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


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*

№ 13: GASLIGHTING vs DAYLIGHTING

№ 14: WINDOWS WHICH OPEN WIDE*

№ 15: BIG BUILDINGS DON’T NEED SOLAR GAINS

№ 16: FEWER IS MORE

№ 17: THREE PLACES FOR FIXED EXTERIOR SHADING

№ 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*

№ 19: LARGE PANES

№ 20: BURIED FRAMES

№ 21: HANGING BALCONIES

№ 22: INSULATED PLUMBING VENTS

№ 23: PATTERNS FOR SUSPENDED SLABS

THICK WALL ARE SEXY

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

№ 25: INTERIOR INSULATION

№ 26: EXTERIOR INSULATION

№ 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 C02

CASE STUDY: What can happen when ventilation is inadequate
Astro Tower, Brussels
ELECTRIFY EVERYTHING

*How buildings use energy & facts about fossil gas*

№ 37: POLICY PATTERNS: TEUI, PER, GAS BANS
№ 38: PER IN MULTI-UNIT BUILDINGS
№ 39: HEAT PUMPS ARE THE PATTERN
№ 40: INDUCTION COOKTOPS
№ 41: REFRIGERATION PATTERNS
№ 42: LIGHTING PATTERNS
№ 43: ELEVATORS & PUMPS
№ 44: PLUG LOAD REDUCTION PATTERNS

[[ lunchtime discussion]]

HOT WATER PATTERNS: Circulation losses burn twice

*Why hot water burns twice*

№ 45: HEAT PUMP WATER HEATERS: *Local, Central, Regional*
№ 46: SHORTEST POSSIBLE PIPE RUNS
№ 47: MAXIMUM PIPE INSULATION
№ 48: LIMITED RECIRCULATION
№ 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*

№ 50: SUITE-LEVEL ANALYSIS PATTERNS
№ 51: FUTURE CLIMATE ANALYSIS PATTERNS
№ 52: HEAT PUMPS ARE THE PATTERN
№ 53: DISTRIBUTION VIA REFRIGERANTS
№ 54: DISTRIBUTION VIA WATER
№ 55: DISTRIBUTION VIA VENTILATION AIR

ARTIGHTNESS PATTERNS

Review: Air tightness vs air leakage
№ 56: AIR BARRIER DESIGN
№ 57: QUALITY CONSTRUCTION
№ 58: AIR TIGHTNESS TESTING

LETTING GO: Concluding thoughts and discussion