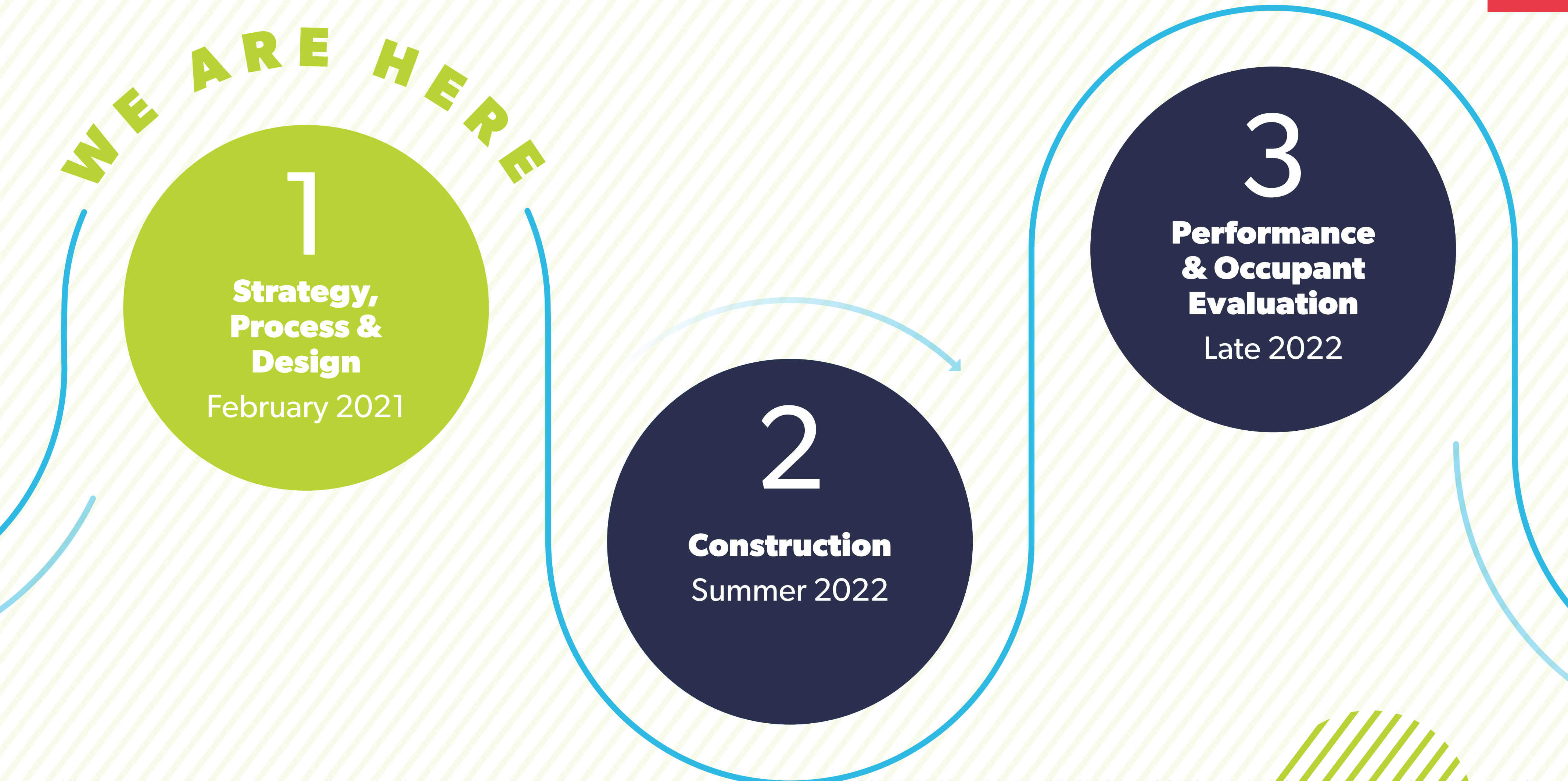


PASSIVE HOUSE

Part 1
Strategy,
Process &
Design



EVOLVING



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.



750+
Employees

60+
in Vancouver

6
Offices

- Vancouver
- Seattle
- Portland
- Los Angeles

- New York
- Washington DC

16

Net-Zero
Energy
Projects

23

Passive House
Designers/
Consultants

7

Passive House
Projects

8

Net-Zero
Carbon
projects

Integrated Team

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



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

About Evolve

- 103,000 SF
- 6 storeys
- Wood-frame
- 110 rental units
- Faculty & staff housing
- In construction
- UBC Vancouver



All design and strategies presented represent current design and may be subject to change.

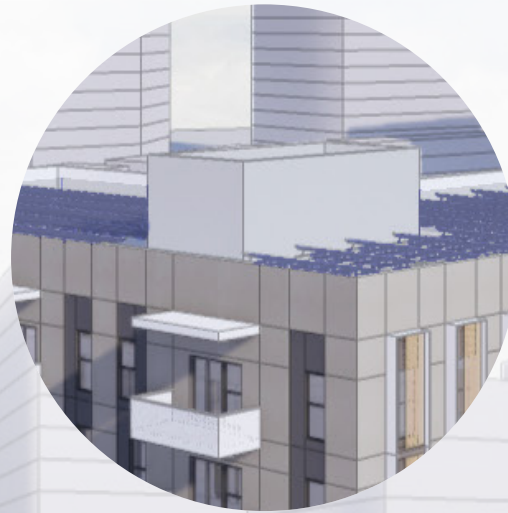


| Passive House Certification targeted | Evolve | Req's |
|--|--------|-------|
| Heating Demand kWh/m ² /yr | 11.0 | ≤15 |
| Heating Load W/m ² | 8.5 | ≤10 |
| Cooling Demand kWh/m ² /yr | 0.4 | ≤15 |
| Cooling Load W/m ² | 0.0 | ≤10 |
| Frequency of Overheating % | 0 | ≤10 |
| Primary Energy Renewable kWh/m ² /yr | 65 | ≤60 |

Building Performance Strategy



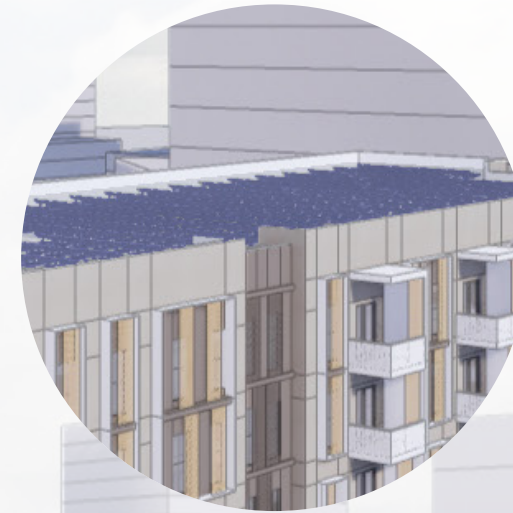
High Performance Windows
Triple Glazed



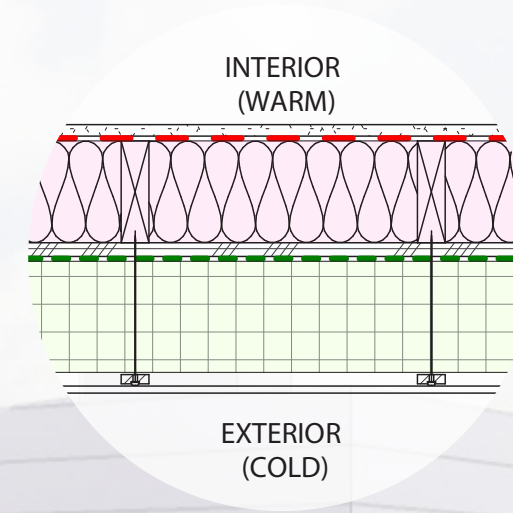
High-Efficiency Mechanical
Heat Pumps, HRV, VRF



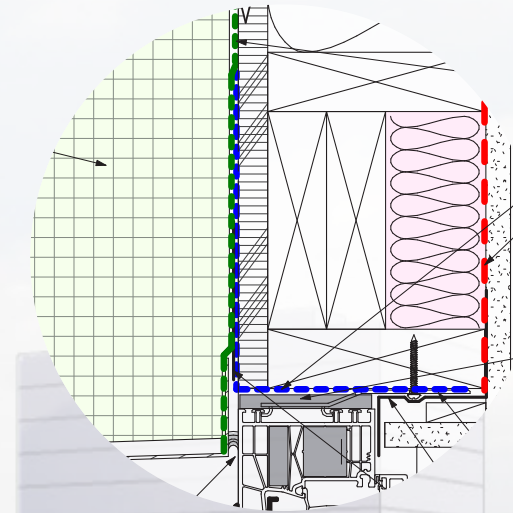
Energy Metering
Occupant Dashboards



Renewable Energy
Photovoltaic Panels



Thermal Insulation
R-40+ Walls/Roof

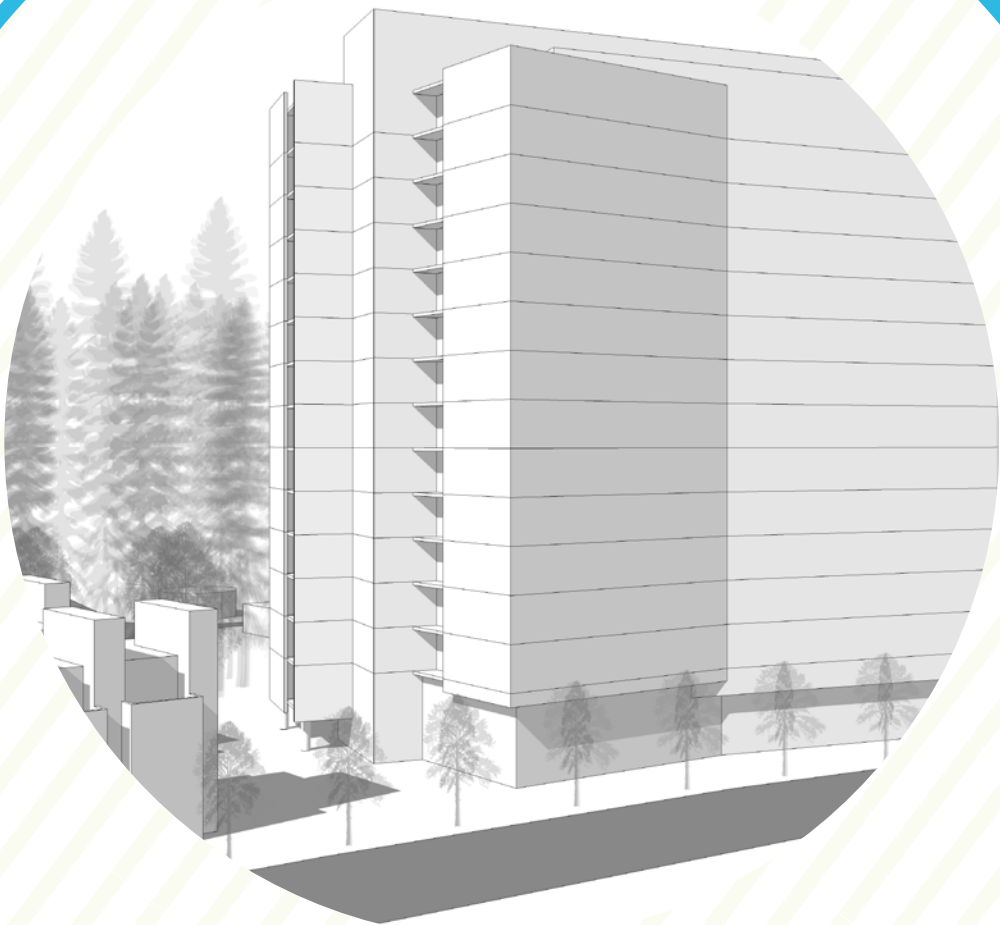


Building Envelope Continuity
Airtight / Thermal-Bridge-Free



Exterior Shading
Operable & Fixed Shades

Why *Evolve*?



Lot 11 (late DD)



Lot 4 (late SD)



Evolve

WHAT

IF

...we engage consultants from project kick-off?

...energy performance drives design decisions?

...we share lessons learned from other projects?

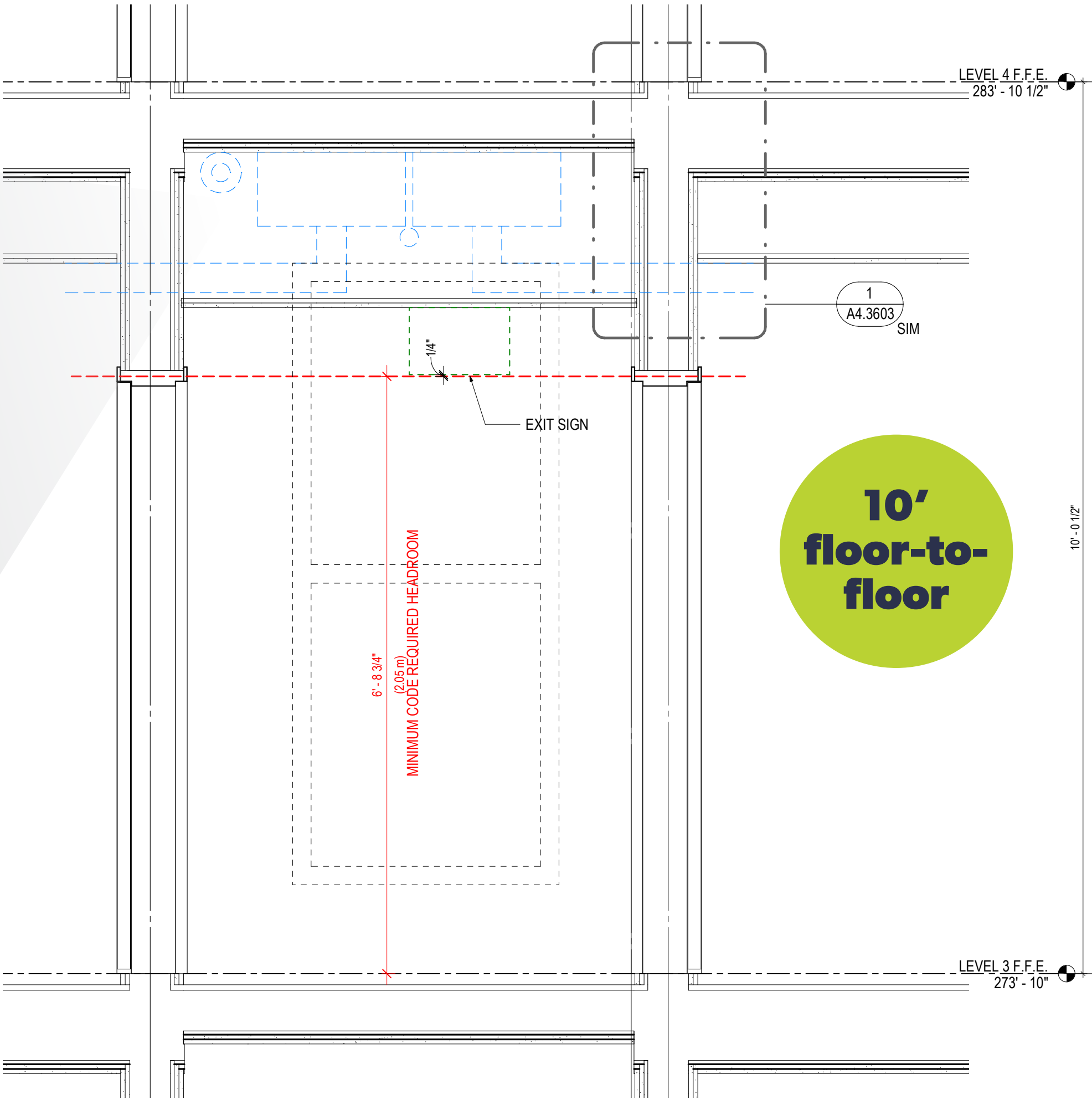
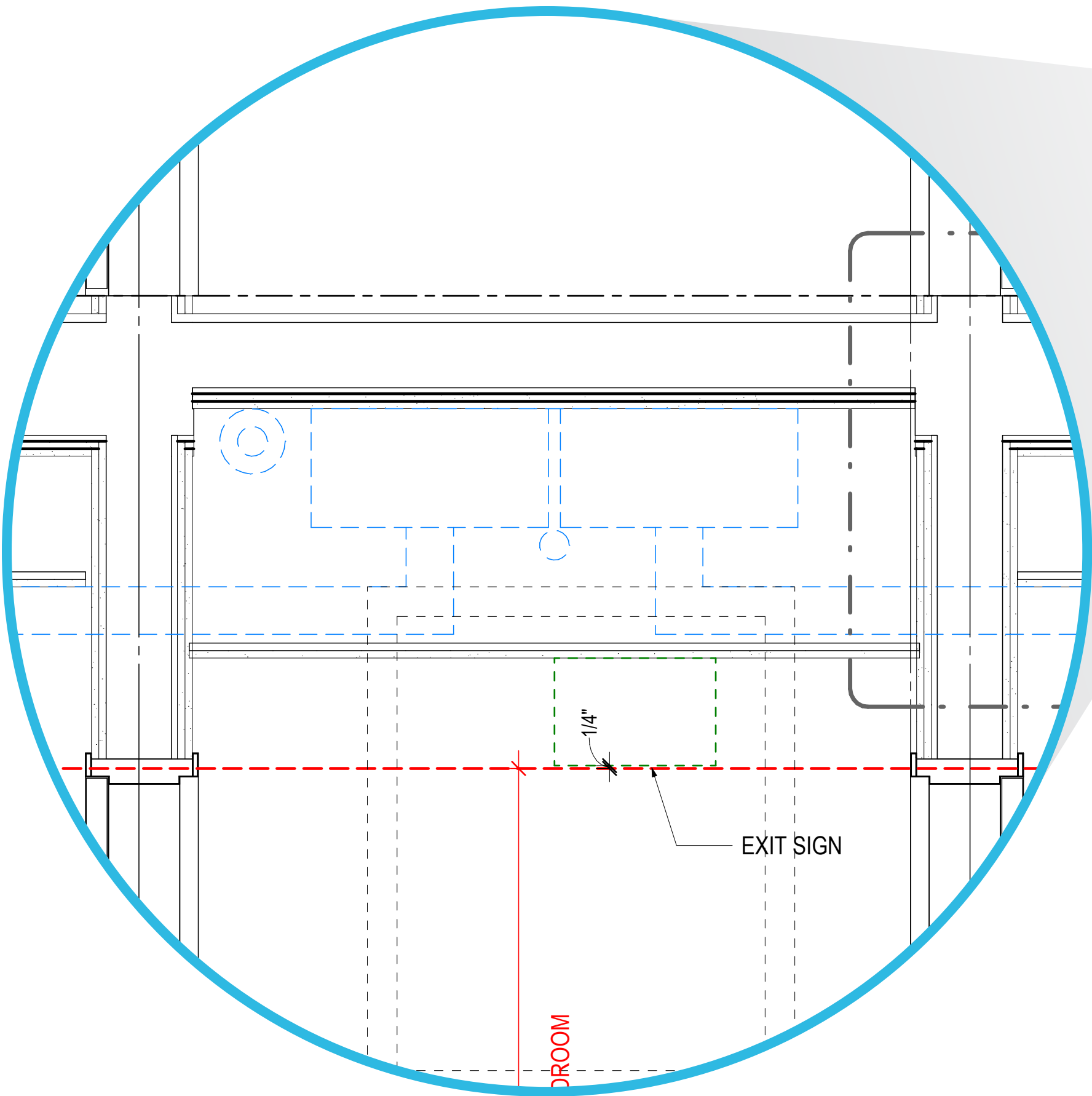
...we consider overheating as a design driver?

...*Evolve* can be a demonstration project?

WHAT IF we engage consultants from project kick-off?

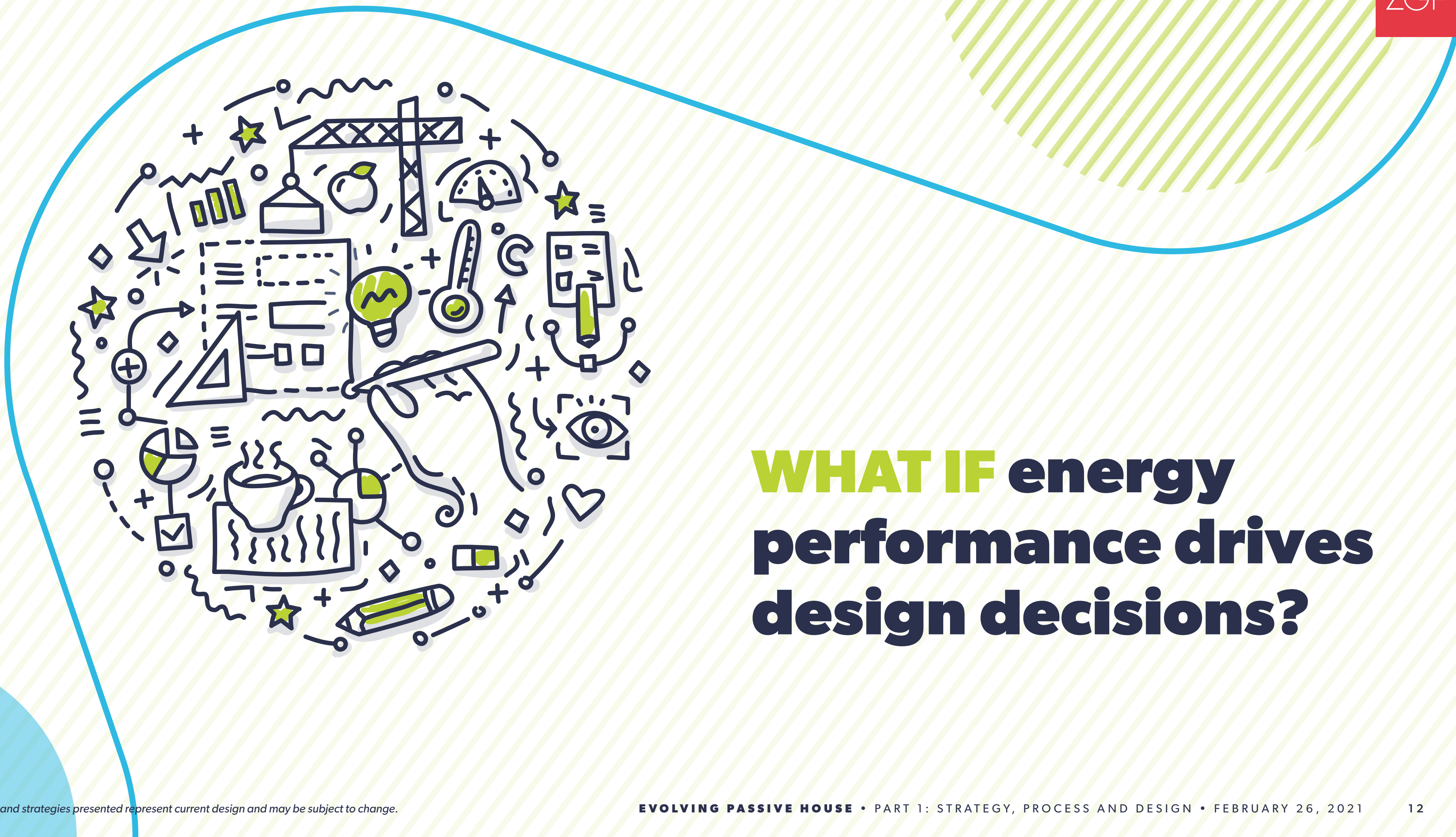


Typical Corridor Section



Leverage team experience to achieve cost savings and energy use reduction through coordination.

- ✓ Constructibility
- ✓ Cost Efficiency
- ✓ Future Proof
- ✓ Operational Cost
- Product Availability
- ✓ Repeatability
- ✓ Team Integration



WHAT IF energy performance drives design decisions?



Be unapologetic—let the Passive House **be a Passive House and the energy performance targets will be much simpler to meet.**

- ☐ Constructibility
- ☐ Cost Efficiency
- ☒ Future Proof
- ☐ Operational Cost
- ☐ Product Availability
- ☒ Repeatability
- ☐ Team Integration

WHAT IF we share lessons learned from other projects?



WHAT IF we share lessons learned from other projects?

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.
- VRFs and high efficiency HRVs.
- Zoned HRVs (north/south wing and west/east wing) with 85% efficiency provide simultaneous heating and tempered cooling throughout.



Future (warmer) climate conditions **are real and must be planned for early in design.**

☒ Constructibility ☐ Cost Efficiency ☒ Future Proof ☐ Operational Cost ☐ Product Availability ☒ Repeatability ☒ Team Integration

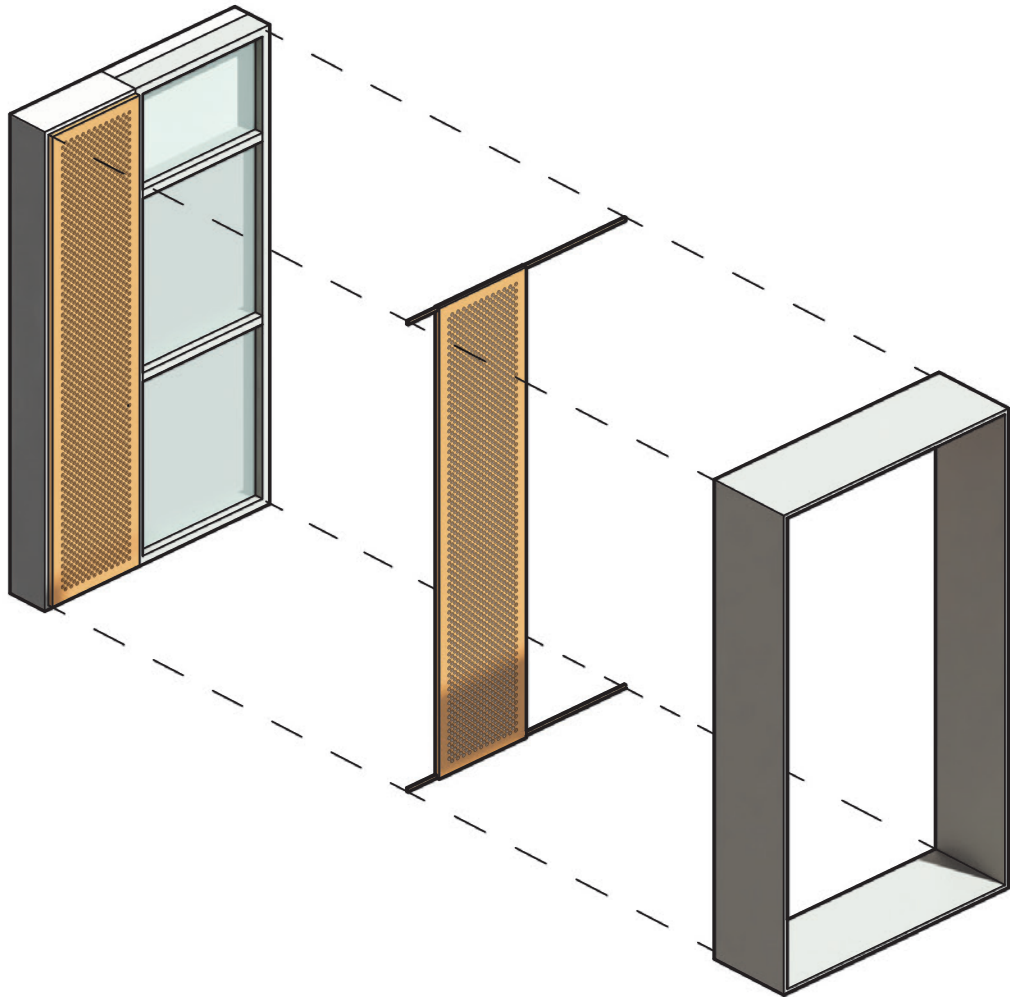


WHAT IF we consider overheating as a design driver?

WHAT IF we consider overheating as a design driver?



Typical Window



Summer Solstice



Equinox (hot day)



Equinox (cold day)

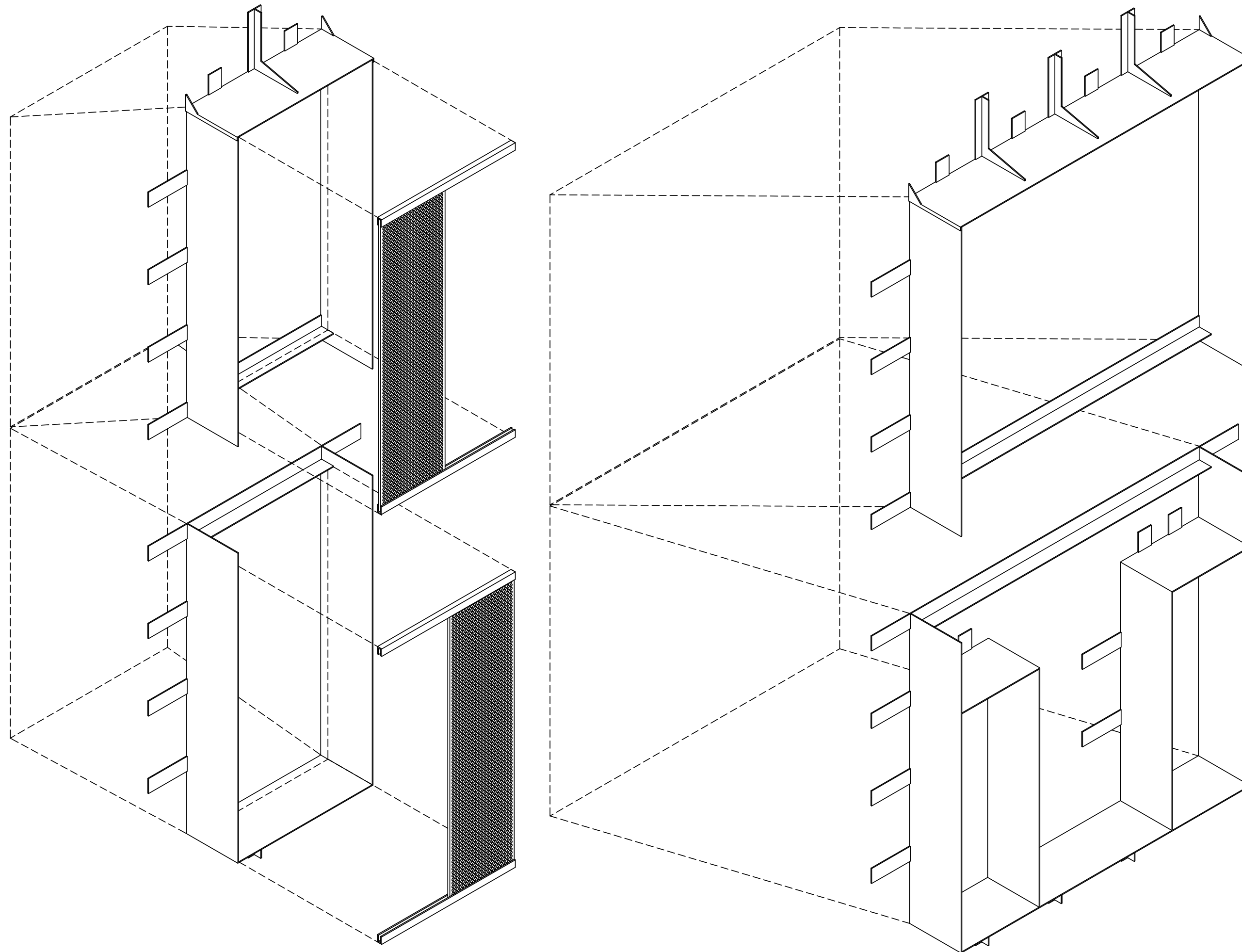


Winter Solstice

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Window Shroud Assembly



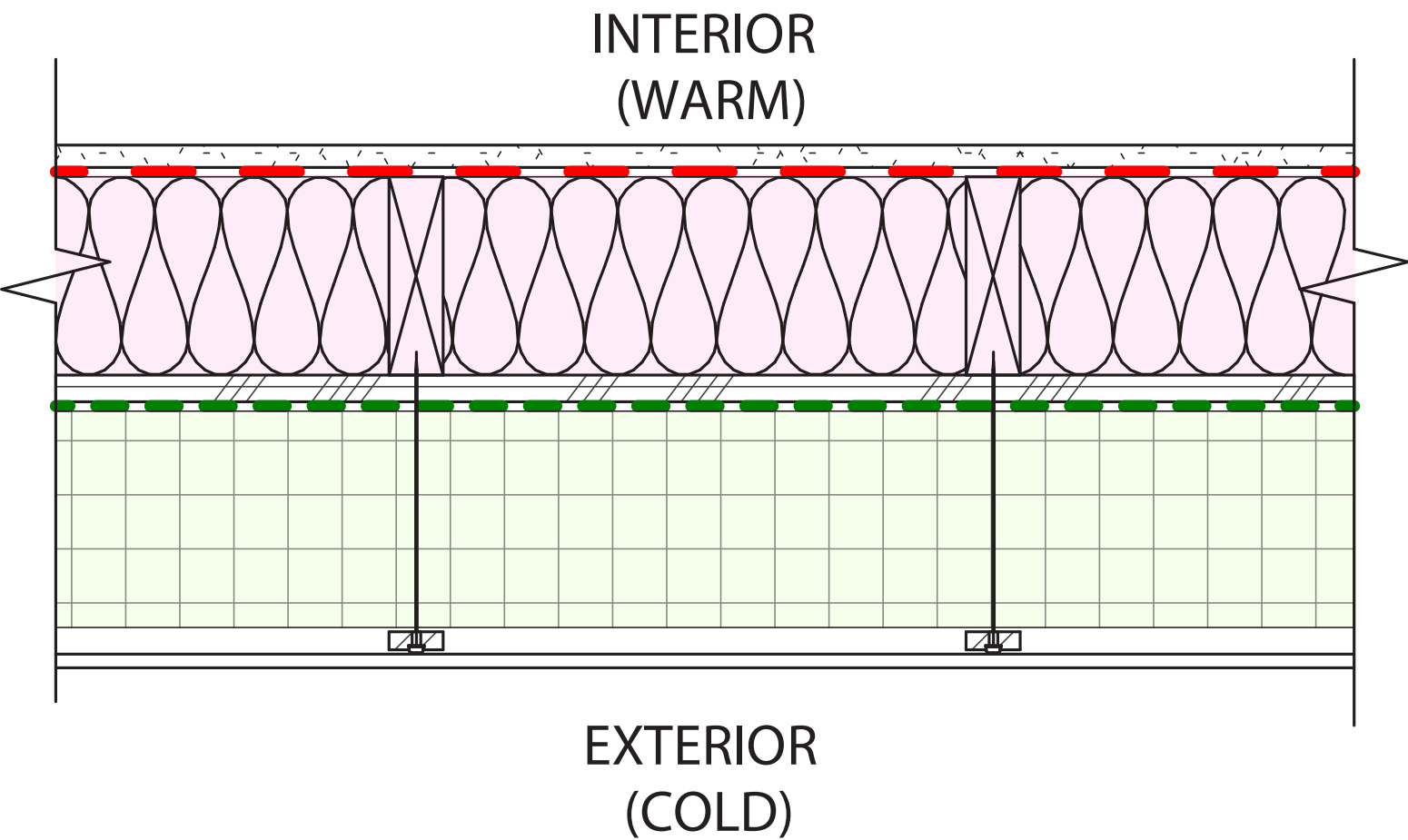
Understanding the overheating challenge early presented a design opportunity for passive strategies.

- ☒ Constructibility
- ☐ Cost Efficiency
- ☒ Future Proof
- ☐ Operational Cost
- ☒ Product Availability
- ☒ Repeatability
- ☒ Team Integration

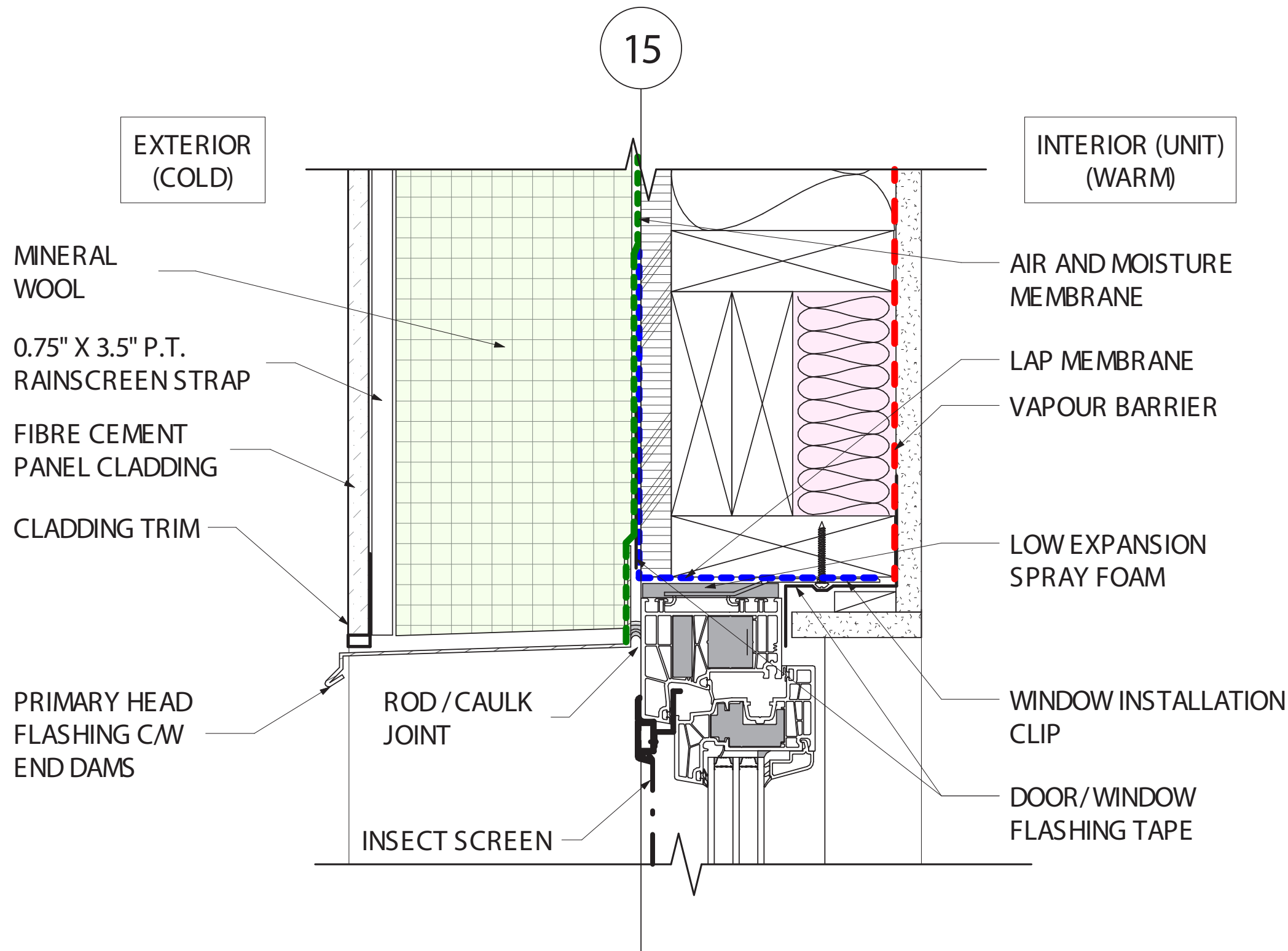
WHAT IF **Evolve** can be a demonstration project?



Wall Assembly



Window Detail



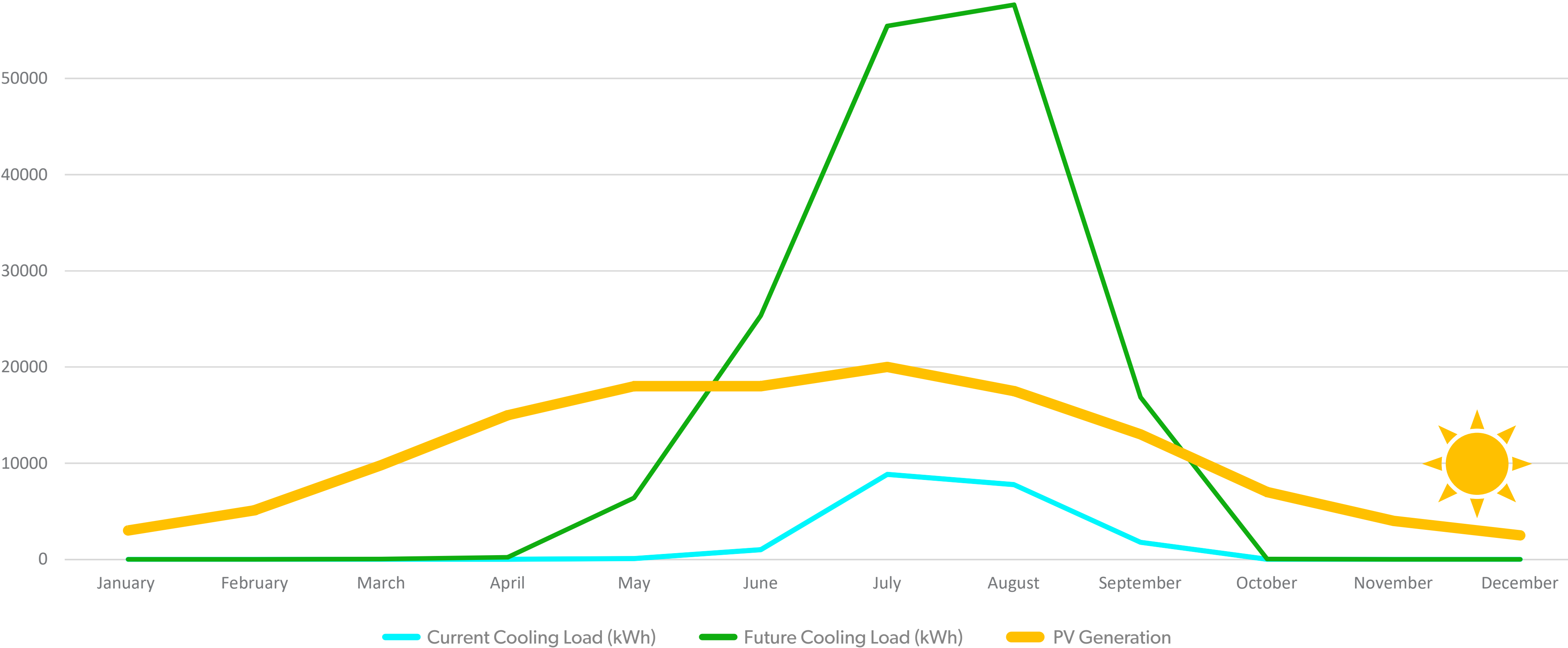
**Keep it simple,
investigate key challenges,
innovate where necessary.**



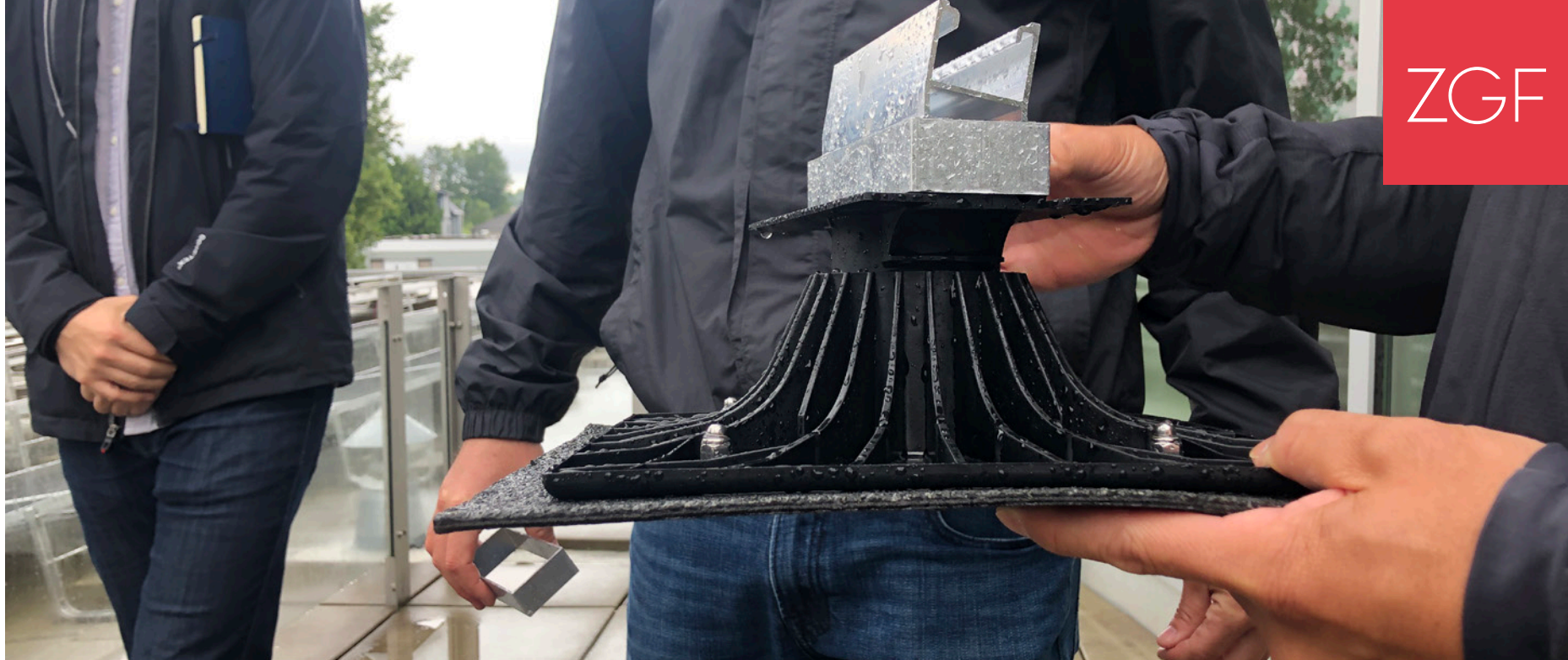
- ✓ Constructibility
- ✓ Cost Efficiency
- ✓ Future Proof
- ✓ Operational Cost
- ✓ Product Availability
- ✓ Repeatability
- ✓ Team Integration

Cooling Load vs PV Generation

The proposed PV array has a 9.5 year payback and is able to offset the costs for cooling.



WHAT IF Evolve can be a demonstration project?



ZGF



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EVOLVING PASSIVE HOUSE • PART 1: STRATEGY, PROCESS AND DESIGN • FEBRUARY 26, 2021

**Overcoming Barriers + Repeatability in Design
+ Simplicity + Challenging Assumptions
=
Industry Transformation**

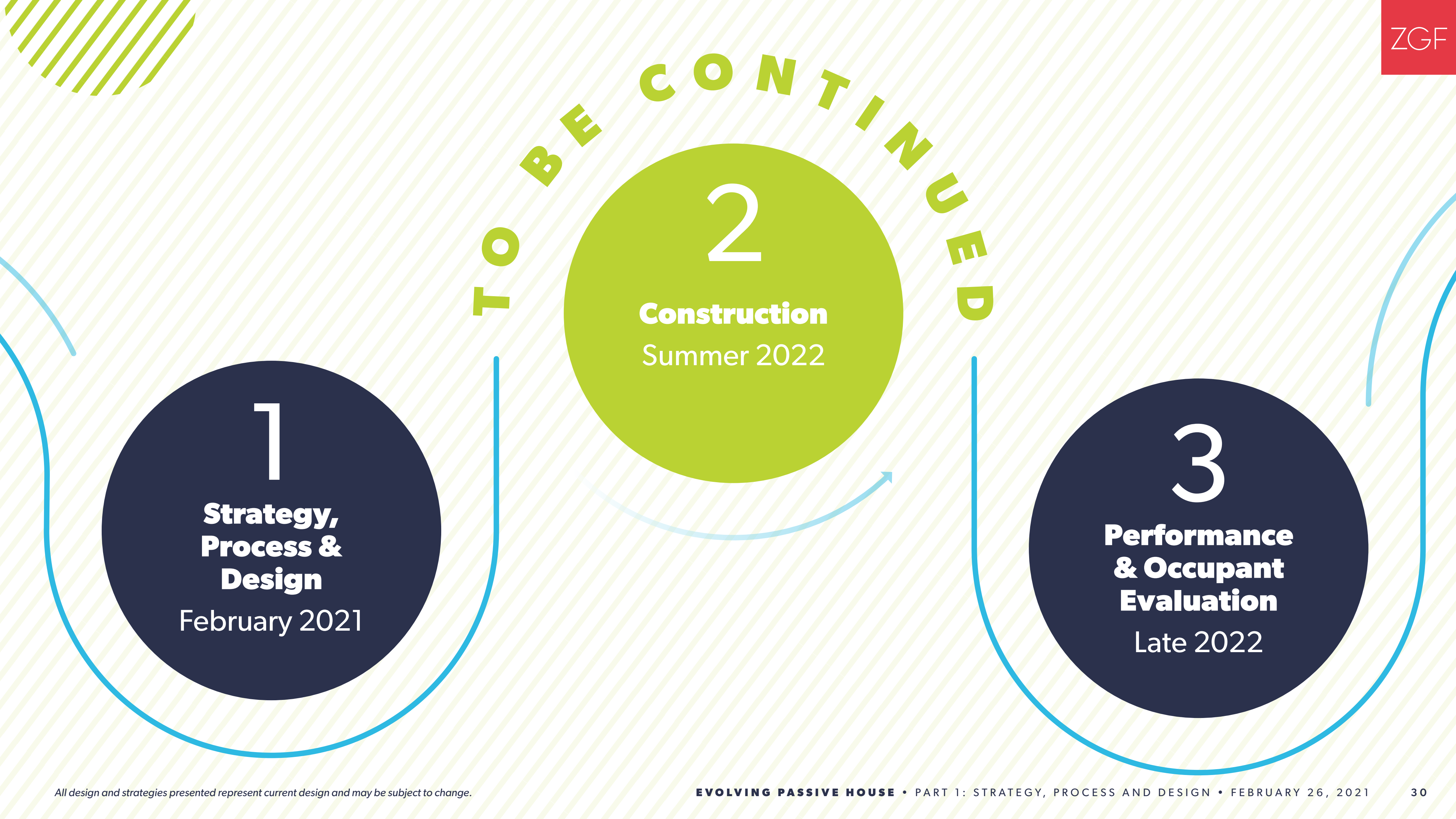
- ✓ Constructibility
- ✓ Cost Efficiency
- ✓ Future Proof
- ✓ Operational Cost
- ✓ Product Availability
- ✓ Repeatability
- ✓ Team Integration

How much further could we have gone?

- **Optimize plug loads**
- **Laundry (centralized vs in-suite)**
- **Off-site or campus PV strategy**









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