.**

Above Grade Walls

Exterior walls offer major carbon reduction potential through insulation choices.

- **Replace fiberglass batts with wood fiber batts (bio-based).**
- **Wood fiberboard in place of polyiso.**
- **Use panelized straw panels (bio-based) to replace both cavity and exterior insulation and include interior service cavities.**
- **R-value reductions with specific materials may increase wall thickness.**

	CreekView II	Low Embodied Carbon	Bio-Based Materials
	Walls		
	BARRIERS AND MEMBRANES		
MATERIAL	Liquid Applied Barrier / [BEAM Avg]	Ext. Wall barrier, liquid applied / Perm-a-Barrier VPL 50RS UV stable / 13 Perms, 0.51 mm	Sheet Barrier Moisture-Variable / [BEAM Avg]
NET EMISSIONS tons CO_2e	**28**	**8**	**4**
	EXTERIOR WALL: CAVITY INSULATION, FRAMING, & SHEATHING		
MATERIAL	Fiberglass batt / R 4.4-inch [Industry Avg] Wood / SPF / 2x6 Lumber [Industry Avg | US & CA] OSB sheathing / 7/16" / LP / TopNotch® 350 / 7/16"	Fiberglass batt & roll / Owens Corning / Unfaced, PINK Next Gen Fiberglas / R 3.6-inch avg. Wood / SPF / 2x6 Lumber [Industry Avg | US & CA] OSB sheathing / 7/16" / LP / TopNotch® 350 / 7/16" Wood / 2x3 Lumber [Industry Avg | US & CA]	Straw Insulated Panels with wood framing (SIP) / EcoCocon / Prefabricated panel, 40 cm / R35 [EU] Wood / SPF / 2x3 Lumber [Industry Avg | US & CA]
NET EMISSIONS tons CO_2e	**48**	**44**	**-378**
	CONTINUOUS INSULATION		
MATERIAL	Polyisocyanurate / Wall Boards / Hunter / Xci / R 6.3-inch, 20 psi	Wood fiber board / GUTEX / Multi-Therm / R 3.6-inch, 40-200 mm [EU]	Wood fiber board / GUTEX / Multi-Therm / R 3.6-inch, 40-200 mm [EU]
NET EMISSIONS tons CO_2e	**77**	**-54**	**-54**
	INTERIOR WALL: CAVITY INSULATION		
MATERIAL	Fiberglass batt / NAIMA / R 4.4-inch [Industry Avg | N.America]	Fiberglass batt & roll / Owens Corning / Unfaced, PINK Next Gen Fiberglas / R 3.6-inch avg.	Hemp fiber batt / NaturFibre / Hemp Wool / R 3.7-inch
NET EMISSIONS tons CO_2e	**9**	**6**	**0**

Cladding, Drywall, Attic, and Roof

- **Vinyl siding has lower embodied carbon than brick, stucco, fiber cement, stone, or metal.**
- **Bio-based alternatives like engineered wood or bamboo are possible but may face cost and procurement challenges.**
- **Drywall can be swapped for USG EcoSmart, though the carbon savings are modest.**
- **Emissions from asphalt shingles from one manufacturer to the next can vary.**

Cladding			
	CreekView II	Low-Carbon Option	Bio-Based Option
	EXTERIOR WALL CLADDING		
Material	Vinyl Siding / Vinyl Siding Institute / 0.040" Double 4.5" [Industry Avg | US & CA]	Vinyl Siding / Vinyl Siding Institute / 0.040" Double 4.5" [Industry Avg | US & CA]	Bamboo Cladding / Dasso / dassoCTECH outdoor oiled Cladding / Shiplap, 5/8" (18 mm)
Net Emissions (Tons CO_2e)	**25**	**25**	**-41**
	DRYWALL (WALLS & CEILINGS)		
Material	Drywall 1/2" [BEAM Avg | US & CA] Drywall 5/8" Type X / Gypsum Association [Industry Avg | US & CA]	Drywall 1/2" [BEAM Avg | US & CA] Drywall 5/8" / USG / Sheetrock Brand EcoSmart Firecode X / 5/8"	Drywall 1/2" [BEAM Avg | US & CA] Drywall 5/8" / USG / Sheetrock Brand EcoSmart Firecode X / 5/8"
Net Emissions (Tons CO_2e)	**88**	**70**	**70**

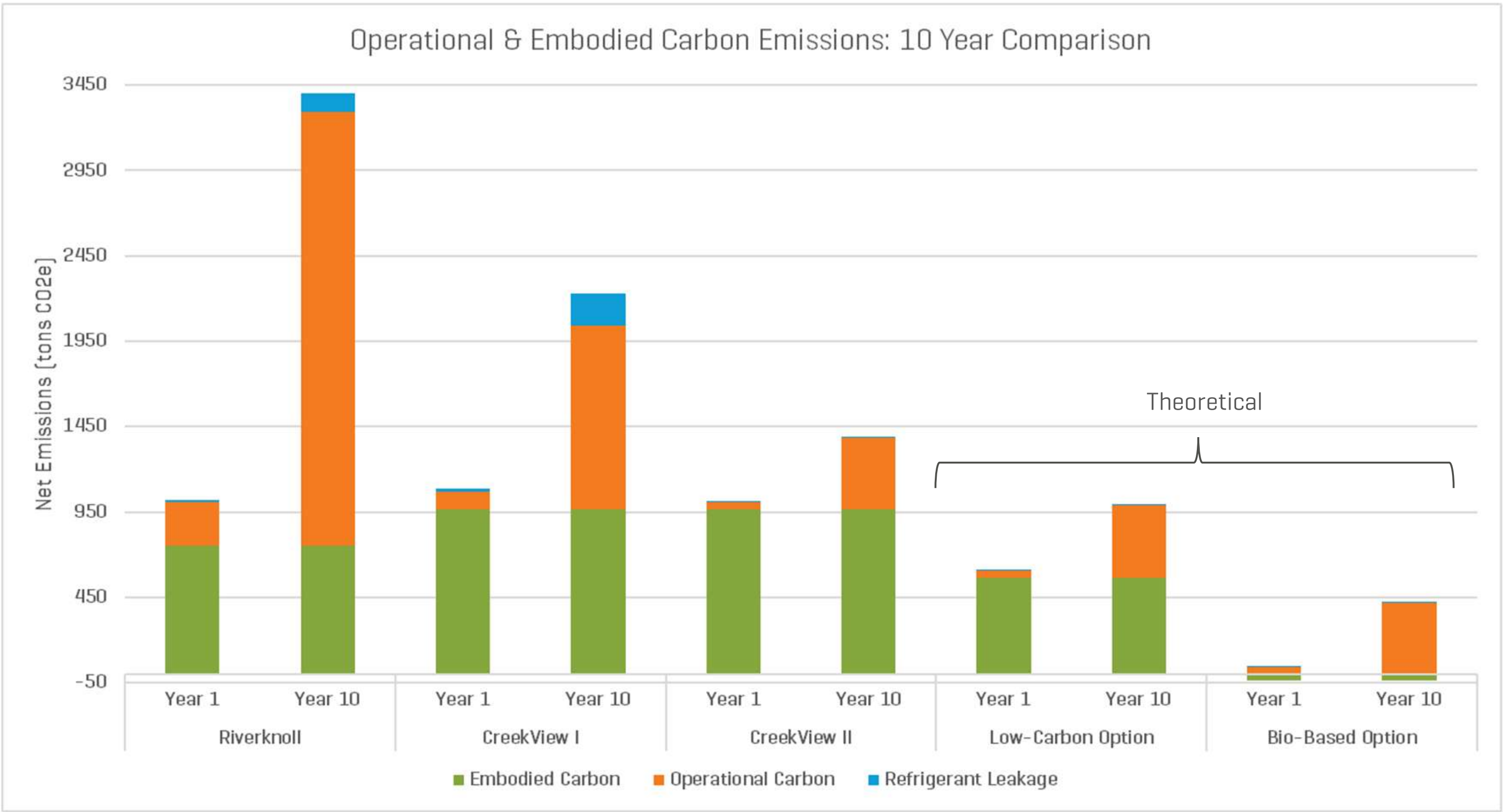
Roof			
	CreekView II	Low-Carbon Option	Bio-Based Option
	ROOF CAVITY INSULATION		
Material	Cellulose / loose fill / CIMA / R 3.7-inch / [Industry Avg | US & CA]	Cellulose / loose fill / CIMA / R 3.7-inch / [Industry Avg | US & CA]	Cellulose / loose fill / CIMA / R 3.7-inch / [Industry Avg | US & CA]
Net Emissions (Tons CO_2e)	**-34**	**-34**	**-34**
Material	Asphalt Shingles / Asphalt Roofing Manufacturers Association / Fiberglass Asphalt Shingles [Industry Avg | US & CA]	Asphalt Shingles / Malarkey Roofing / Dura-Seal /	Asphalt Shingles / Malarkey Roofing / Dura-Seal /
Net Emissions (Tons CO_2e)	**23**	**12**	**12**

Flooring

- **Flooring emissions vary widely by manufacturer.**
- **Interface carpet fully offsets embodied carbon; some linoleum products can even store carbon.**
- **The BEAM tool lists manufacturer options and supports requesting EPDs for accurate data.**
- **Designers should use BEAM and/or similar tools during material selection to factor embodied carbon into decisions.**

FLOORING			
	CreekView II	Low-Carbon Option	Bio-Based Option
		Floors	
		FLOOR COVERING	
Material	Carpet / [BEAM Avg]	Carpet / Shaw / Residential Broadloom with ClearTouch Platinum	Carpet / Interface / CQUEST BioX / 1.5 mm Modular tile carpet
Net Emissions (Tons CO_2e)	**55**	**33**	**0**
Material	Vinyl flooring / Resilient Floor Covering Institute / Heterogeneous [Industry Avg | US & CA]	Linoleum flooring / 4.0 mm [BEAM Avg]	Linoleum flooring / Tarkett / Lino Veneto xf2, Etrusco, Style Elle|Emme, Veneto, Originale, LinoRail, Linosport / 2.5 mm sheet style linoleum
Net Emissions (Tons CO_2e)	**11**	**2**	**-1**
		FLOOR CAVITY INSULATION	
Material	Fiberglass batt / NAIMA / R 4.4-inch [Industry Avg | N.America]	Fiberglass batt & roll / Owens Corning / Unfaced, PINK Next Gen Fiberglas / R 3.6-inch avg.	Hemp fiber batt / NaturFibre / Hemp Wool / R 3.7-inch
Net Emissions (Tons CO_2e)	**15**	**9**	**0.37**

10 Year Comparison



Team Effort














SUSTAINABLE COMFORT

Thank you! Any questions?

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CreekView Phase I Photos

Bonus Content

Thermal Bridging

Connections

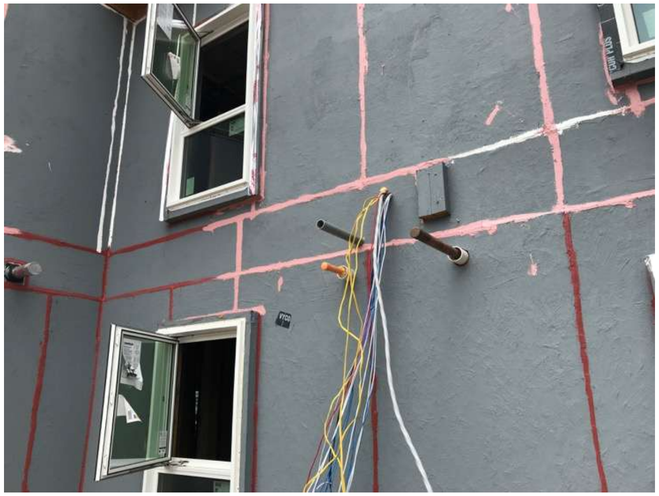
Construction Phase

Fluid Applied Air Barrier

Concept

Reality

Result



Construction Phase

Continuous Ceiling Air Barrier

Concept

Reality

Result

PHIUS+ Certification Process

Schematic Design: Initial Layout and Systems

Pre-Certification: Approved Modeling and CD's

Construction Inspections: Insulation & Air Sealing Checks

Final Testing: Air Tightness & Commissioning

Certification: Final Certifications

Insulation Levels

No Thermal Bridging

- \- Continuous insulation at walls
- \- Porch point connections
- \- Storage room held away
- \- Foundation walls held away

Insulation Levels

Windows/Doors

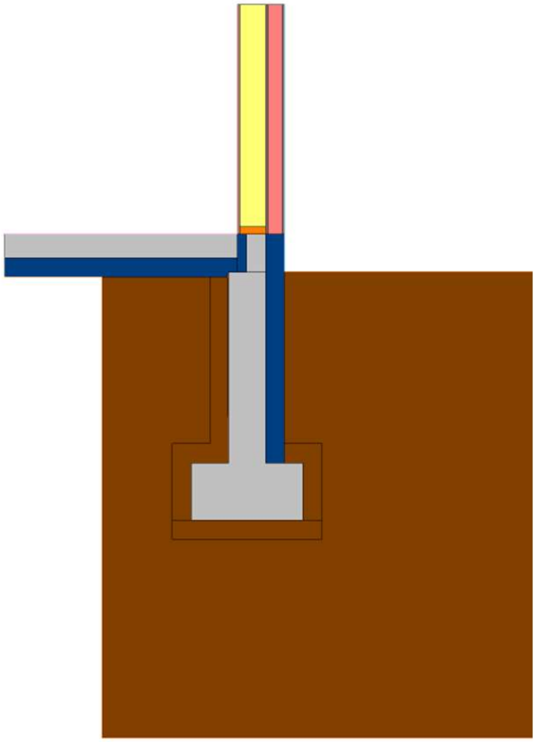
- - Triple pane insulated
- - Casements/Fixed for air tightness
- - ADA sills vs. air tightness
- - Fall protection?

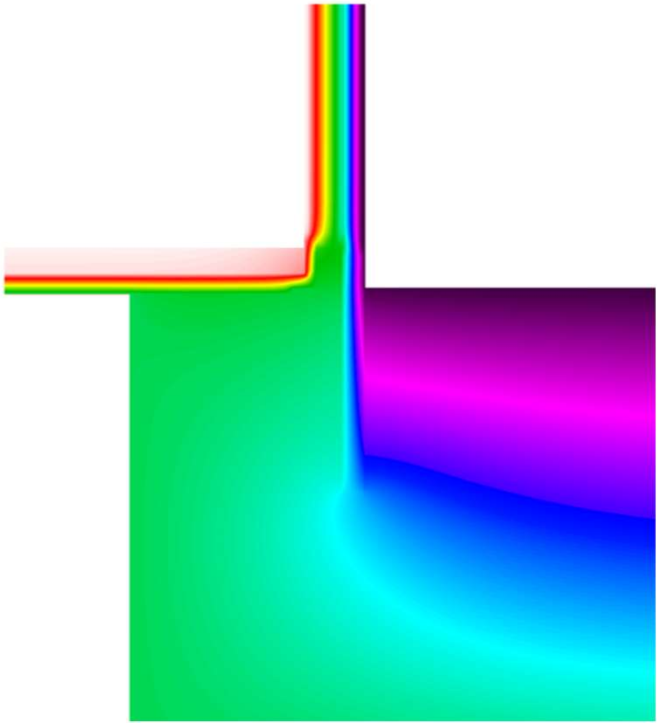
Insulation Levels

Sub-Slab Insulation

- - R-15 Underslab Insulation
    - 3” EPS Foam
    - Vapor Retarder
    - Concrete Slab
- - Slab Edge Detailing
    - 2” vertical slab edge
    - 4” exterior foundation wall
    -

Foundation Insulation Inspection





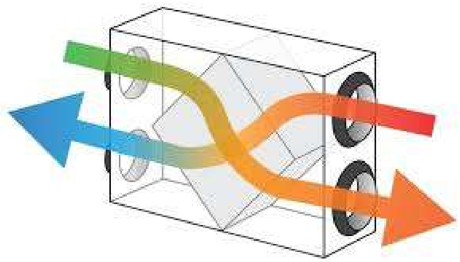
Attic Air Sealing

Ceiling Insulation

- - R-60 to R-80 Wall
    - OSB Sheathing as primary air barrier
    - Taped seams
    - Drywalled ceiling

Mechanical Systems

Ventilation



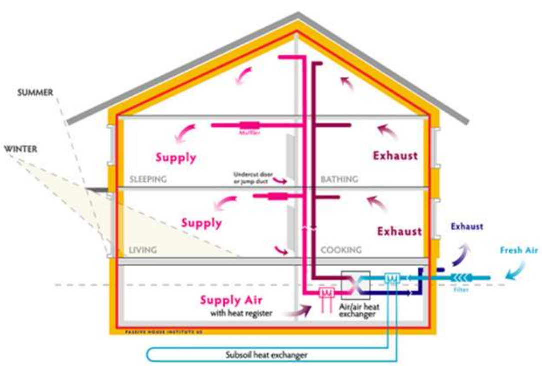
- - Panasonic FV-10VEC1
- - Continuous Exhaust
  - Bathroom: 20 CFM
  - Kitchen: 25 CFM
- - Supply register to each room
- - Range hood recirculating

Mechanical Systems Installation

Install air source heat pumps off the ground adequate for snow not to interfere with operation

The Value of Verification

- Identifying major constructability items that may have been overlooked
- Preparing for and performing the whole building air tightness testing/Compartmentalization
- Important to catch design/product issues early, ideally at air sealing or open wall inspection
- PHIUS verification overlaps with other energy green program requirements

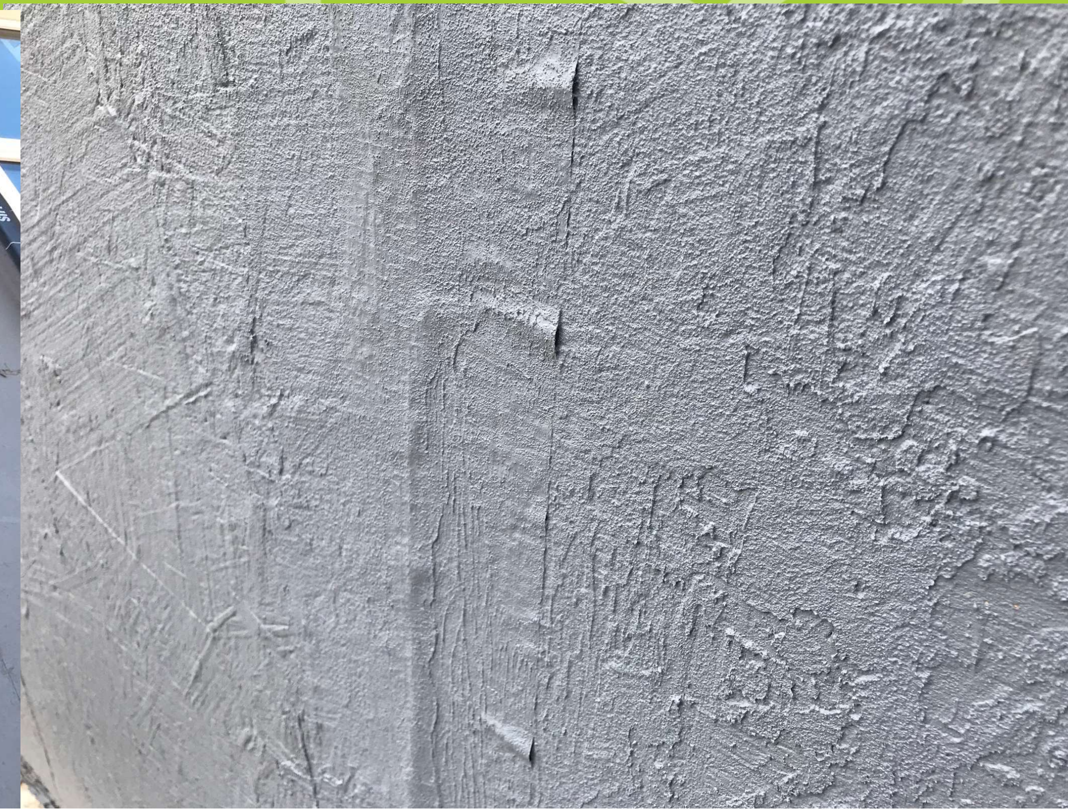


PHIUS+ VERIFIER

Foundation Insulation Inspection

Install Coordination

Primary Air Barrier Failure

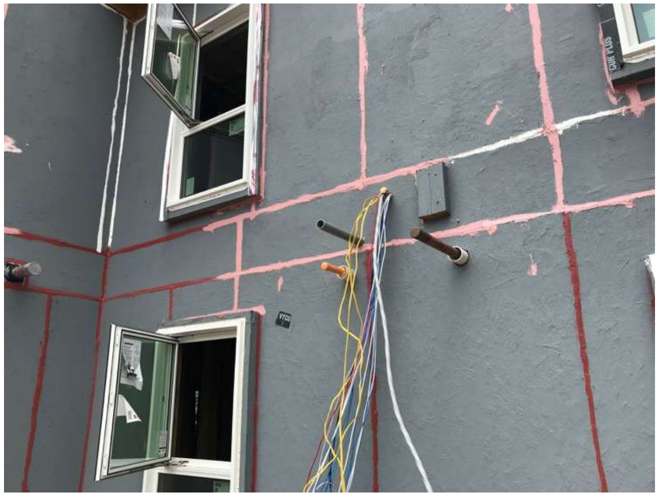


Fluid Applied Air Barrier

Concept

Reality

Result



Preliminary Testing

Interior Spray Foam

Test 1: Initial Pre-Test
970 CFM50

Test 2: Spray Foam Interior
862 CFM50

Target: Continuous Air Barrier
706 CFM50

Continuous Ceiling Air Barrier

Concept

Reality

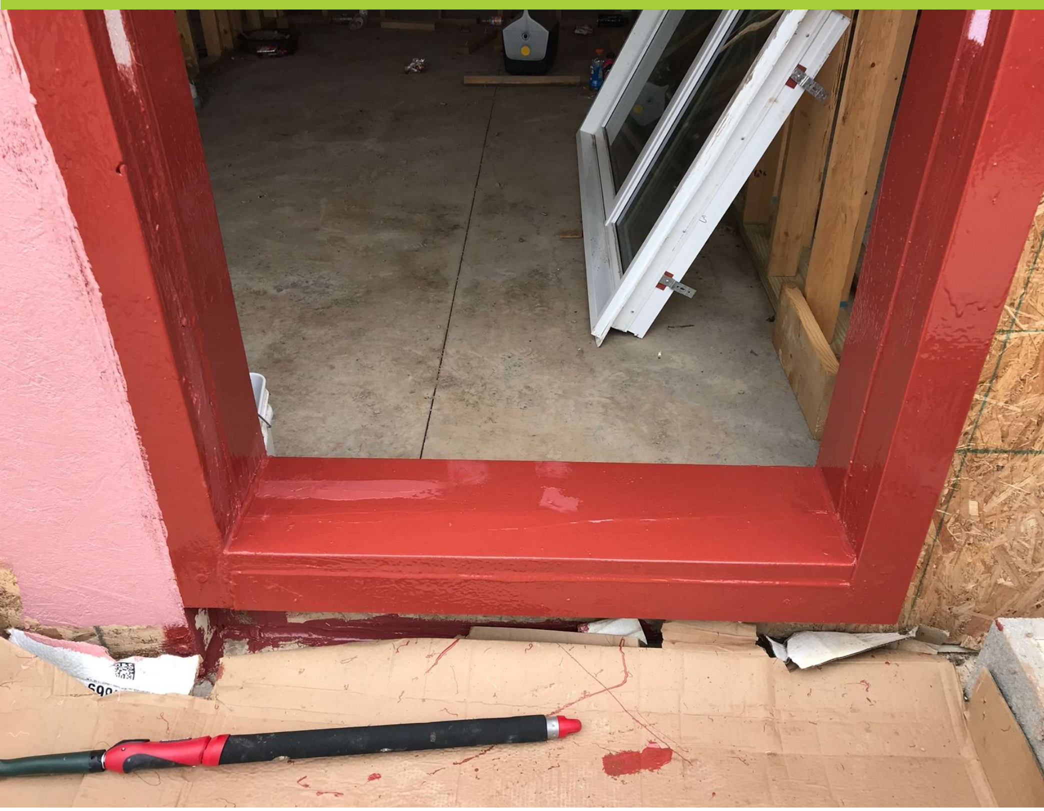
Result

Quality of Install

Connections

Building Components

Material Selection



Reality

Material Compatibility


Air Sealing Detail Verification

PHIUS+ Certification Process

Schematic Design: Initial Layout and Systems

Pre-Certification: Approved Modeling and CD’s

Construction Inspections: Insulation & Air Sealing Checks

Final Testing: Air Tightness & Commissioning

Certification: Final Certifications

Air Tightness Testing

Air Tightness

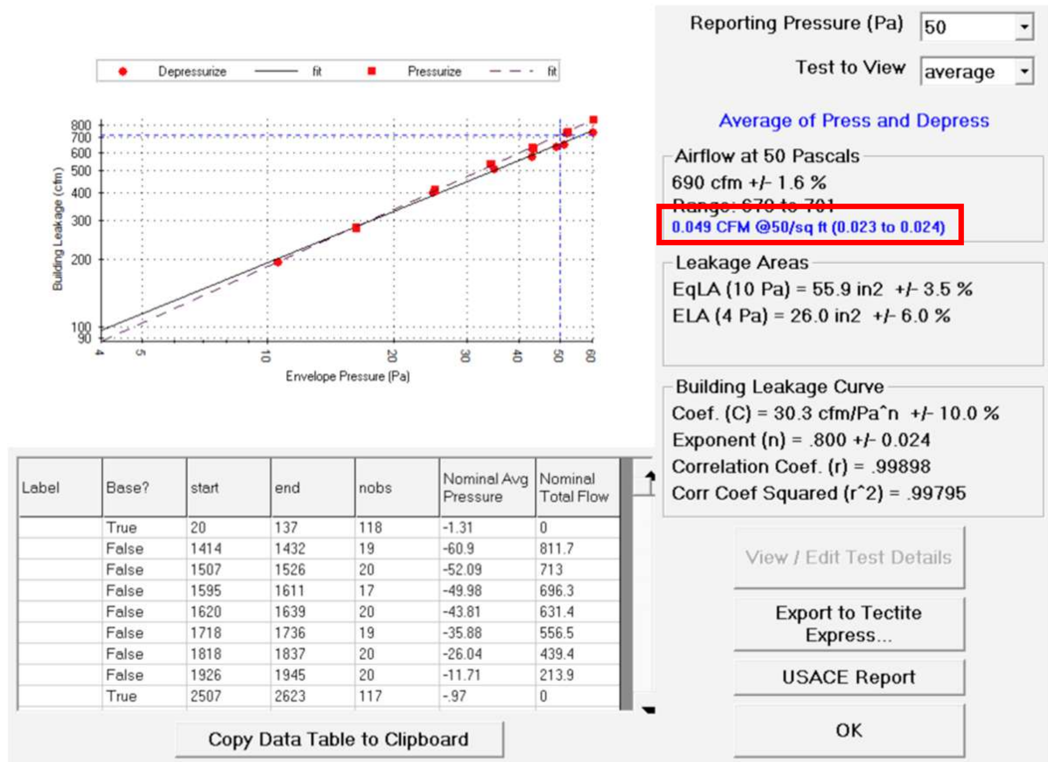
- - Continuous air barrier across building
- - Air tight windows (casement) and doors
- - Buildings meet 0.05 CFM50/sf of Shell
- - Testing occurred pre-drywall and final

Air Tightness Testing

Results:

- \- Target: 0.05 CFM50/sf of Shell

		TARGET
UNIT	ENVELOPE AREA	BLOWER DOOR TARGET (@50Pa)
3 Bedroom	17,192	860
2 Bedroom	14,113	706
1 Bedroom	11,481	574



Air Tightness Testing

Final Verification

Additional Verification

- - Hot Water Distribution
- - Ventilation Flow Rates
- - Ventilation wattages
- - Final equipment efficiencies

PHIUS+ Certification Process

Schematic Design: Initial Layout and Systems

Pre-Certification: Approved Modeling and CD's

Construction Inspections: Insulation & Air Sealing Checks

Final Testing: Air Tightness & Commissioning

Certification: Final Certifications

Certification

Timeline:

- - PHIUS+ Verifier submission for review
- - Completed PHIUS+ Workbook
- -Verification Picture
- -Thermal Imaging
- - Finalized additional certifications
    - NYSERDA Low Rise New Construction
    - Energy Star Homes V3.1
    - DOE Net Zero Energy Ready
    - EPA Indoor AirPlus

CreekView Apartments Ph 1

BALDWIN
a DiMarco Group company

DIMARCO GROUP

DiMarco Constructors

Glasow Architecture

EC4B engineering, p.c.

SUSTAINABLE COMFORT

Special Thanks to the Project Team!

CreekView Apartments
Canandaigua, NY

Early Design
$1 Million Award

BALDWIN
a DiMarco Group company

DIMARCO GROUP

DiMarco Constructors 50 YEARS 1965 – 2015

Glasow Architecture

EC4B engineering, p.c.

SUSTAINABLE COMFORT

CreekView Apartments Phase II

- How to get a PHIUS Project to Net Zero?
  - Size of roof now dictates source energy, how to reduce building loads to fit in budget of roof produced solar.
  - Geothermal heating/cooling/DHW central per building
  - Central ERV systems to reduce construction and maintenance cost
  - Solar PV – Owner paid remote net metering
    - Owner pays all utilities for the project
    - 108 Individual Electric Meters – 1 apt meter + 1 blg meter
    - Solar PV on each building tied into 1 owner meter

Integrated Process

- Feedback from all contractors for ideas welcomed
- Regular check points to reassess project goals
- Net-Zero goal dictates final loads of the building
- Solar capacity constrained by roof sizing and orientation
- Building orientations optimized
- Insulation and equipment sized to solar capacity