



Passive House Design & Construction Training Course

Outline for 2x2.5 days course

DAY 1

details might be subject to change

unit	time	topic	content
1.0	16:00	Intro	Trainer and participant introductions, Course structure, general content, approach
1.1		Big Picture, Definitions	correlation of energy consumption and environmental impact, climate-independent definition of PH, how it is derived; implications of building energy performance
1.2		Passive House Principles & Definitions	History of Passive House development; General passive design criteria including fundamentals of thermal comfort – winter and summer; shape factor and its implications; building orientation; solar gain sensitivity, Insulation and airtightness; thermal mass
break	19:00 - 19:30		
1.3		Building Envelope	Thermal insulation requirements in a PH - thickness, quality and thermal bridge avoidance; relationship between complicated thermal envelopes, heat loss and costs; U-value and R-value definitions and calculation; relationship between U and surface temperatures; need for exterior dimensions to be used; insulating materials and properties

DAY 2

2.1	8:30	Thermal Bridge	Principles of thermal-bridge free construction; qualitative analysis of building envelope components in terms of thermal bridges ; examples of energy implications of thermal bridging, examples of thermal-bridge-free construction, psi-value; quantitative analysis of thermal bridges and entry into PHPP
break	10:00 - 10:30		
2.2		Airtightness	Principles of airtight envelope; impact of airtightness on performance; suitable joints for reaching PH airtightness requirements; planning of details; recognition of weak spots; test procedures and requirements; main leakage points and how to achieve airtightness of < 0.6 ach; avoidance of problems; high-performance products; need for planning
lunch	12:30-13:30		
2.3		Windows	Importance of windows to overall thermal performance of a PH; losses and gains; comfort criteria; required properties of PH-compliant units; PH- certified windows; understanding and confident handling of coefficients Ug, Uf, psi-g, psi-inst ; glazing types and solar transmittance/performance ; edge effects and spacers; frame size and performance; g-value and SHGC; design strategies for Canada; Influence of window orientation on heat load and solar energy supply; shading – default data, shading – entry for each window; examples of energy flow through windows (cold day, heating period, summer); modeling errors; summer comfort
break	15:00 - 15:30		
2.4		Questions, Discussion, Exercise Homework 1	

DAY 3

3.1 8:30 Ventilation Air contaminants inside a building; CO₂ criterion; determination of fresh air flow rate for hygienically adequate ventilation; relationship between relative air humidity and absolute. General layout of a Passive House ventilation system; zones for air supply, transfer and extraction; air circulation and mixing; Coanda-effect; components of a PH ventilation system (incl. ducting, duct insulation, filters, inlets, outlets, sound baffles); placement of outlets; exercises; Balanced air supply and extraction units with heat recovery; typical air exchange rates; Strategies for frost protection; obtaining PH-Certified ventilation equipment in Canada; performance of PH-Certified equipment vs non-Certified & implications for overall house heating requirements; humidity sources; limiting flow rates in winter; non-mechanical ventilation and driving sources of air leakage

break 10:00 -10:30

3.2 Passive Cooling and Shading Passive cooling strategies such as shading and earth tubes for ventilation; Summer comfort and cooling requirements in a PH

lunch 12:30-13:30

3.3 Heating Heating load criterion; difference between heating load and space heat requirement; thermal comfort requirements; significance of drafts; heating load calculation in standard Canadian housing vs. PH and required heating equipment sizes; Ventilation supply air heating and its various limitations; PHPP calculations; temperature zoning in a PH; over-design and backup heat per room for Canadian Building Code compliance

break 15:00 - 15:30

3.4 alternative heating and DHW alternative active systems for heat and hot water, including biomass, solar thermal
Homework 2

DAY 4

laptop required

4.1 16:00 PHPP Intro Modeling requirements and approach; Data requirements and entry; Introduction to primary sheets

4.2 PHPP Envelope building envelope related sheets in PHPP will be explained and explored

4.3 PHPP Mechanical mechanical systems related sheets in PHPP will be explained and explored

break 19:00 - 19:30

4.4 PHPP exercises Confidence-building with the software; hands-on PHPP example – modeling a contemporary detached new house to assess the specs required to turn it into a Passive House in the local climate

DAY 5

5.1 8:30 construction solutions various examples of buildings, analyse problems in design phase and implementation

break 10:00 - 10:30

5.2 eastern case studies Analysis including client specs, design process, site limitations, PHPP analysis, viable solutions, special components, required specs per component – floors, roof, walls, windows, ventilation - difference in required specs for different climates; construction experience; airtightness

Homework 2

lunch 12:30 - 13:30

5.3 humidity management Potential for moisture problems in superinsulated floor, wall and roof assemblies; protection strategies and products including vapour-permeable constructions, interior and exterior barriers and sheathings.

break 15:00 - 15:30

6.3 western case studies Western Canada: first Canadian PH and following projects.

DAY 6

6.1 8:30 quality management PH quality issues including worker education, checks and quality control; construction site issues, responsibilities and recommendations

break 9:30 - 10:00

6.2 Case studies Europe European projects: renovations, large MURBs, office buildings, schools

lunch 12:00 - 13:00

5.4 economics Economic analysis of incremental costs and benefits – various models; inappropriateness of simple payback method; example of incremental cost analysis for a contemporary Canadian project; Passive House project Certification – what is it and is it worth it?

break 15:30 - 16:00

PH certification How to certify a building and how to become a certified Passive House Designer

final discussion participant design questions and problems/issues; feedback, discussion about how to move on