



## Passive House Design and Construction – **NEW Online** Training Course

### *Course Modules and Learning Goals*

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Module 1	Introduction: Why Passive House?
Module 2	Passive House Elements
Module 3	Passive House Design
Module 4	Building Envelope
Module 5	Thermal Bridging
Module 6	Airtightness
Module 7	Windows and Doors
Module 8	Ventilation Systems
Module 9	Heating Systems
Module 10	Summer Shading and Cooling
Module 11	Passive House Economics
Module 12	Project Case Studies & Examples
Module 13	Building Science Essentials

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#### **Module 1**     *Why Passive House? (4 videos)*

1. Big Picture: CO<sub>2</sub> and climate change, building resilience
2. Historical perspective: Passive design through the ages
3. Canadian context / R-2000, Energy Star etc.
4. Net Zero Energy concept and its relation to PH
5. Energy consumption and environmental impact
6. The Passive House Standard: development of the concept
7. Current status of Passive House – Large Projects worldwide
8. Canadian Policy Context & Pending Building Code changes



## **Module 2      *Passive House Elements (6 videos)***

1. The climate-independent definition of a Passive House
2. Heating load definition
3. Energy Balance: Annual space heat demand
4. Building envelope and airtightness
5. Thermal bridge-free design
6. Winter comfort criteria
7. Summer comfort: Frequency of excess temperature
8. Certification requirements for Passive House buildings

## **Module 3      *Passive House Design (4 videos)***

1. Seven Guidelines for Passive House design
2. Shape Factor – calculation for any building
3. Building Footprint – impact on shape factor and economics
4. Floor plans – typical layouts for cool/cold climates
5. Passive House Diversity
6. Passive House For Extreme Climates

## **Module 4      *Building Envelope (13 videos)***

1. Principle of a highly insulating thermal envelope
2. Thermal conductivity
3. Definitions of U-value, R-value and their measurement
4. Insulation types and performance characteristics
5. Heat flow calculation principles
6. Link between U-value & surface temperature
7. Typical U-value requirements for Passive House building elements in Canada
8. Building assemblies suitable for Passive House: Foundation/Floor
9. Building assemblies suitable for Passive House: Walls
10. Building assemblies suitable for Passive House: Roofs
11. Certified Construction Systems

## **Module 5      *Thermal Bridging (4 videos)***

1. Concept and importance of thermal bridging
2. Types of thermal bridge
3. Principles of thermal bridge-free construction & overall impact
4. Calculation of psi-values
5. Typical calculated examples
6. Common examples of thermal bridges, and avoidance strategies
7. Thermal bridge catalogue



## **Module 6     *Airtightness and Thermal Imaging (6 videos)***

1. Typical Airtightness levels in buildings
2. Principle of “one airtight envelope”
3. Airtightness planning – the essentials
4. Appropriate airtightness strategies in wood frame construction
5. Airtightness and vapor transportation
6. Suitable air sealing methods and materials
7. Potential airtightness weak spots & strategies
8. Blower door test procedures and requirements
9. Understanding common leakage points/problem areas
10. Thermography – basics
11. How to install woodstoves in Passive House buildings

## **Module 7     *Windows and Doors (10 videos)***

1. The critical importance of window performance in a low energy building
2. Thermal comfort criteria in a Passive House; influence of windows
3. Window U-values – Passive House criteria and measurement
4. Glazing quality and testing
5. Six Thermal Parameters for window performance
6. Designing window frames for improved thermal performance
7. Design and purpose of glazing spacers
8. Placement of windows in an optimal thermal plane: pros and cons
9. Calculation of window installation coefficient & examples
10. SHGC and g-value definitions; direct and diffuse radiation
11. How to assess non-Certified windows?
12. Examples of Passive House-suitable windows for different climates
13. Relative performance of PH-Certified and non-Certified products
14. Calculation of total energy flows through windows

## **Module 8a     *Ventilation Fundamentals (4 videos)***

1. Reason for mechanical ventilation systems in low-energy buildings
2. Air contaminants inside a building / the CO<sub>2</sub> criterion
3. Determining optimum fresh air flow rates
4. Relationship between rate of fresh air supply and external temp/humidity
5. Reasons for limiting air flow during winter



## **Module 8b    *Ventilation Systems (8 videos)***

1. General requirements for Passive House ventilation systems
2. Defining air supply, transfer air and air extraction zones
3. Knowledge of Certification criteria for HRVs / performance comparisons
4. Suitable ducting systems: planning & layout
5. Example of ventilation system design, including flow rate calculations
6. Air circulation and mixing; the Coanda effect.
7. How to eliminate ventilation sound transmission in a Passive House
8. Required air filter qualities and reasons
9. Commissioning ventilation systems and reasons for doing this
10. Frost protection options for ventilation systems
11. Centralized vs Decentralized systems
12. Electric efficiency in ventilation units; examples
13. New Ventilation units for 2019

## **Module 9    *Heating systems for Passive Houses (6 videos)***

1. Definition of Heating Load and how it is calculated
2. Reason for the 10 W/m<sup>2</sup> Passive House heating load criterion
3. Difference between building efficiency and heating efficiency
4. Thermal comfort requirements used in Passive House design
5. Typical heat distribution strategies and systems
6. Evaluating the possibility of supply air heating
7. Defining the upper and lower limits of supply air flow rates
8. How PHPP calculates heating loads
9. Suitable heat sources and systems for Passive House
10. Heat Pumps

## **Module 10    *Shading and Passive Cooling (3 videos)***

1. Shading Influences in Winter
2. Examples of winter shading for windows
3. Summer thermal comfort standards used in Passive House design
4. Influences on summer heat loads
5. Impact of thermal mass inside a building
6. Strategies for summer window shading
7. Passive cooling options via Ventilation



### **Module 11    *Passive House Economics (7 videos)***

1. Six Useful Economic Parameters
2. Energy Prices in Passive House planning
3. Defining incremental costs for a Passive House building
4. Life cycle assessment /monthly financial balances
5. Assessing economically effective insulation/efficiency levels
6. Calculating cost-effective efficiency measures
7. Economic Case Studies: 6 Passive House Buildings in Canada

### **Module 12    *Project Case Studies & Examples (14+ videos..)***

1. Whistler's Austria Passive House
2. Case Study: Montebello – E.Canada's first Passive House
3. Case Study: An Urban Passive House, ON
4. Case Study: PH Retrofit to an Old NB Farmhouse
5. Case Study: Large Off-Grid Passive House, QC
6. Case Study: An Affordable CLT Passive House, QC
7. Case Study: Passive House Apartment Block, ON
8. Case Study: "8.5m Passive House" Design
9. Case Study: UNBC Research Lab 2018
10. PH Example: Rosdorf Community Centre
11. First Certified Passive House in Saskatchewan
12. First Certified Passive House in Japan
13. Passive House Architecture Award 2014
14. Winnipeg Passive House Retrofit

### **Module 13                    *Building Science Essentials (5 videos)***

1. Building Science Definitions
2. Hygrothermic Analysis Software Demo
3. Understanding Diffusion Open vs Diffusion-closed systems
4. Examples of suitable assemblies for Passive House
5. Consequences of improper design and materials
6. CBC – Renovation Horror Story video