

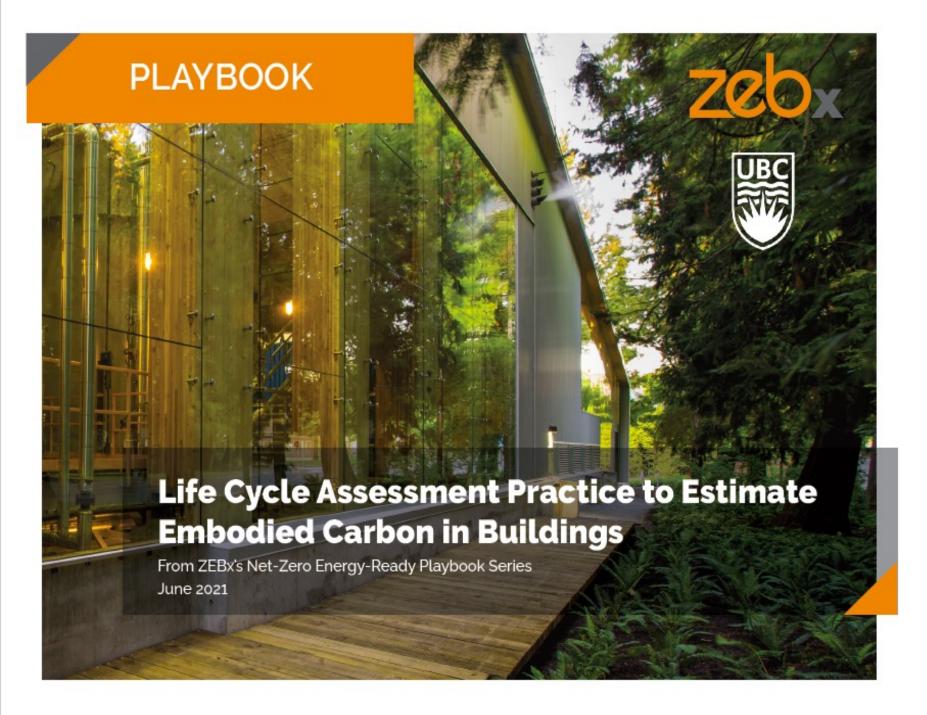




NET-ZERO ENERGY-READY CHALLENGE

WINNERS SERIES

Supporting, promoting and celebrating the design and construction of net-zero energy-ready buildings





NET-ZERO ENERGY-READY CHALLENGE

PLAYBOOK SERIES

- Ventilation Strategies for High-Performance MURBs
- Planning Airtight Buildings
- LCA Practice to Estimate
 Embodied Carbon
- Thermal Bridging
- Low-Carbon Energy Systems
- Planning High-Performance Buildings

POLL 1

Tell us about yourself!

Three-part anonymous poll













ZEBx Decarb Lunch

The Builders Have Spoken: The Cost of High Performance Construction

Jeff Fisher

Vice President, Government Relations & Communications

June 25, 2021





ABOUT UDI

- Non-partisan, non-profit org., 990+ members across B.C.
- Chapters in Lower Mainland, Capital Region & Okanagan
- We represent residential (strata & rental), commercial, institutional, industrial & resort builders
- Our members include thousands of individuals involved in all facets of real estate, land development and planning.
- Since 1972, UDI has concentrated its activities in three primary areas:
 - Communicating on behalf of the industry
 - Policy and Government Relations
 - Education & Professional Development



BC DEVELOPMENT INDUSTRY'S \$22.9 BILLION IN GDP GENERATED THROUGH...

The real estate development industry is a key driver of British Columbia's economy. The industry generates a diverse range of jobs to support each stage of the development process, from financing, to construction, to sales, and property management. Development revenues collected by municipalities are reinvested in local communities in the form of new public services and amenities.

233,600 JOBS CREATED

SALES & MARKETING

















GOVERNMENT REVENUES FROM THE DEVELOPMENT INDUSTRY INCLUDE:

- Property Transfer Tax (PTT)
- Goods and Service Tax (GST)
- Provincial Sales Tax (PST)
- Property Tax

- Development Cost Levies (DCLs)
- Development Cost Charges (DCCs)
- Community Amenity Contributions (CACs)













UDI and Sustainability

"As a 'Partner in Community Building,' the Urban Development Institute is committed to working with communities and governments to create and achieve the vision of balanced, well-planned and sustainable communities."

- UDI was involved in developing the Energy Step Code White Paper in 2014.
- Since then we have been an Active Participant in numerous ESC Committees,
 Sub-committees and now the Energy Step Code Advisory Council.
- We also sit on the Mass Timber Advisory Council



UDI Future Event

Webinar (Date TBC – end of July)

Survey of Potential Additional Code Changes to Mass Timber in the Vancouver Building Bylaw 2019







409 GRANVILLE STREET, SUITE 950 VANCOUVER, BC VBC 1T2 CANADA

F 604 589 4419 www.ghl.cs Holder of AIBC Certificate of Practice

SURVEY OF POTENTIAL ADDITIONAL CODE CHANGES TO MASS TIMBER IN THE VANCOUVER BUILDING BYLAW 2019



Prepared for

Sustainability Group | Planning, Urban Design & Sustainability City of Vancouver 453 West 12th Avenue

Vancouver, BC V5Y 1V4

June 10, 2021

GHL File 7757.00



POLL 1

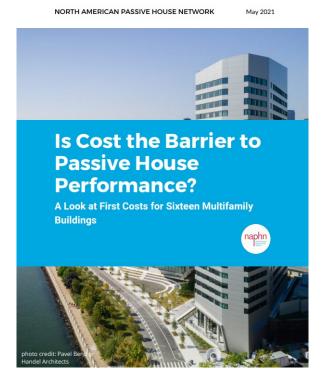
What did you tell us about yourself?













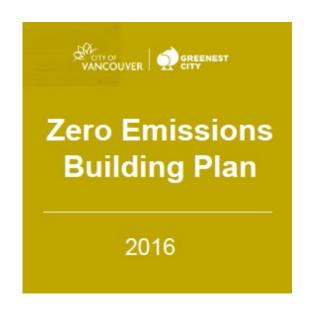


three Flavour of the month \$

Where are we Heading?



The Vancouver Building By-law was updated June 1, 2021 with lower heat loss, energy use, and greenhouse gas limits for Part 3 new construction. This work is part of the implementation of the City of Vancouver's Zero Emissions Building Plan to reduce emissions for new buildings by 90% by 2025 and is aligned with BC's Energy Step Code.





All heating and hot water systems in new buildings in Vancouver are zero-emission by 2025.



PATTERN LANGUAGE FROM PASSIVE HOUSE

Architecture for the Anthropocene
4-Part Online Course



Step 4, Energy Step Code Passive House Net-Zero Energy Ready

WHO

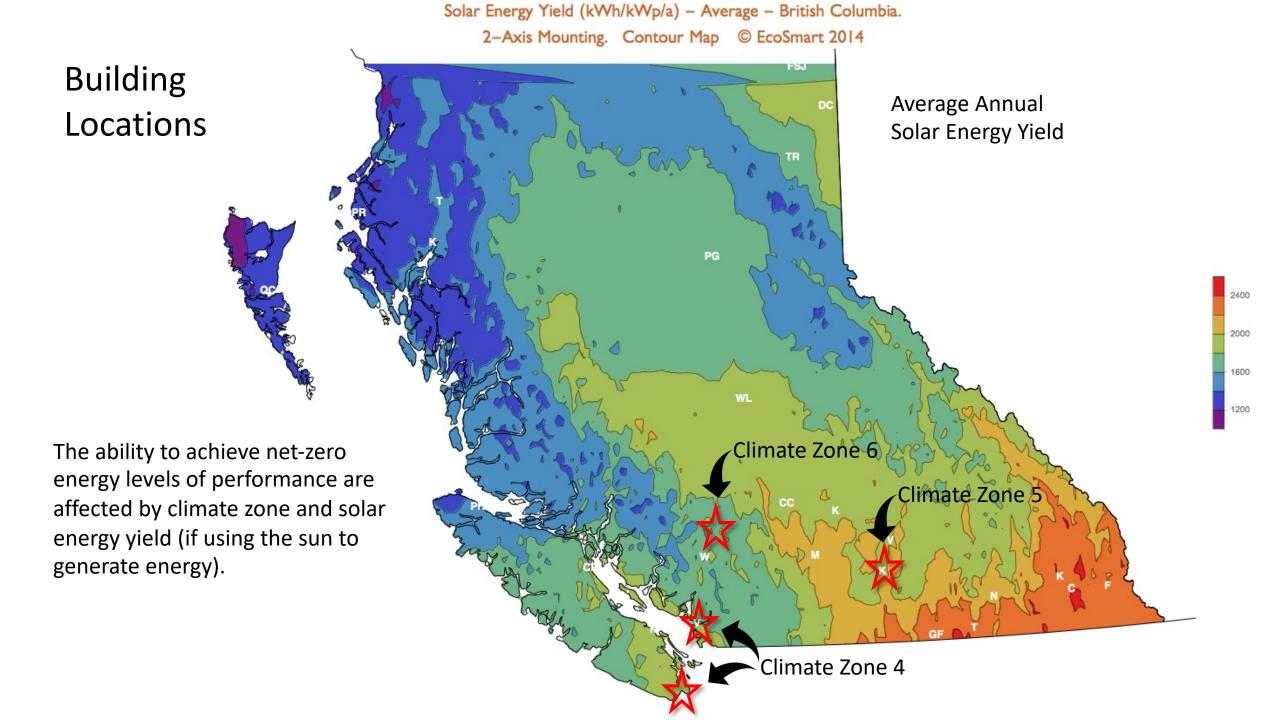
Architects, Municipal Planners, Sustainability Consultants, General Contractors, Developers Multi-Unit Residential Buildings (MURB)

The missing middle has more benefits than you think!

Affordability
Biogenic carbon storage
Walkable neighbourhood
Minimal impact on climate







Included in the Construction Cost

GENERAL CONDITIONS AND REQUIREMENTS	Management (project managers/coordinators, superintendents, etc.), field office (trailers, furniture, office supplies, services, equipment, etc.), field operations support (labor, storage, equipment, tools, fencing, clean-up, etc.), job-site requirements (security, roads, toilets, signage, etc.), project safety requirements (audits, safety equipment, safety supplies, fire protection, etc.), waste management, temporary power, water, heating, etc., scaffolding, hoisting, etc. and excludes insurance and bonding, surveying, warranty, training, legal
ELEVATORS	Elevator cabs, hoistway equipment, machines, drives, controllers
BUILDING ENCLOSURE	Siding and/or cladding, fenestration, shading devices, exterior doors, roofing and roof deck waterproofing, roofing and roof deck assemblies (including insulation), balcony waterproofing, balcony and roof deck guardrails, damp-proofing and waterproofing on concrete walls, exterior canopies
MECHANICAL SYSTEMS	Heating, ventilation and air conditioning (HVAC) system, plumbing system, building automation system, fire protection system
ELECTRICAL SYSTEMS	Electrical distribution system, lighting, fire alarm system
INTERIOR	Steel studs for interior walls, acoustic insulation (if any), gypsum wallboard (GWB), flooring and paint, mill work (kitchen cabinetry, bathroom vanities, entrance lobby fixtures, etc.), finish carpentry (window sills and casing, baseboards, etc.), washroom accessories, interior doors
WOOD FRAMING AND CONCRETE	Concrete footings, walls, suspended slabs and slab-on-grade, elevator shafts, concrete block walls, structural steel and miscellaneous metals, mass timber components, rough carpentry (including wood stud walls), roof trusses

Baseline Building Costs

CITY OF VANCOUVER:

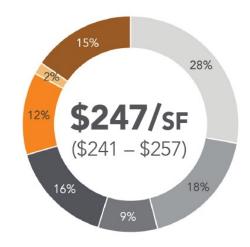
Number of buildings included in baseline	3	
Date of construction tender	Jan 2019 – Nov 2020	
Gross floor area	64,500 – 86,000 ft² (6,000 – 8,200 m²)	
Number of units	52 – 120 residential, 3 – 5 commercial	
Number of levels	6 – 7 above grade, 2 underground (parkade)	
Number of elevators	1 – 2	

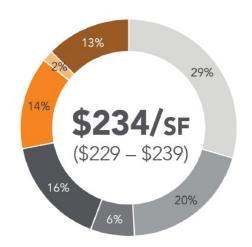
To better align with the two high-performance buildings in City Of Vancouver, where required, the costs for the baseline buildings were individually adjusted to include five above-grade levels and two elevators.

CAPITAL REGIONAL DISTRICT:

Number of buildings included in baseline	2	
Date of construction tender	Feb 2019 – Nov 2019	
Gross floor area	80,000 - 86,000 ft ² (7,450 - 8,450 m ²)	
Number of units	80 – 85 residential	
Number of levels	5 above grade, 1 underground (parkade)	
Number of elevators	2	

To better align with the two high-performance buildings in the Capital Regional District (CRD), where required, the costs for the baseline buildings were individually adjusted to include two parkade levels, a 2018 construction bid and cooling.













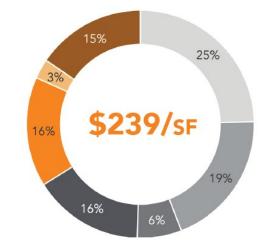


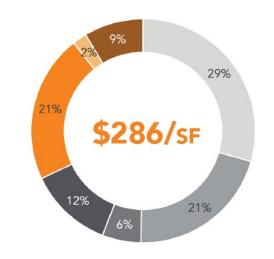






Performance Target	Step 4	Performance Target	Step 4
Date of construction tender	July 2018	Date of construction tender	August 2018
Gross floor area	60,644 ft ² (5,634 m ²)	Gross floor area	63,292 ft ² (5,880 m ²)
CCDC Contract ¹	14 (Design-Build Stipulated Price Contract)	CCDC Contract ¹	5B (Construction Management Contract - for Services and Construction)
Number of units	72 residential	Number of units	102 residential
Number of levels	6 above grade, 2 underground (parkade)	Number of levels	6 above grade, 2 underground (parkade)
Number of elevators	2	Number of elevators	2
All-electric building	No	All-electric building	No





GC

ELEV

BE

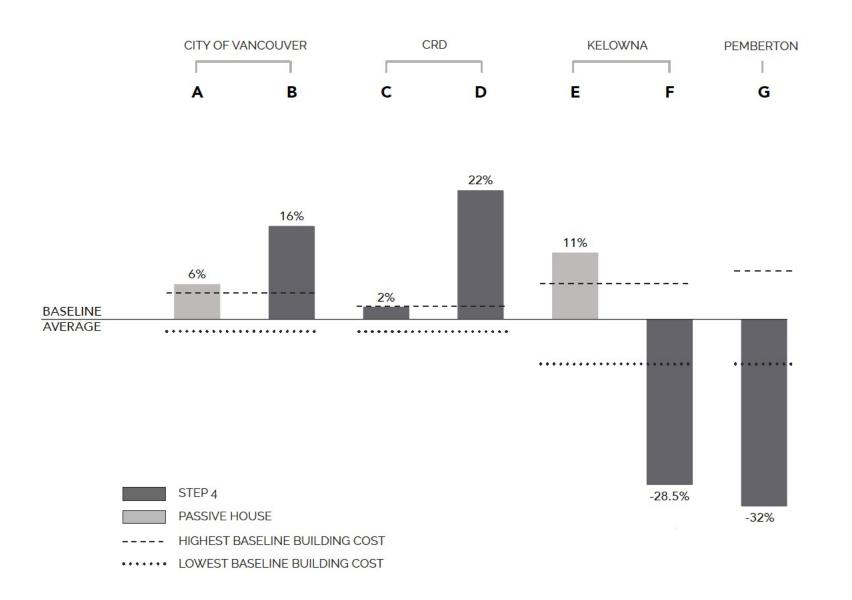
Месн

ELEC

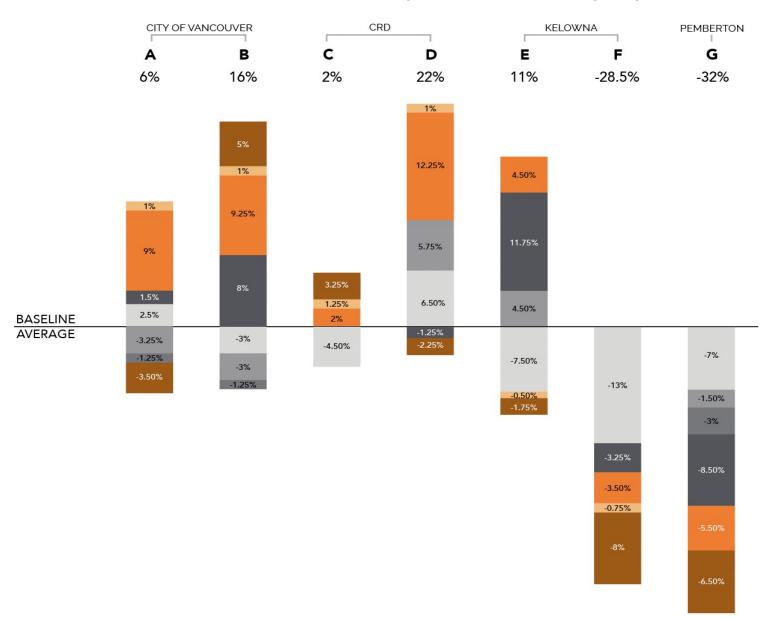
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WFC

Overall Cost Comparison



Overall Cost Comparison by System



WFC

Building System Cost Comparison

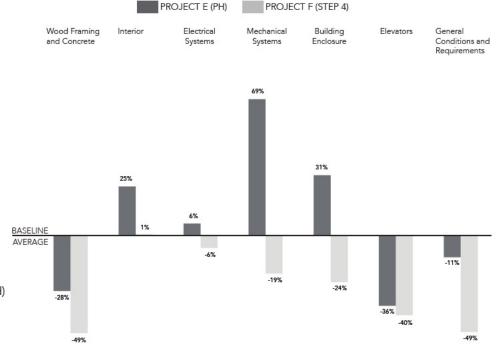
KELOWNA

PROJECT E (Passive House)

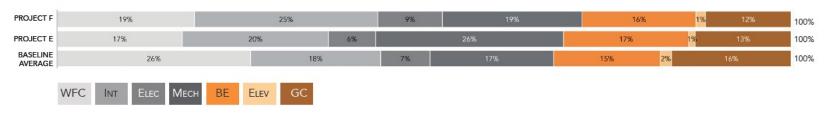
- Competitive concrete form work and supply bid/price
- · Competitive rough carpentry bid
- Lumber prices were locked in low
- Very simple building form
- · Above-average density of suites and washrooms
- Heat pumps used for centralized heating and cooling
- Heat pumps used for centralized domestic hot water generation
- Numerous thermally broken cladding attachment clips
- Exterior siding and PH-certified windows imported from Europe

PROJECT F (Step 4)

- · Very simple building form
- No scaffolding or crane used
- Structural insulated panels for exterior walls
- Suites have individual heat pumps for heating and cooling and individual energy recovery ventilators (fully decentralized)
- Domestic hot water is generated with individual water heaters with integral heat pumps



COST DISTRIBUTION



Closing Comments

- So will this cost more? Not necessarily. **Step 4 (including all-electric) buildings** can be constructed for less than code-minimum buildings in some areas of BC.
- The lowest construction costs relative to the baselines were constructed by developer/builders.
- For a few projects, a **lack of availability** of high-performance building materials, products and equipment, as well as a **lack of familiarity** with cost-effective NZER designs resulted in increased construction costs.
- The overall cost difference is affected by many **project-specific or industry-wide factors**, some of which don't have anything to do with the NZER design aspects of the building.



POLL 2 Can a premium be offset?







Decarb Lunch

Monte Paulsen, RDH Building Science







RDH consulting to 7+ million s.f. of Passive House

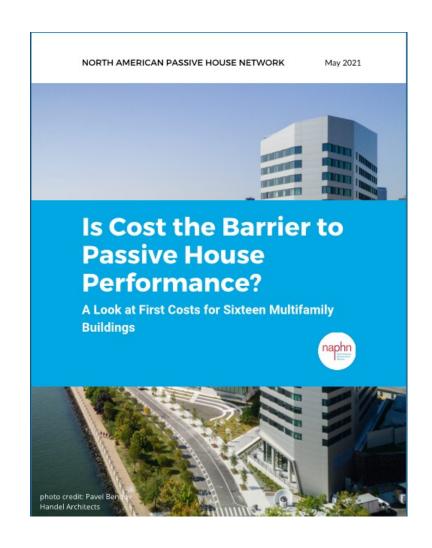








ZebX findings consistent with 2021 U.S. survey



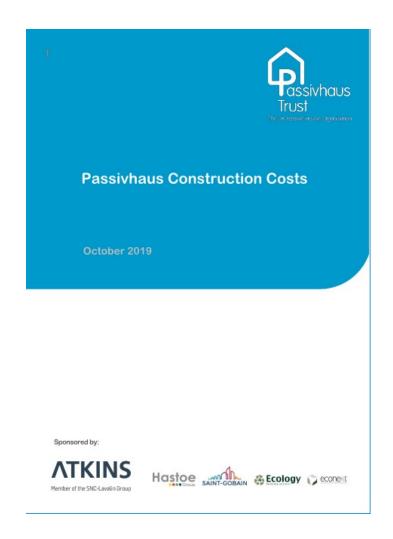
"First costs between 1% and 8% over baseline."

"The most obvious determinant of increased cost appears to be the experience of the project design team, and not the size of the building"

"Findings show that the Passive House buildings use far less energy than typical multifamily buildings. These results translate into operational cost savings that can increase access to private debt..."



ZebX findings consistent with 2019 U.K. survey



"The current best practice is at 9% extra cost."

"Key success factors" include:

- → Passive House needs to be part of the initial brief
- → Employ an experienced Passive House Consultant
- → Keep it simple
- → Ventilation design is important
- → Overheating control is part of the standard



ZebX findings consistent with RDH experience











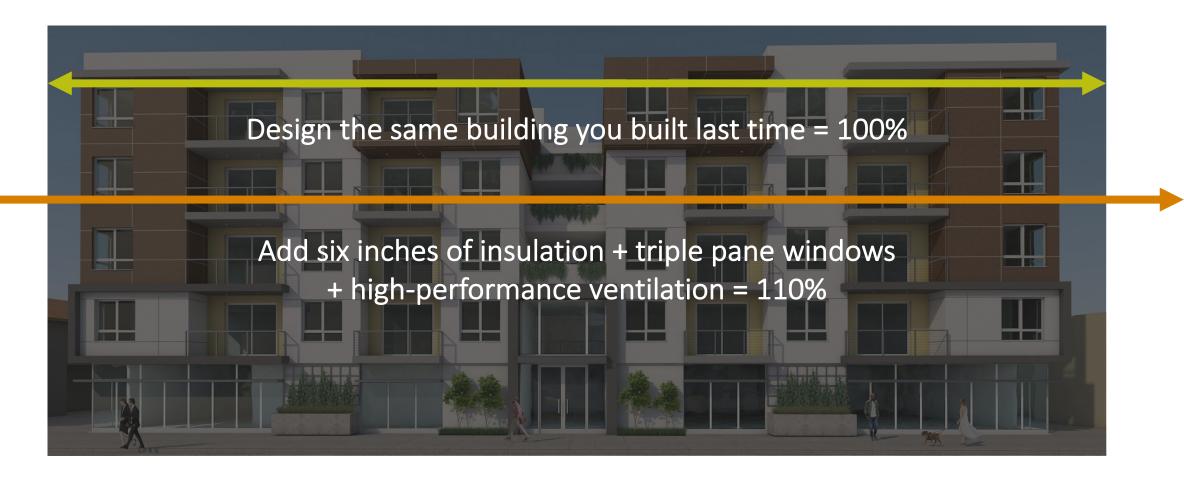
So the question I hope you're asking is:

1% or 9%

How do I build my project for less?



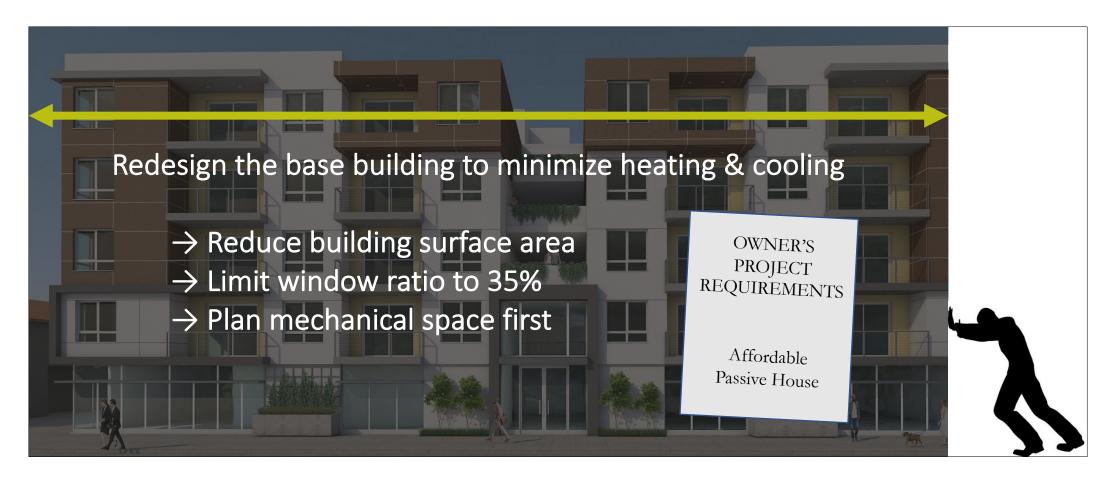
How to maximize the Passive House premium



If you "retrofit" your last project to Passive House, you will pay the most



How to minimize the Passive House premium



If you design as a Passive House from the outset, you will pay the least



Numerous multifamily Passive House projects have been build at zero cost premium in U.S.

\$158 p.s.f. in PORTLAND, OR





🗅 \$149 p.s.f. in PORTLAND, ME

△ \$169 p.s.f. in PHILADELPHIA, PA



Dakota Partners Newington, CT Kaplan Architects







Replication is the "secret" to affordability















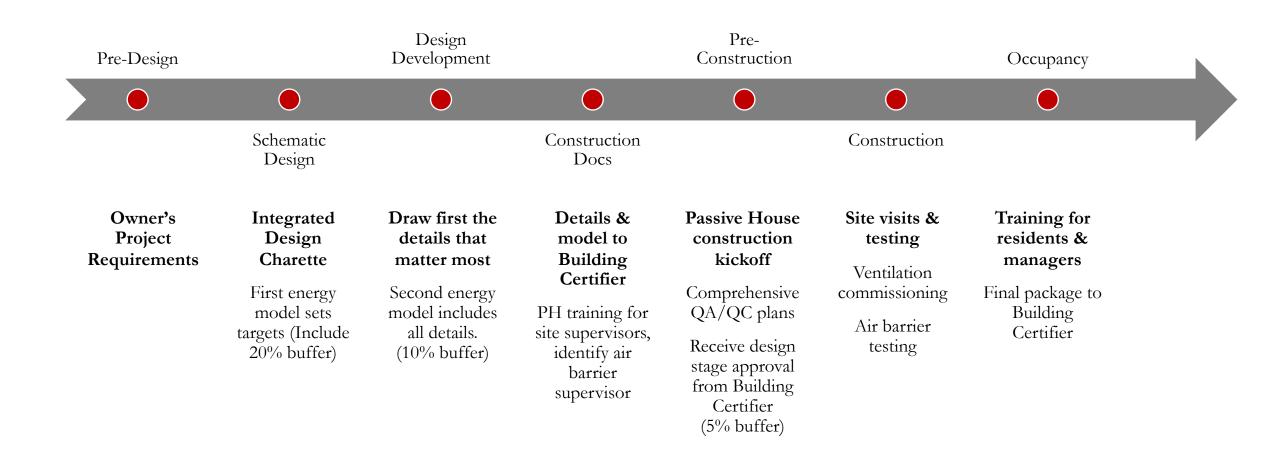


How to minimize the Passive House premium

- 1. Write a concise Owners Project Requirements document with specific sustainability targets and reasonable strategies to achieve those targets.
 - → If you need guidance, hire a sustainability/energy code consultant
- 2. Use the OPR to identify & hire architects and engineers who have affordably achieved that specific sustainability target on previous projects.
 - → If you hire a team new to Passive House, you pay for their training & mistakes
- 3. Develop milestones by which you can measure progress toward these goals.
 - → Budget early and manage to the milestones



Sample milestones for Passive House projects



Questions?

Monte Paulsen, RDH Building Science mpaulsen@rdh.com







POLL 2 RESULTS Can a premium be offset?





