

# A Pattern Language from Passive House: Architecture for the Anthropocene

Outline of two-day workshop on how to design multi-unit buildings to the Passive House standard

June 20 + 21, Victoria BC

*Introductions & Overview*

CONTEXT: *A Pattern Language... from Passive House*

EMBRACE CONSTRAINTS: *Milestones for energy-centric design*

*Recognize True Constraints: Mitigation, adaptation, urbanization. Policy responses.*

Pattern № 1: DEFINE CONSTRAINTS

№ 2: SEEK BALANCE

№ 3: WORKSHOP THE ENERGY MODEL

№ 4: DETAIL EARLY AND OFTEN

№ 5: THIRD-PARTY REVIEW PRIOR TO IFC

№ 6: WRITE A CONSTRUCTION VERIFICATION PLAN

№ 7: PLAN TO CERTIFY, CERTIFY TO PLAN

*Milestones for larger projects*

CASE STUDY: *What can happen when constraints are not clearly defined?*

History of a Passive House Plus project in North Vancouver

BOXY BUT BEAUTIFUL: *Design from the inside out*

*Heat loss is the prime constraint*

№ 8: FIGURE THE FORM FACTOR

№ 9: SIMPLIFY THE THERMAL BOUNDARY

№ 10: UTILIZE THE SPACE BETWEEN

№ 11: ALLOT MECHANICAL SPACE FIRST

№ 12: EMBRACE “BOXY BUT BEAUTIFUL”

CASE STUDY: *How simple form factor & front-end planning can work*

Six-unit modular Passive House in Bella Bella, BC

WINDOW PATTERNS: *Glaze strategically, shade continuously*

*How Windows Work*

Nº 13: GASLIGHTING vs DAYLIGHTING

Nº 14: WINDOWS WHICH OPEN WIDE\*

Nº 15: BIG BUILDINGS DON'T NEED SOLAR GAINS

Nº 16: FEWER IS MORE

Nº 17: THREE PLACES FOR FIXED EXTERIOR SHADING

Nº 18: TEN PATTERNS of OPERABLE EXTERIOR SHADING

*Window Energy Balance*

CASE STUDY: *Factors that can lead to overheating*

Nineteen-unit seniors' residence in Smithers, BC

THERMAL BRIDGING PATTERNS: *How things connect matters most*

*Review: Lambda and PSI*

Nº 19: LARGE PANES

Nº 20: BURIED FRAMES

Nº 21: HANGING BALCONIES

Nº 22: INSULATED PLUMBING VENTS

Nº 23: PATTERNS FOR SUSPENDED SLABS

THICK WALL ARE SEXY

*Define Constraints: Its time to let go of curtain wall*

Nº 25: INTERIOR INSULATION

Nº 26: EXTERIOR INSULATION

Nº 27: SPLIT INSULATION

№ 28: STANDING PANELS

№ 29: HANGING PANELS

№ 30: MODULAR CONSTRUCTION

CASE STUDY: *Modular multi-unit Passive House*

Belfield Townhomes, Philadelphia

PASSIVE HOUSE JOURNEY: Discussion

[[ end of day one / start of day two ]]

DESIGN EXERCISE: *Farnsworth House, by Ludwig Mies van der Rohe*

Part A: Redesign this glass box as a Passive House

Part B: Redesign this project to adapt to frequent flooding

Discussion: Mitigation & Adaptation.

VENTILATION PATTERNS

*Why ventilation matters & Passive House requirements*

№ 31: LOCAL VENTILATION PATTERNS

№ 32: CENTRALIZED VENTILATION PATTERNS

№ 33: REGIONAL VENTILATION PATTERNS

№ 34: PERFECTLY SEALED DUCTS

№ 35: RESIDENTIAL KITCHEN PATTERNS (two)

№ 36: FILTRATION

*Beyond Filtration: Atmospheric CO2*

CASE STUDY: What can happen when ventilation is inadequate

Astro Tower, Brussels

## ELECTRIFY EVERYTHING

*How buildings use energy & facts about fossil gas*

Nº 37: POLICY PATTERNS: TEUI, PER, GAS BANS

Nº 38: PER IN MULTI-UNIT BUILDINGS

Nº 39: HEAT PUMPS ARE THE PATTERN

Nº 40: INDUCTION COOKTOPS

Nº 41: REFRIGERATION PATTERNS

Nº 42: LIGHTING PATTERNS

Nº 43: ELEVATORS & PUMPS

Nº 44: PLUG LOAD REDUCTION PATTERNS

[[ lunchtime discussion]]

## HOT WATER PATTERNS: Circulation losses burn twice

*Why hot water burns twice*

Nº 45: HEAT PUMP WATER HEATERS: *Local, Central, Regional*

Nº 46: SHORTEST POSSIBLE PIPE RUNS

Nº 47: MAXIMUM PIPE INSULATION

Nº 48: LIMITED RECIRCULATION

Nº 49: DRAIN WATER HEAT RECOVERY

*Why District Energy fails*

## CASE STUDY: How higher IHGs can also lead to overheating

The Heights: 85-unit building in Vancouver, BC

## COOLING & HEATING

*Passive House overheating limits vs ASHRAE overheating limits*

Nº 50: SUITE-LEVEL ANALYSIS PATTERNS

Nº 51: FUTURE CLIMATE ANALYSIS PATTERNS

№ 52: HEAT PUMPS ARE THE PATTERN

№ 53: DISTRIBUTION VIA REFRIGERANTS

№ 54: DISTRIBUTION VIA WATER

№ 55: DISTRIBUTION VIA VENTILATION AIR

#### AIRTIGHTNESS PATTERNS

*Review: Air tightness vs air leakage*

№ 56: AIR BARRIER DESIGN

№ 57: QUALITY CONSTRUCTION

№ 58: AIR TIGHTNESS TESTING

LETTING GO: Concluding thoughts and discussion