Decarb Lunch Series

zebx

UBC

UBC's Latest & Greatest: Passive House, All-Electric and Solar

Fri Oct 28, 2022,
from 12- 1pm PDT
Free Webinar I zebx.org

ZGF

PEAK CONSTRUCTION GROUP

mood provided by: spring gang
song: Papa Funk

Metro Vancouver

OCAF OTTAWA CLIMATE ACTION FUND

HCi3 FUND AN EFFICIENCYONE COMPANY

TAF

ZERO EMISSIONS INNOVATION CENTRE

ALBERTA ecotrust

FONDS CLIMAT DU GRAND MONTRÉAL

Edmonton

Calgary

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CLF Carbon Leadership Forum Vancouver

B2E Building to Electrification Coalition

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The ZEBx Podcast is now on Spotify, Apple & Google

RESOURCES

SORTING:

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Series:

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- [ ] NZER Challenge Playbook Series
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Systems:

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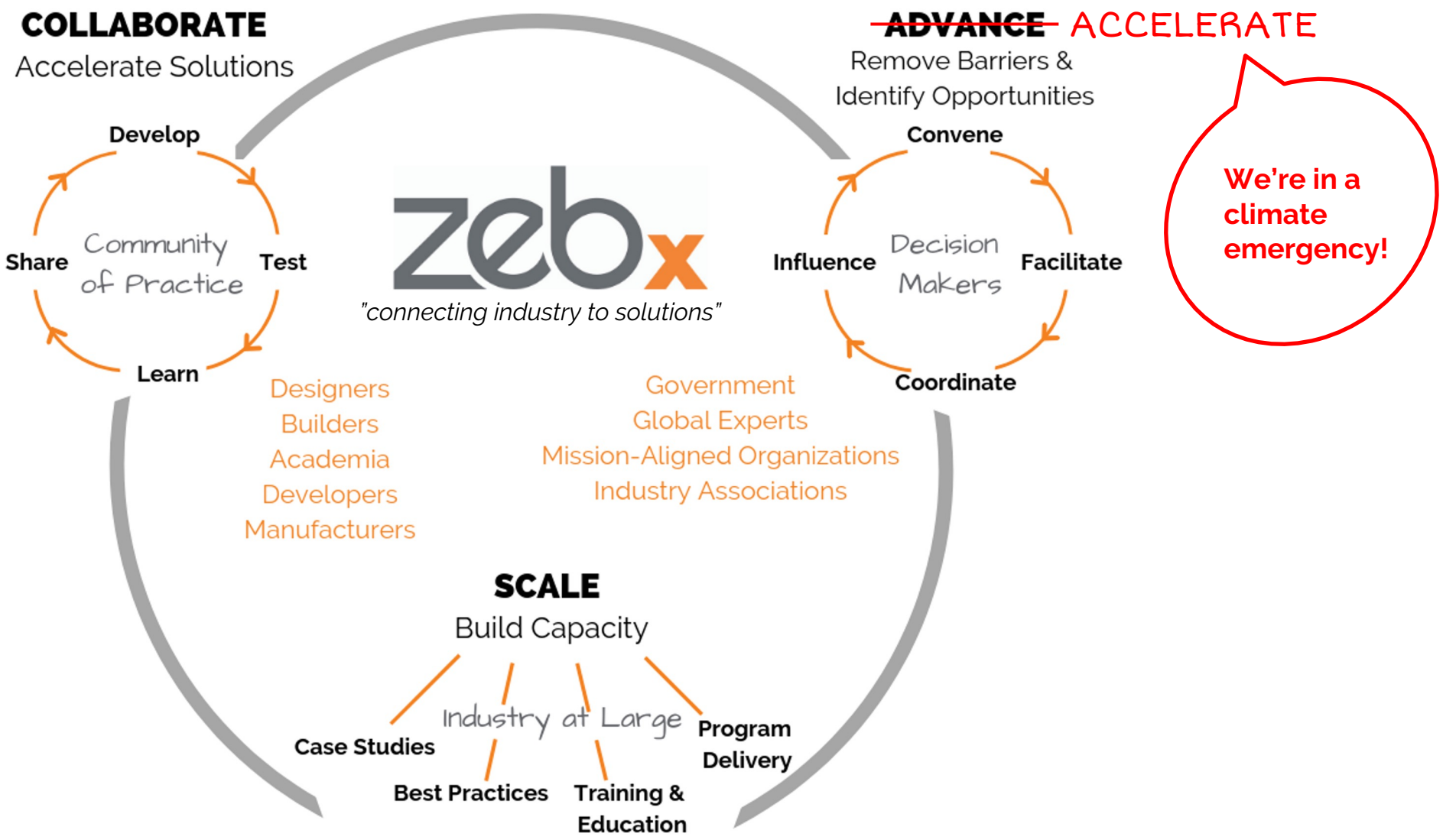
- [ ] Domestic Hot Water Heat Pump
- [ ] Geothermal
- [ ] Mechanical
- [ ] Solar Energy

The ZEBx Podcast Decarb Lunch Jan 2022: Reducing Embodied Carbon for Step Code Homes

The ZEBx Podcast Decarb Lunch Oct 2021: From Net-Zero Energy to Near-Zero Emissions

The ZEBx Podcast Decarb Lunch Jul 2021: Developer/Builder Recipes for Low-Cost, All-Electric, Step 4 Residential Construction


COLLABORATE
Accelerate Solutions
Develop
Test
Learn
Share
Community of Practice
zebx
"connecting industry to solutions"
Designers
Builders
Academia
Developers
Manufacturers
~~ADVANCE~~ ACCELERATE
Remove Barriers & Identify Opportunities
Convene
Facilitate
Coordinate
Influence
Decision Makers
Government
Global Experts
Mission-Aligned Organizations
Industry Associations
We're in a climate emergency!
SCALE
Build Capacity
Industry at Large
Case Studies
Best Practices
Training & Education
Program Delivery

zebx.org

B2E

Events Resources FAQ About ZEBx Contact **Get Involved**

Become a Member

Becoming a member of B2E is simple and free. As a member you will enjoy the following benefits:

- Numerous collaboration opportunities with industry leaders through working groups, subcommittees, B2E events, case study development, and publishing online articles;
- Early access to building electrification news, updates and events;
- Recognition on B2E website and acknowledgement that your organization is fully engaged in the decarbonization of the building sector.

Join B2E

What is Building Electrification?

Building electrification is about making the shift away from fossil-fuels and using low-carbon electricity for space heating, hot water and cooking.

Instead of using natural gas or propane to run appliances like furnaces, kitchen stoves, washers and dryers, everything is electric.

Read more about building electrification on our FAQ page.

View FAQ

b2electrification.org

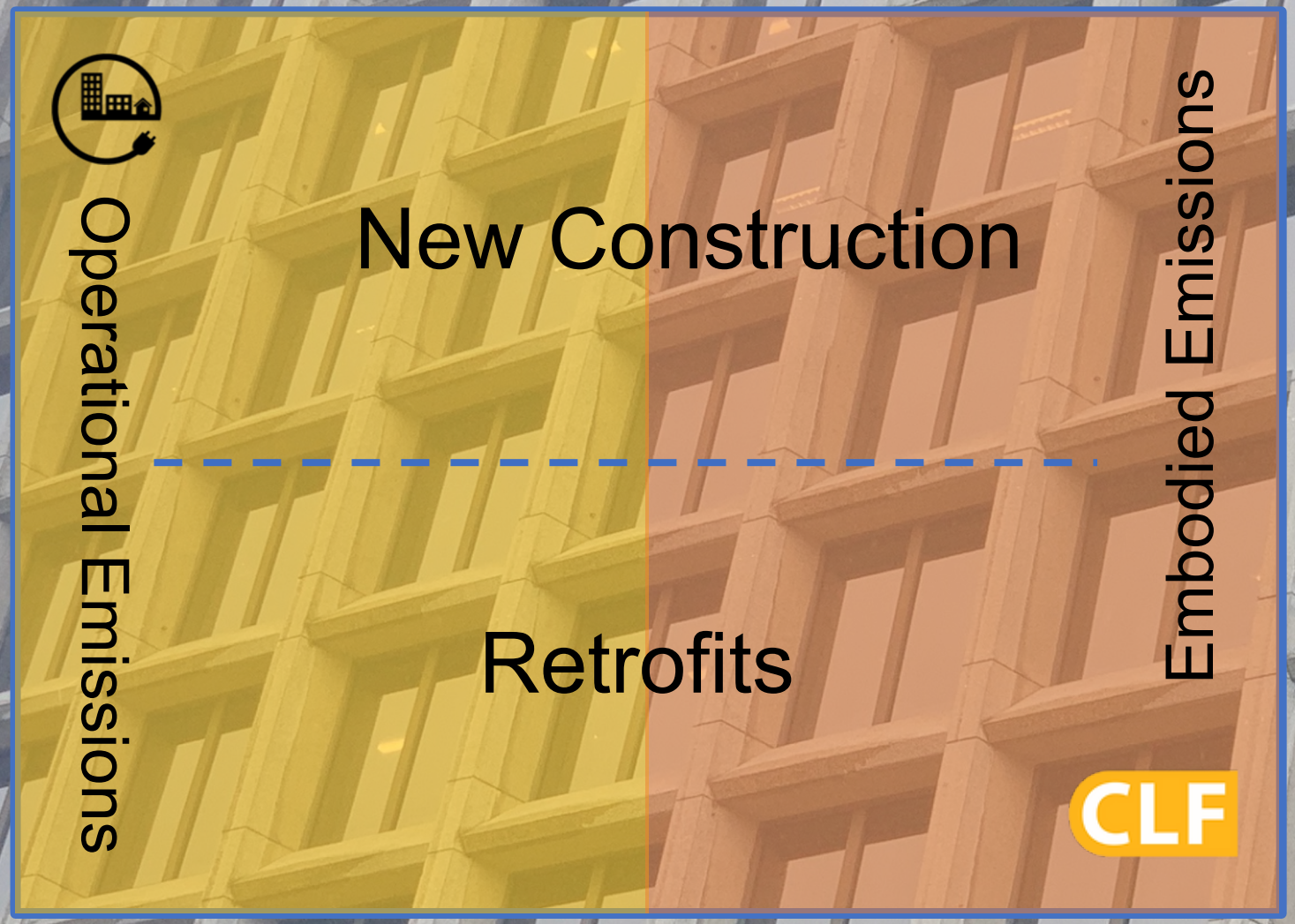
We are a broad **coalition working together** to electrify buildings in British Columbia in order to reduce their climate impacts and reliance on fossil fuels.

b2electrification.org

clfvancouver.com

zebx

ZERO EMISSIONS BUILDING EXCHANGE



CASE STUDY

When the University of British Columbia decided to add another student residence to their Okanagan campus in 2017, the UBC Board of Governors decided to pursue Passive House certification for the project to affirm UBC's reputation as a leader in sustainability. This was an ambitious goal. Not only was this going to be UBC's first Passive House project, but no other educational institution in Canada had yet attempted Passive House certification for a student residence.

CASE STUDY

What makes the OSO residential development in Golden BC impressive is not just the fact that the buildings are all-electric (climate-friendly), energy-efficient (top step of the BC Energy Step Code), and climate-resilient, but also how they were constructed in a highly cost-effective way. This had a lot to do with the developer/builder that has several high-performance building projects under its belt. Check out our most recent, in-depth case study on this finalist of the CleanBC Net-Zero Energy-Ready Challenge.

PODCAST

The ZEBx Podcast
Decarb Lunch

Overheating: Will the need for cooling accelerate decarbonization?

Season 2 Episode 5

Spotify

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Can the need for resilient buildings translate into a need for all-electric buildings? This past May, ZEBx was joined by the City of Vancouver for this event focused on overheating, featuring speakers from the University of British Columbia and RDH Building Science. New developments and building retrofits must take future climate conditions into consideration to ensure occupants remain safe in their residences. Cooling is part of this consideration, but can it be a path to a future where zero-emissions buildings are the norm?

POLL 1

Tell us about yourself!

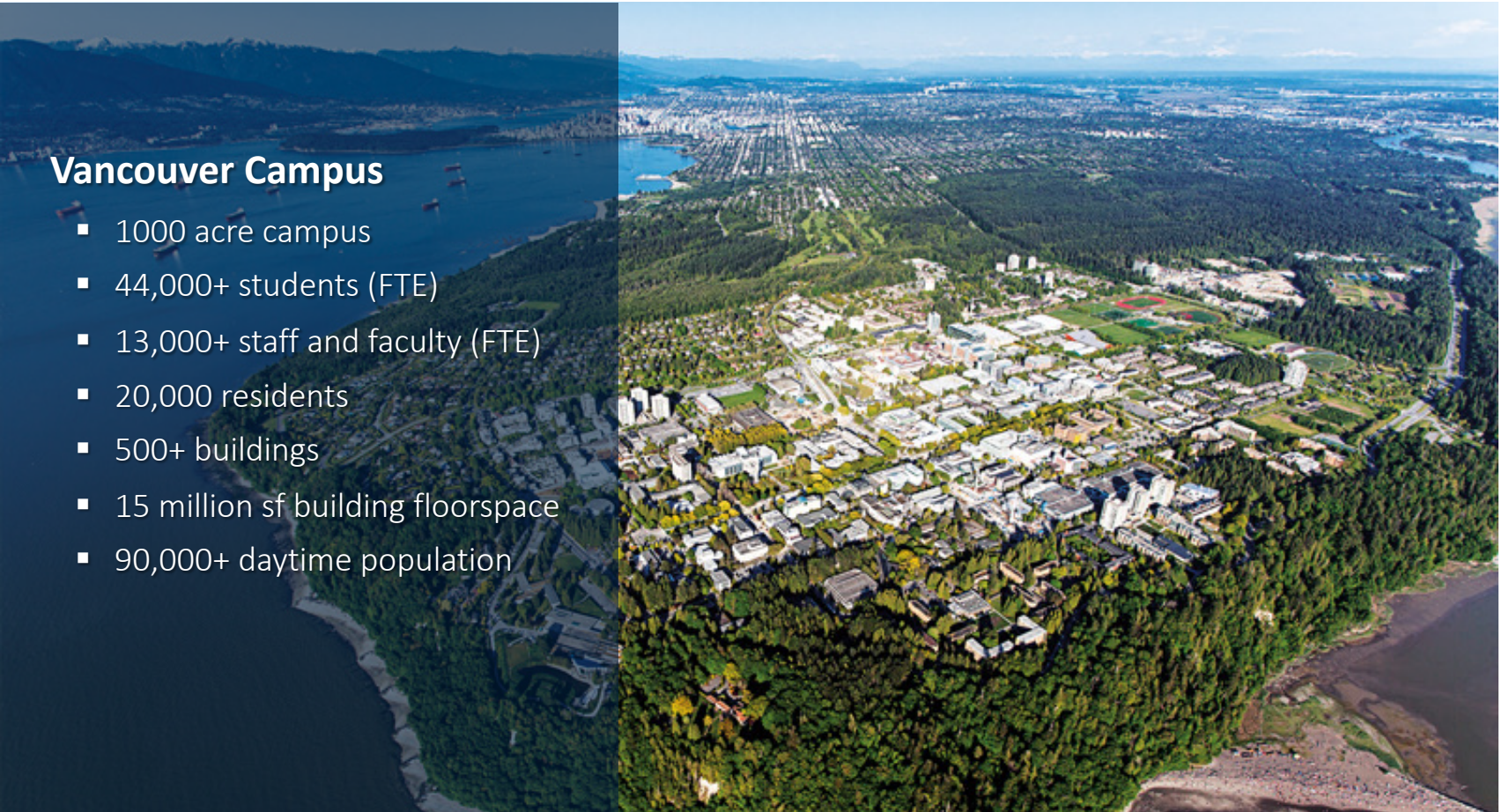
Three-part anonymous poll

Evolve--Staff & Faculty Rental Housing

UBC's Latest And Greatest: Passive House, All-Electric and Solar

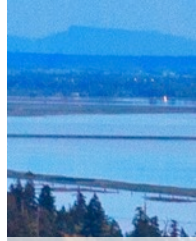
John Madden | Director Sustainability and Engineering
Campus and Community Planning | University of British Columbia

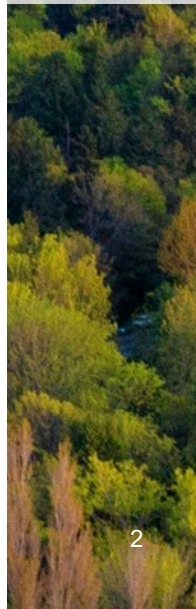
UBC CONTEXT



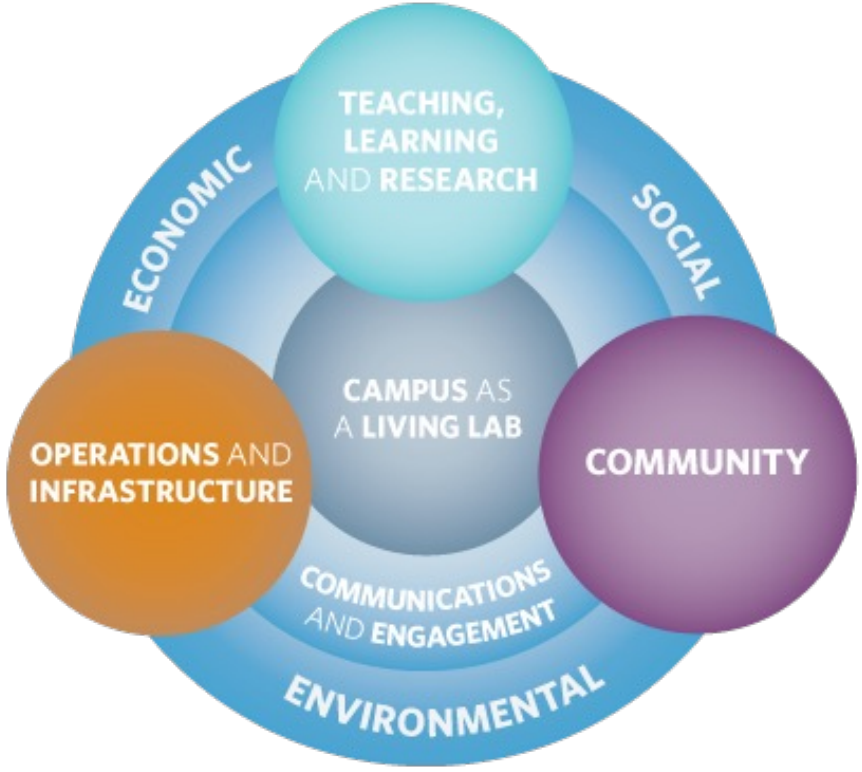
Vancouver Campus

- 1000 acre campus
- 44,000+ students (FTE)
- 13,000+ staff and faculty (FTE)
- 20,000 residents
- 500+ buildings
- 15 million sf building floorspace
- 90,000+ daytime population



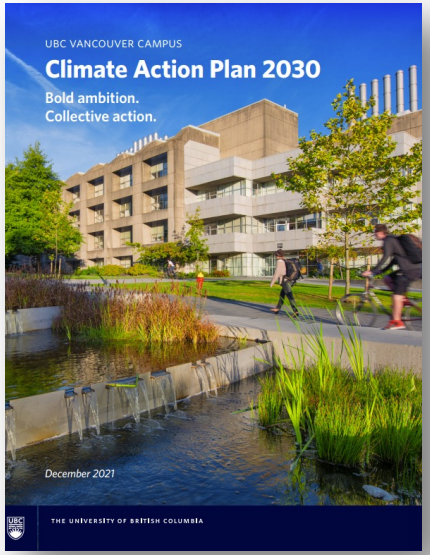


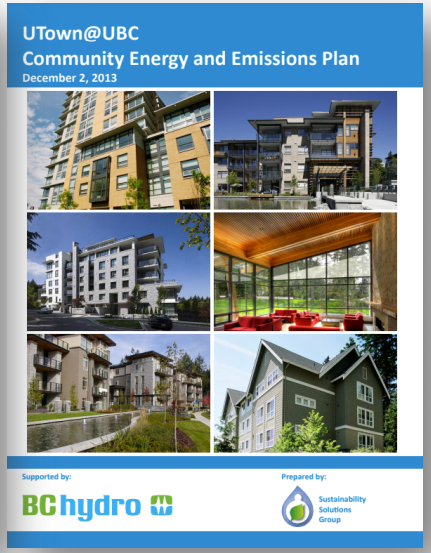
UBC CAMPUS AS A LIVING LAB



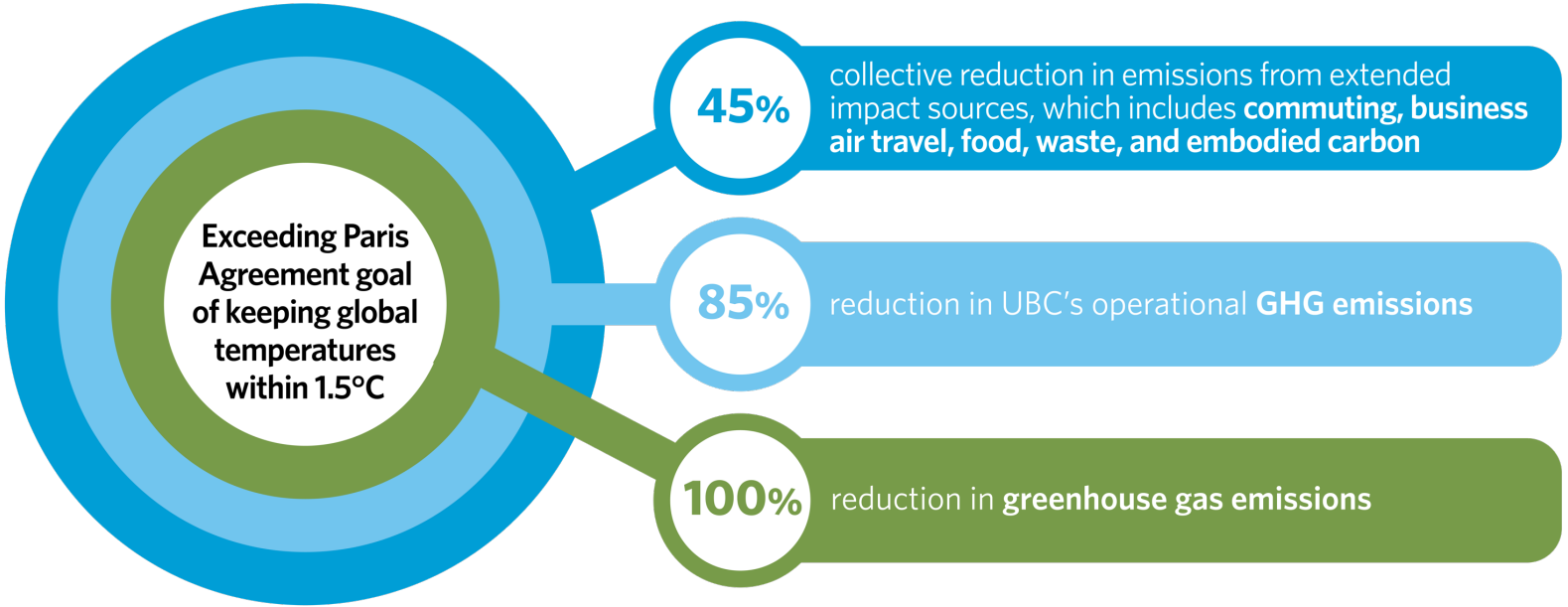
UBC Evolve Housing Project: solar rooftop array | passive, active shading strategies

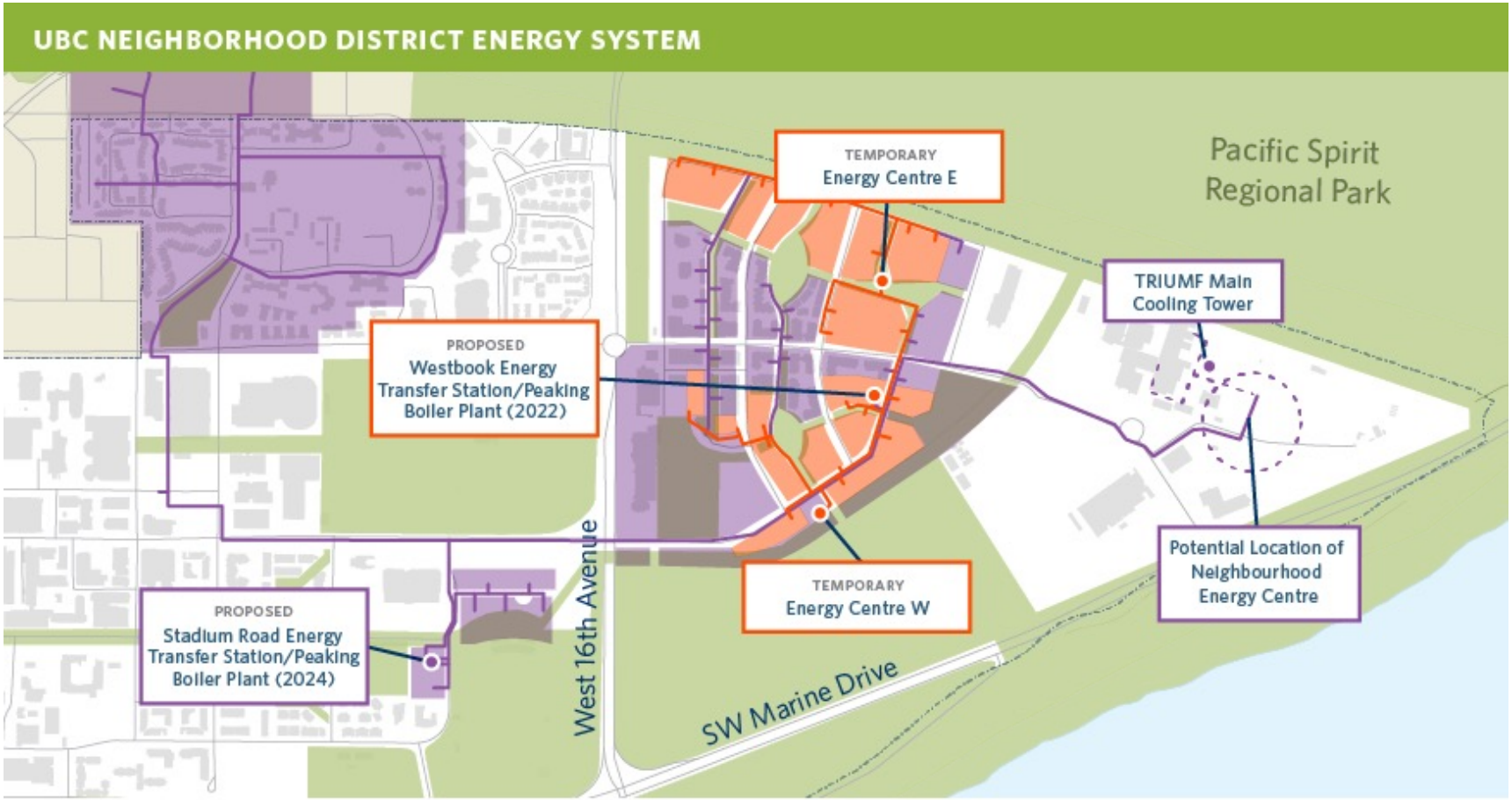
UBC POLICY CONTEXT





CAP 2030 TARGETS




UBC NEIGHBORHOOD DISTRICT ENERGY SYSTEM
TEMPORARY
Energy Centre E
Pacific Spirit
Regional Park
TRIUMF Main
Cooling Tower
PROPOSED
Westbook Energy
Transfer Station/Peaking
Boiler Plant (2022)
Potential Location of
Neighbourhood
Energy Centre
TEMPORARY
Energy Centre W
PROPOSED
Stadium Road Energy
Transfer Station/Peaking
Boiler Plant (2024)
West 16th Avenue
SW Marine Drive
PHASE 1:
Building Connection
Piping
Energy Centre
OTHER PHASES:
Building Connection
Piping
TRIUMF Cooling Loop (2024)
Energy Sources
0 200 400m
N

EVOLVE FUNDING CONTRIBUTION FROM NRC GREEN INFRASTRUCTURE FUND

Français

Government of Canada | Gouvernement du Canada

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Canada Invests in UBC Green Infrastructure Demonstration Projects

From: Natural Resources Canada

News release

July 23, 2019 Vancouver, British Columbia Natural Resources Canada

The Government of Canada believes that clean energy technology innovation must be affordable, reliable and sustainable to support Canadians as we build a low-carbon economy. To these ends, Canada is delivering more options for families to make greener choices while creating good, middle-class jobs.

The Honourable Amarjeet Sohi, Canada's Minister of Natural Resources, today announced $5.8 million in funding to the University of British Columbia (UBC) for two projects that will improve Canadians' quality of life and reduce pollution as we build a clean energy future.

The first project, in partnership with BC Hydro and Cypress Power, will support a system for electric vehicle charging stations, with an investment of $2.3 million. This project will also help inform the development of guidelines for wireless charging and give UBC access to a fleet of two dozen electric vehicles.

The second project, in partnership with UBC Properties Trust, will build a six-storey certified passive house for staff and faculty at the UBC Vancouver campus and install state-of-the art monitoring equipment in a second building, with an investment of $3.5 million. The project will evaluate and compare the two multi-unit residential buildings (MURB) to gather data such as energy use, emissions and indoor environmental quality to speed up the adoption of more net-zero energy MURBs throughout Canada.

Funded through the Green Infrastructure Program, these demonstration projects will provide significant data for future clean energy projects throughout Canada.

Canada's climate plan includes over 50 measures to protect the environment and leave a healthier planet for future generations, including actions to protect our oceans, phase out coal-fired electricity, invest in renewables and public transit and reduce plastic pollution. Zero-emission vehicles and energy efficiency in buildings play a key part of Canada's plan to combat climate change, while growing the economy.

- 30 -

- **UBC received $3.5 M from Natural Resources Canada (NRC Green Infrastructure Fund) to help support achieving Passive House Certification and Net Zero Energy Ready (Step 4)**

- **Research and Monitoring UBC School of Architecture + Landcape Architecture**

THE UNIVERSITY OF BRITISH COLUMBIA

John Madden | Director | Sustainability + Engineering |
UBC Campus & Community Planning

POLL 1

What did you tell us about yourself?

EVOLVING PASSIVE HOUSE

Part 2
Construction

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PEAK CONSTRUCTION GROUP 30th ANNIVERSARY

UBC PROPERTIES TRUST

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WE ARE HERE

1

Strategy, Process & Design

February 2021

Read more >

2

Construction

October 2022

3

Performance & Occupant Evaluation

2024

Introduction

ENR CALIFORNIA

2018
Design Firm of the Year

NEW BUILDINGS INSTITUTE

2018
Top Zero Energy Architect

Projects of all scales with a focus on innovation, human performance & environmental stewardship.

760+
Employees

60+
in Vancouver

7
Offices

ZGF

17
Net-Zero Energy Projects

7
Passive House Projects

8
Net-Zero Carbon projects

PEAK CONSTRUCTION GROUP
30th ANNIVERSARY

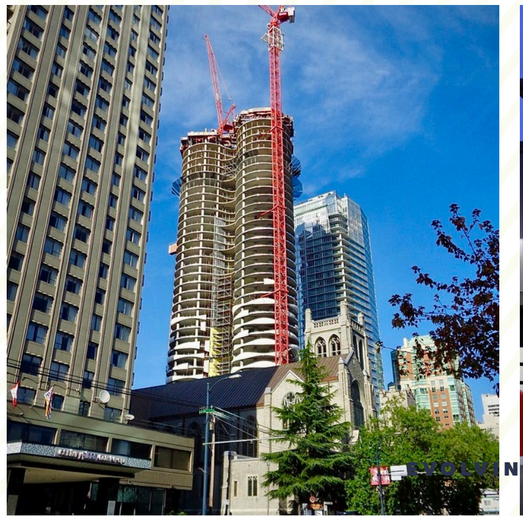
Founded in
1992

Offices in
Vancouver
Seattle

5
Passive House Projects

400+
Units completed in Passive House Projects

Seńáḵw—Canada's largest Net Zero Carbon project



Why *Evolve?*

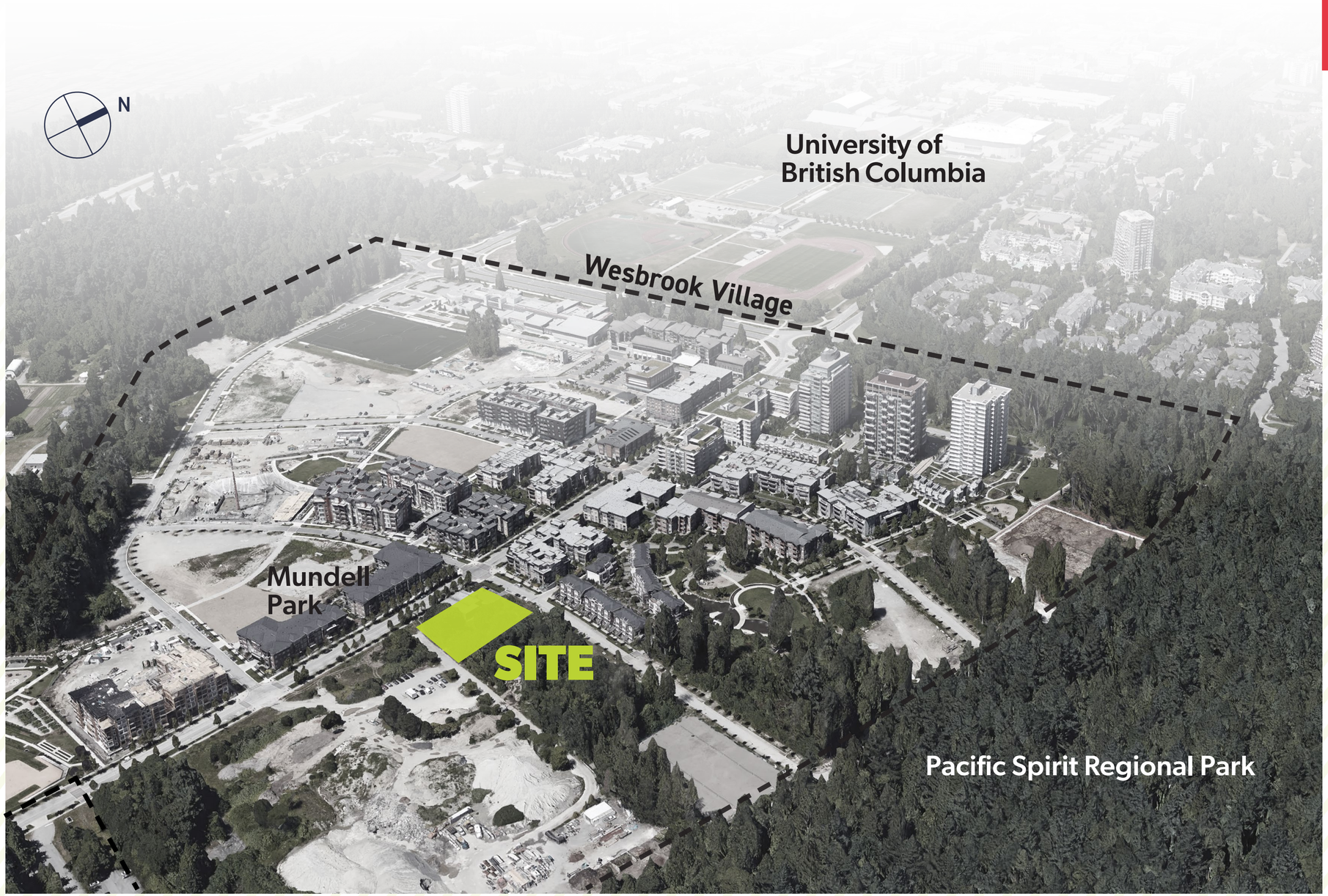
Lot 11 (late DD)

Lot 4 (late SD)

Evolve

About *Evolve*

- 103,000 SF
- 6 storeys
- Wood-frame
- 110 rental units
- Faculty & Staff Housing at UBC Point Grey Campus
- Occupancy Aug 2022



About *Evolve*

Passive House Certification targeted	Evolve	Req's
Heating Demand kWh/m²/yr	12.3	≤15
Heating Load W/m²	8.1	≤10
Cooling Demand kWh/m²/yr	0.3	≤15
Cooling Load W/m²	0.0	≤10
Frequency of Overheating %	0	≤10
Air Tightness ACH@50	0.3	0.6
Primary Energy Renewable kWh/m²/yr	65	≤72

Building Performance Strategies

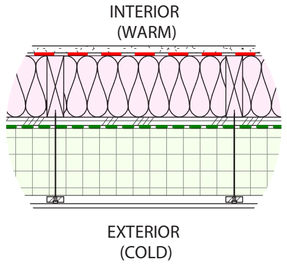
Passive House Principles + Beyond Passive House

High Performance Windows

Triple Glazed

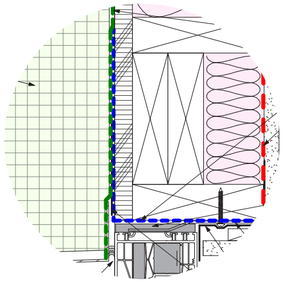
High-Efficiency Mechanical

Heat Pumps, HRV



Thermal Insulation

R-40+ Walls / Roof



Building Envelope Continuity

Airtight / Thermal-Bridge-Free

Exterior Shading

Operable & Fixed Shades

Renewable Energy

Photovoltaic Panels

Energy Metering

Occupant Dashboards

Shading

- Operable and fixed exterior shades and fin walls on east/west elevations help mitigate solar heat gains.
- Shading strategy designed specifically for each elevation.

Partial Cooling

- Cooling coil integrated in HRV for partial cooling.
- Zoned HRVs (north/south wing and west/east wing) with 85% efficiency provide simultaneous heating and tempered cooling throughout.

LESSONS LEARNED

Design and Construction Collaboration

User Centered Design

Design Intent Constructability and Reality

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Integrated Team

- UBC SALA: research
- NRCan: funding body
- AME Group
- Jarvis Engineering Consultants
- Aquacoast
- RDH
- RJC

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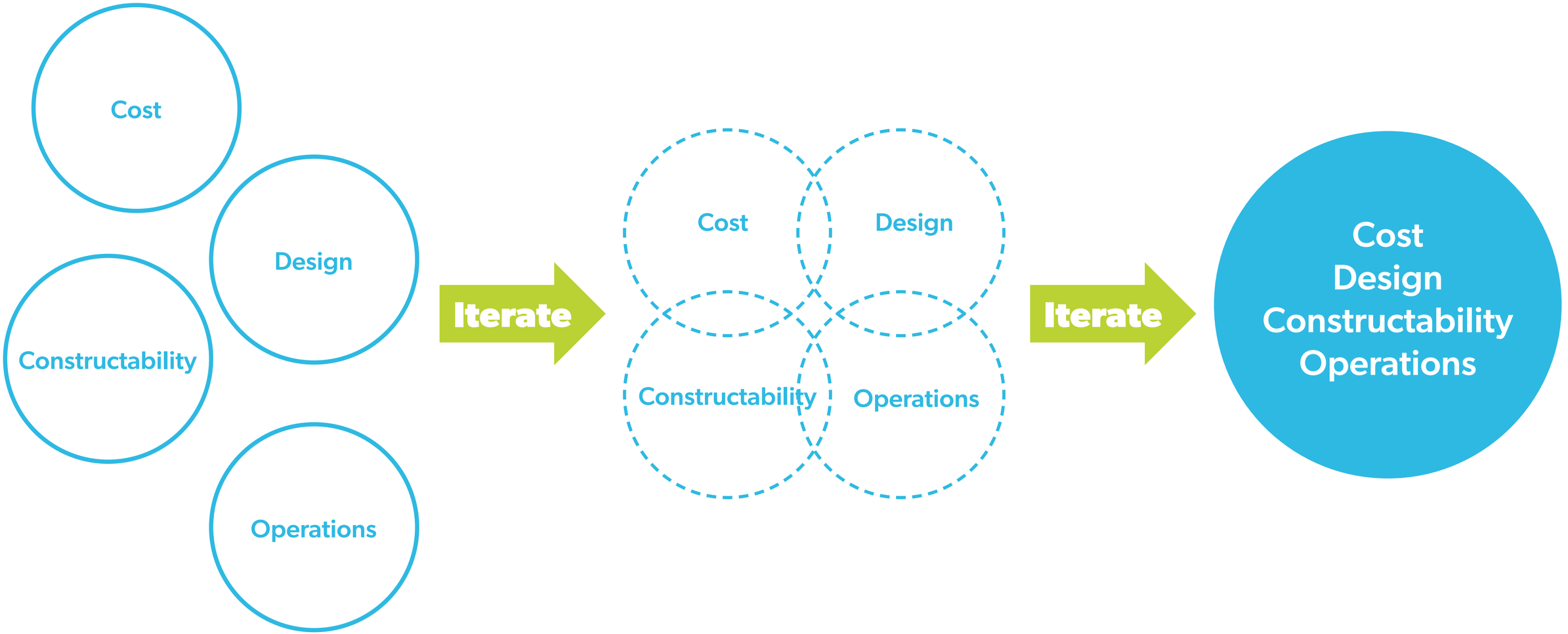
UBC PROPERTIES TRUST

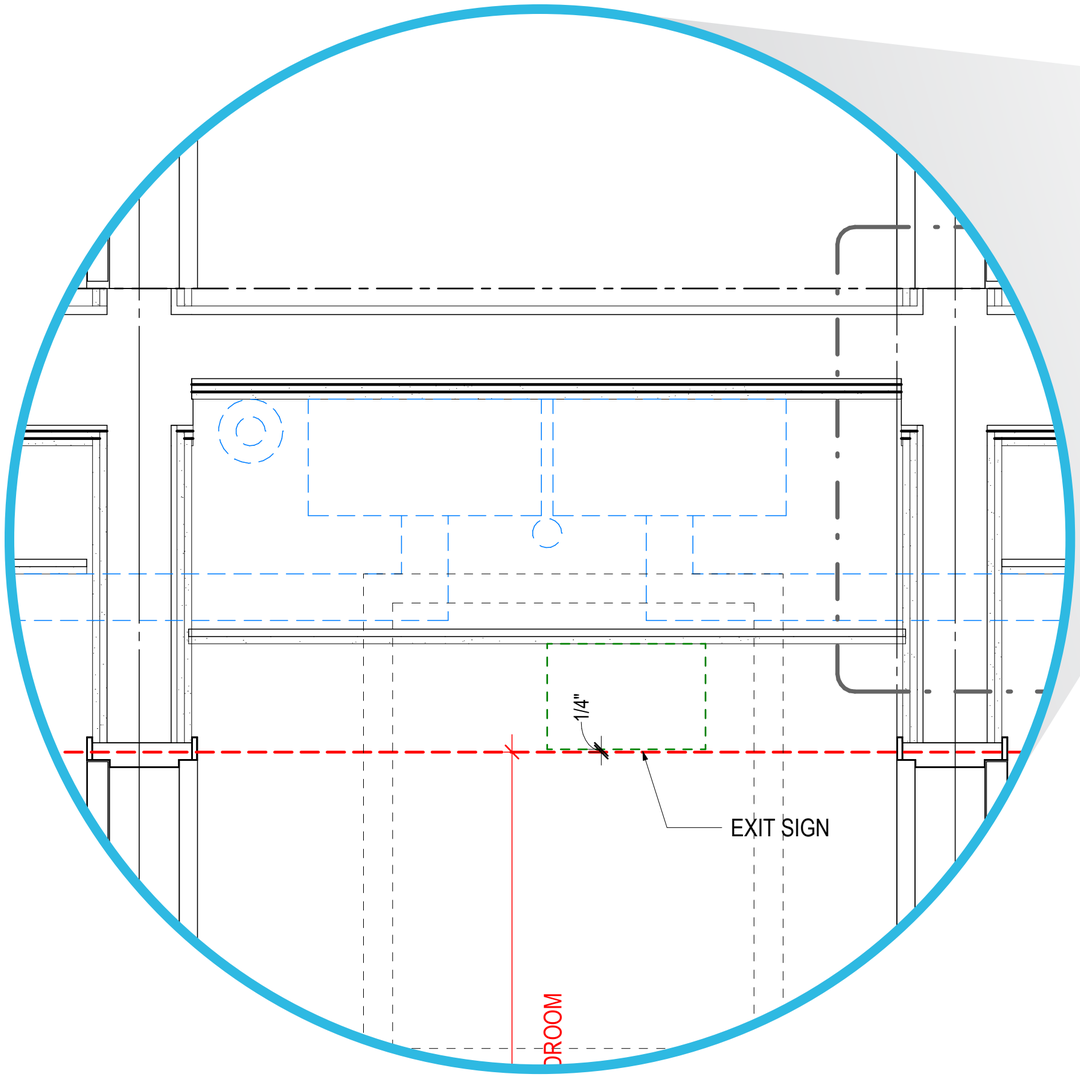
PEAK CONSTRUCTION GROUP

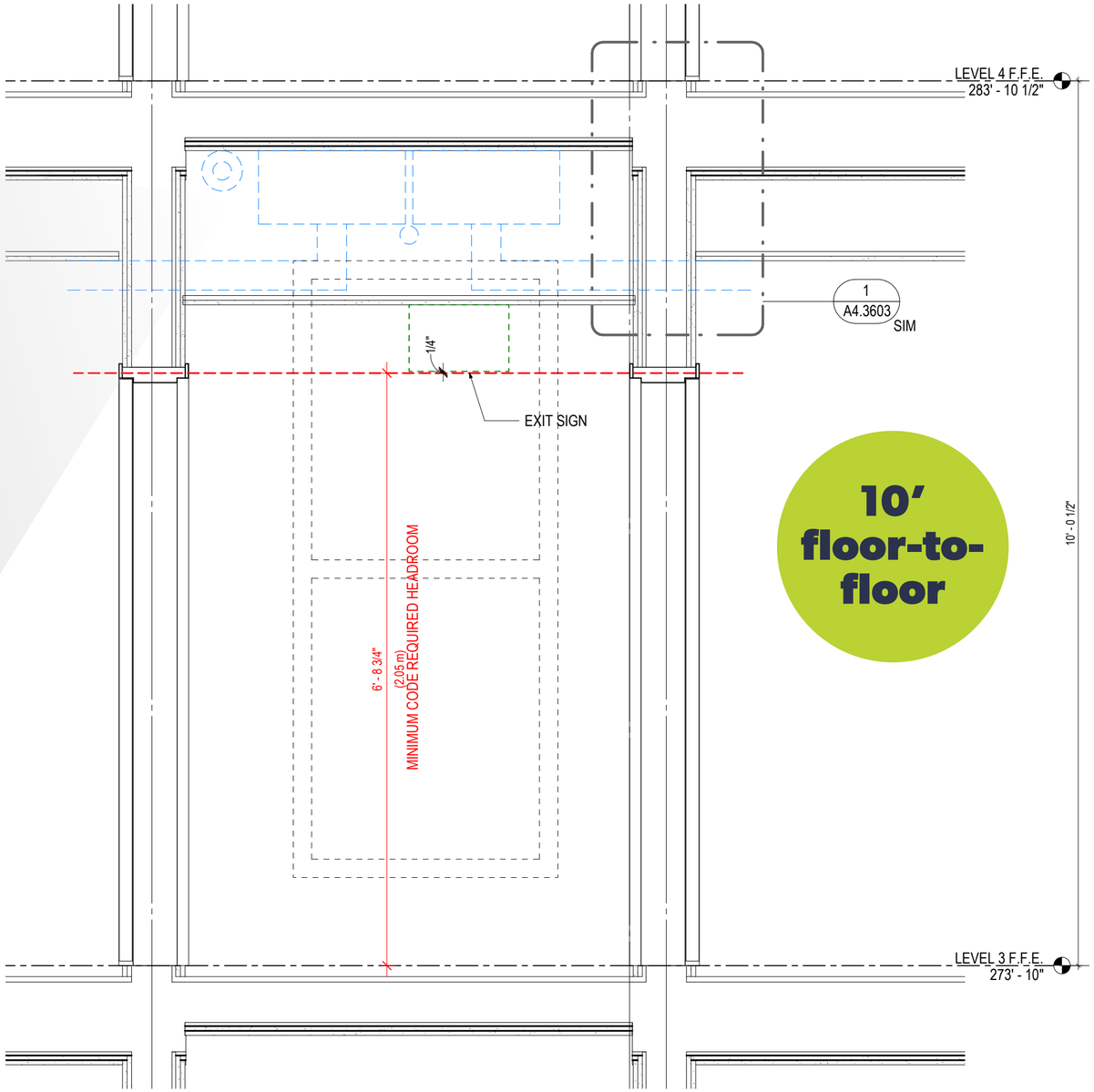
- Perry + Associates
- CFT: code consultant
- Terratek: PV
- Enerpro: metering
- CADmakers: Constructability review

LESSONS LEARNED Design and Construction Collaboration



Typical Corridor Section





10’ floor-to-floor

LESSONS LEARNED Design and Construction Collaboration

Description	Ventilation Equipment	Htg. Equipment	Clg. Equipment	Vent. Equip. Layout	Equip. Layout	Htg/Clg. Plant	Fire/Smoke Damper Issue	Ventilation Notes	Maintenance Considerations	Benefits	Negative Considerations	Average Cost Per Suite Heating & AC	Average Cost Per Suite Ducting for distribution SA & Return Air & Suite Ventilation	Vertide Shaft	Horizontal Shaft	FSD's	ElecBB	Total Cost
Suite by Suite (4-pipe FCU) Note the drawins have 1A & 1B reversed, I priced based on this description	Swegon	Jaga	Jaga	In-Suite	Roof/In-Suite	Aermec NRL (1 Htg, 1 Clg)	No FSD's required.	Min. Vent = Smaller distribution duct sizing	In-Suite (Fan & Filters), Mech. Rm. (Pumps etc.)	No FSD's, suite-by-suite controlability (Clg. Only), optimized floor plans, no floor space requirements for Mech.	Ceiling height to accommodate equipment, increased maintenance within suites (quarterly), more thermal bridges thru wall penetrations.	$14,000.00	$4,000.00	$0.00		$0.00		$18,000.00
Suite by Suite (VRF)	Swegon	Mitsubishi	Mitsubishi	In-Suite	Roof/In-Suite	Mitsubishi	No FSD's required.	Min. Vent = Smaller distribution duct sizing	In-Suite (Fan & Filters), Roof (VRF Cond. Units)	No FSD's, suite-by-suite controlability (Clg. Only), optimized floor plans, no floor space requirements for Mech.	Ceiling height to accommodate equipment, increased maintenance within suites (quarterly), more thermal bridges thru wall penetrations.	$11,500.00	$4,000.00	$0.00		$0.00		$15,500.00
Floor by Floor	Swegon	Baseboard/Vent	Vent (VRF @ HRV)	Mech Rm.	Roof/In-Suite	Mitsubishi	FSD's on all distribution ducting.	Vent. Ducting sized for partial Clg at unit, ductwork larger than min. vent	Mech. Room (Fan & Filters), Roof (VRF Cond. Units)	Optimized floor plans, most maintenance in a owner accesible locations, reduced equipment, reduced piping distribution.	Significant Mech. Rm. Floor area required, FSD's on SA and EA, potential crossovers and impacts on ceiling heights No Individual Suite Control on Cooling, interlock needs to hppen so ther is no simutaneous heating and cooling	$5,500.00	$7,000.00			$1,600.00	$1,275.00	$15,375.00
Floor by Floor (serving 2 floors)	Swegon	Baseboard/Vent	Vent (VRF @ HRV)	Mech Rm.	Roof/In-Suite	Mitsubishi	FSD's on all distribution ducting.	Vent. Ducting sized for partial Clg at unit, ductwork larger than min. vent	Mech. Room (Fan & Filters), Roof (VRF Cond. Units)	Optimized floor plans, most maintenance in a owner accesible locations, reduced equipment, reduced piping distribution.	Mech. Rm. Floor area required, FSD's on SA and EA, potential crossovers and impacts on ceiling heights No individual Suite control On Cooling interlock needs to hppen so ther is no simutaneous heating and cooling	$5,000.00	$8,000.00		$500.00	$1,600.00	$1,275.00	$16,375.00
Floor by Floor (serving 3 floors)	Swegon	Baseboard/Vent	Vent (VRF @ HRV)	Mech Rm. OR Roof	Roof/In-Suite	Mitsubishi	FSD's on all distribution ducting.	Vent. Ducting sized for partial Clg at unit, ductwork larger than min. vent	Mech. Room (Fan & Filters), Roof (VRF Cond. Units)	Optimized floor plans, most maintenance in a owner accesible locations, reduced equipment, reduced mech. Space requirements, reduced piping distribution.	FSD's on SA and EA, potential crossovers and impacts on ceiling heights No individual Suite control On Cooling interlock needs to hppen so ther is no simutaneous heating and cooling	$4,500.00	$9,500.00		$1,000.00	$1,600.00	$1,275.00	$17,875.00
Vertical Distribution w/ Partial Clg	Swegon	Baseboard/Vent	Vent (VRF @ HRV)	Roof	Roof/In-Suite	Mitsubishi	FSD's only required on S/A ducting.	Vent. Ducting sized for partial Clg at unit, ductwork larger than min. vent	Mech. Room (Fan & Filters), Roof (VRF Cond. Units)	Most maintenance in a single location, reduced number of FSD's, reduced equipment, least amount of piping distribution.	Mech. Shafts requirements for ducting, FSD's on SA	$3,500.00	$8,000.00	$2,500.00	$0.00	$800.00	$1,275.00	$16,075.00
Fully Centralized HRV (4-pipe FCU)	Swegon	Jaga	Jaga	In-Suite	Roof/In-Suite	Aermec NRL (1 Htg, 1 Clg)	FSD's only required on S/A ducting (Potentially none).	Min. Vent = Smaller distribution duct sizing	Roof (Fan & Filters), Mech. Rm. (Pumps etc.)	Most maintenance in a single location, potentially no FSD's, suite-by-suite controlability (Clg. Only)	Mech. Shafts requirements for ducting, maintenance within suites (yearly) (6500 + 3000 controls)	$9,500.00	$9,000.00	$3,000.00				$21,500.00
Fully Centralized HRV (VRF)	Swegon	Mitsubishi	Mitsubishi	In-Suite	Roof/In-Suite	Mitsubishi	FSD's only required on S/A ducting (Potentially none).	Min. Vent = Smaller distribution duct sizing	Roof (Fan & Filters, VRF Cond. Units)	Most maintenance in a single location, potentially no FSD's, suite-by-suite controlability (Clg. Only)	Mech. Shafts requirements for ducting, maintenance within suites (yearly) (5000 + 3000 controls)	$8,000.00	$9,000.00	$3,000.00				$20,000.00

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Decision Matrix

	Maintenance Considerations	Benefits	Negative Considerations	Cost
System 1	●●●●○	●○○○○	●●●●○	$$
System 2	●●○○○	●●●●○	●○○○○	$$$$$
System 3	●●●○○	●●○○○	●●●○○	$$$
System 4	●○○○○	●●●○○	●●○○○	$$$$

Iterate together.

Schematic Design

Design Development

Construction Documents

Construction Administration

ZGF

Design and Construction Collaboration

User Centered Design

Design Intent Constructability and Reality

LESSONS LEARNED

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Mid-construction testing

The Issue

Testing highlights potential issues prior to fully sealing the building and full airtightness testing.

The Cause

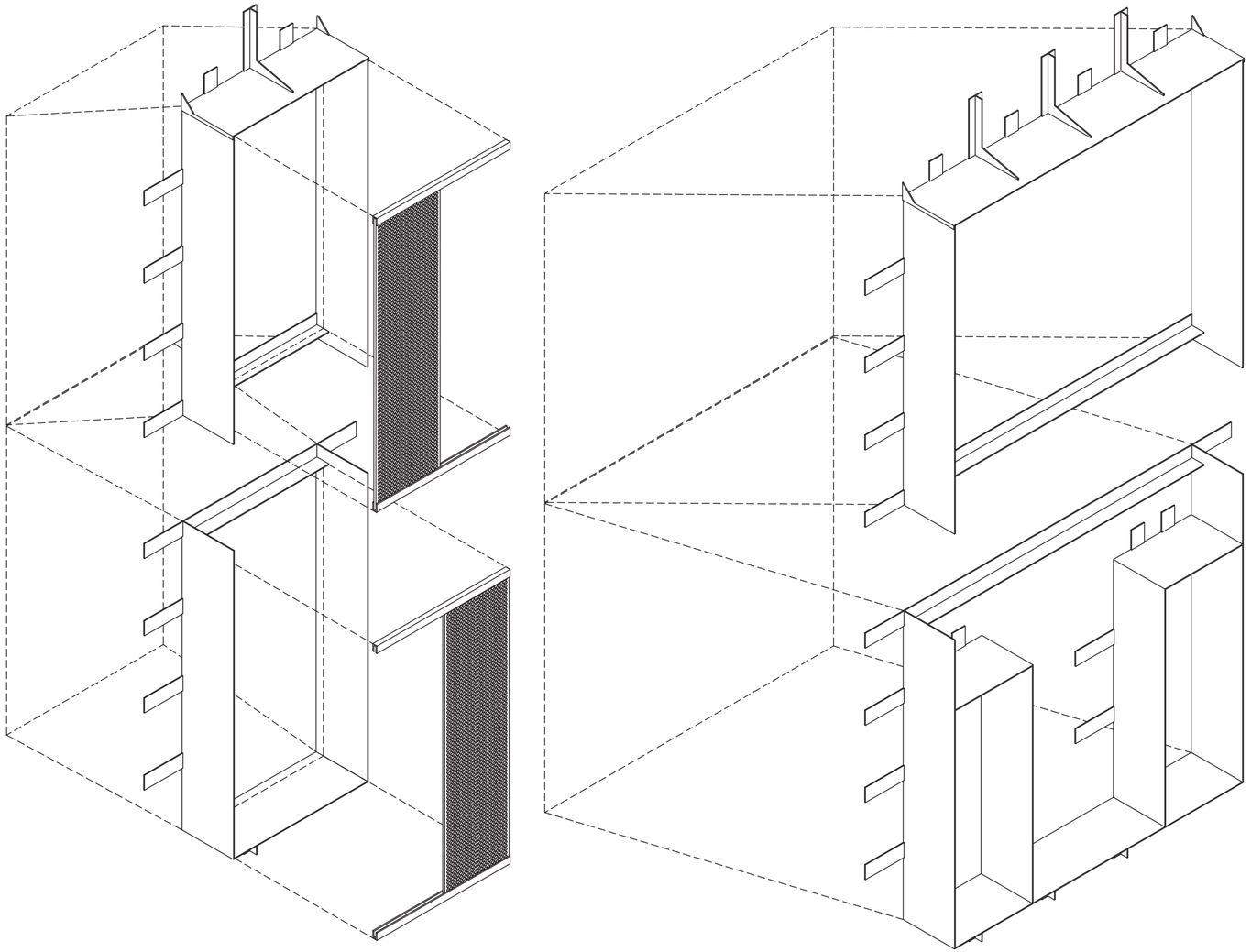
Testing identified that tape left voids. In operation air would escape into building structure causing:

- dampness
- reduced energy efficiency
- potential thermal comfort issues

The Fix

Testing allowed more cost effective corrective action to be implemented with less impact on schedule.

Window Shroud Assembly



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Respond to issues together before they grow.

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LESSONS LEARNED

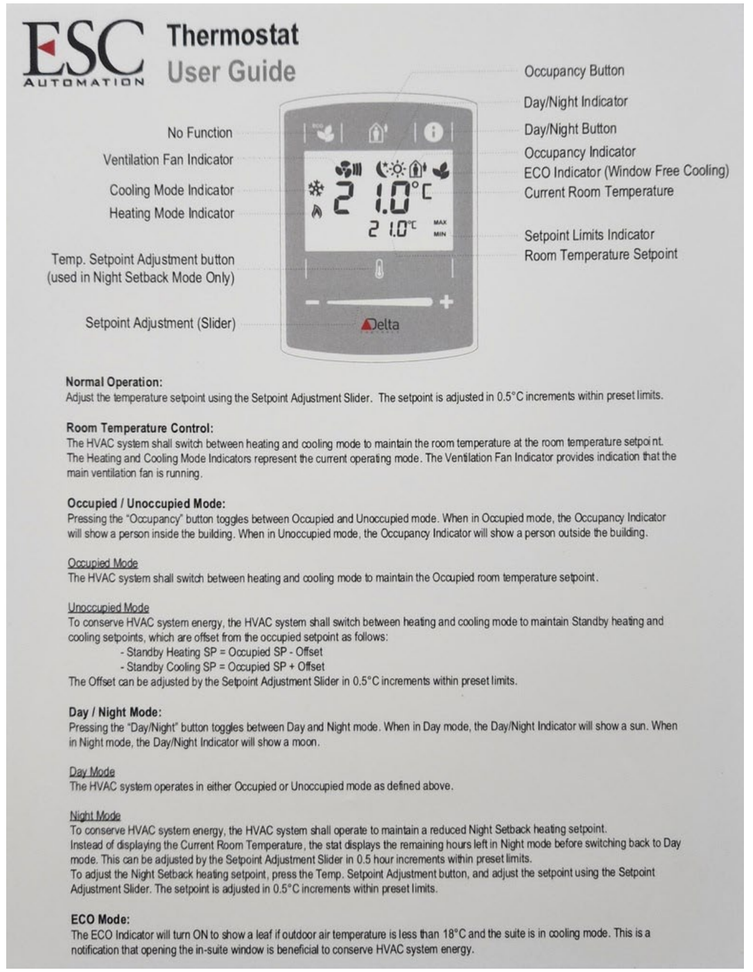
User Centered Design

Design and Construction Collaboration

Design Intent Constructability and Reality

LESSONS LEARNED User Centered Design

Fire Damper Light



ESC AUTOMATION

Thermostat User Guide

Normal Operation:
Adjust the temperature setpoint using the Setpoint Adjustment Slider. The setpoint is adjusted in 0.5°C increments within preset limits.

Room Temperature Control:
The HVAC system shall switch between heating and cooling mode to maintain the room temperature at the room temperature setpoint.
The Heating and Cooling Mode Indicators represent the current operating mode. The Ventilation Fan Indicator provides indication that the main ventilation fan is running.

Occupied / Unoccupied Mode:
Pressing the "Occupancy" button toggles between Occupied and Unoccupied mode. When in Occupied mode, the Occupancy Indicator will show a person inside the building. When in Unoccupied mode, the Occupancy Indicator will show a person outside the building.

Occupied Mode
The HVAC system shall switch between heating and cooling mode to maintain the Occupied room temperature setpoint.

Unoccupied Mode
To conserve HVAC system energy, the HVAC system shall switch between heating and cooling mode to maintain Standby heating and cooling setpoints, which are offset from the occupied setpoint as follows:
- Standby Heating SP = Occupied SP - Offset
- Standby Cooling SP = Occupied SP + Offset

The Offset can be adjusted by the Setpoint Adjustment Slider in 0.5°C increments within preset limits.

Day / Night Mode:
Pressing the "Day/Night" button toggles between Day and Night mode. When in Day mode, the Day/Night Indicator will show a sun. When in Night mode, the Day/Night Indicator will show a moon.

Day Mode
The HVAC system operates in either Occupied or Unoccupied mode as defined above.

Night Mode
To conserve HVAC system energy, the HVAC system shall operate to maintain a reduced Night Setback heating setpoint.
Instead of displaying the Current Room Temperature, the stat displays the remaining hours left in Night mode before switching back to Day mode. This can be adjusted by the Setpoint Adjustment Slider in 0.5 hour increments within preset limits.
To adjust the Night Setback heating setpoint, press the Temp. Setpoint Adjustment button, and adjust the setpoint using the Setpoint Adjustment Slider. The setpoint is adjusted in 0.5°C increments within preset limits.

ECO Mode:
The ECO Indicator will turn ON to show a leaf if outdoor air temperature is less than 18°C and the suite is in cooling mode. This is a notification that opening the in-suite window is beneficial to conserve HVAC system energy.

Thermostat User Guide

LESSONS LEARNED User Centered Design

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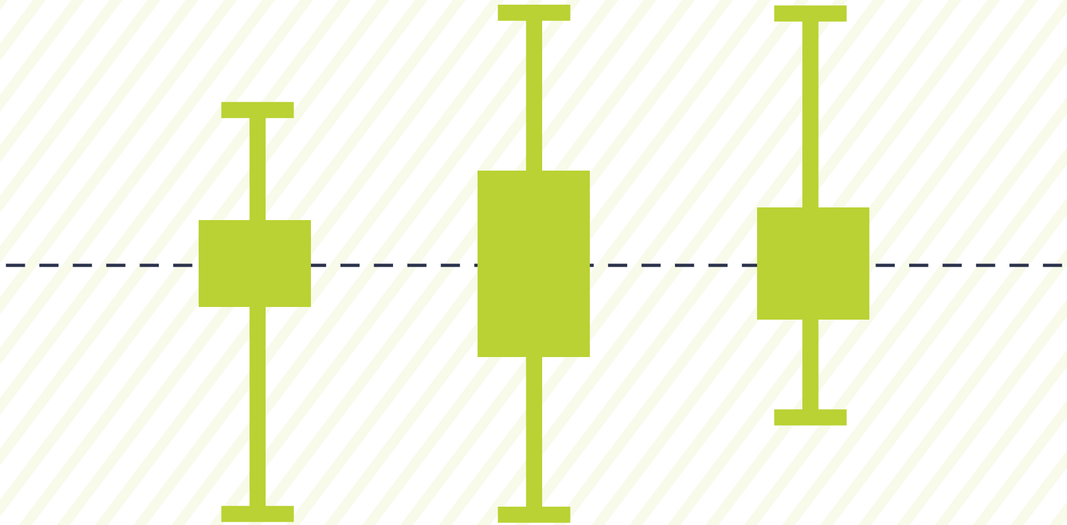
Design for how people and systems are, not for how you want them to be.



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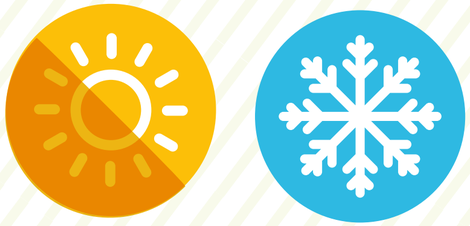
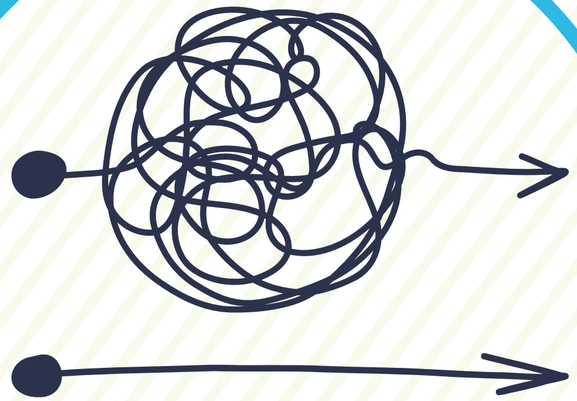


Thermal comfort over certifications

Understand User Profiles



Keep it simple

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1

Strategy, Process & Design

February 2021

2

Construction

October 2022

3

Performance & Occupant Evaluation

2024

TO BE CONTINUED...

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