



Appendix I b

Catalogue of Learning targets “Construction Verifier” and “Site Supervisor”

Valid as of 20 October 2021

Introductory remarks

The Passive House Institute (PHI) has extended the existing training and certification system for designers and tradespeople to acknowledge the further education of other professional groups and the activities that are important for the construction of Passive Houses. In addition, more focus will be placed on "lifelong learning" and the gradual acquisition of Passive House knowledge.

The policy envisages that additional training will be certified as an "add-on" to the existing seals of Passive House Designer / Consultant or Tradesperson. The new "add-on seals" are therefore used in conjunction with the associated "main seal" (Designer / Consultant or Tradesperson seal).

With the additional certificate "Construction Verifier" the PHI has developed a further education programme which aims at ensuring the realisation of the designed Passive House quality on the construction site and in building operation, and improving the process of building certification and thus making it more cost-efficient. The programme aims at already certified Passive House designers/consultants. The content of this training is in-depth knowledge of Passive House relevant topics on the construction site, planning and implementation of the energetic commissioning of Passive Houses and knowledge of the process of building certification including the necessary preliminary work and necessary documents.

The additional training "Construction verifier" includes the modules:

1. Site Supervisor
2. Commissioning
3. Navigating Passive House Certification

The module and certification "Passive House Site Supervisor" addresses in-depth knowledge on Passive House relevant topics on the construction site of complex and larger projects. This additional training can be used as a stand-alone training and certification for building professionals who are already certified as Passive House tradespersons.

1. Passive House Site Supervisor

- Provide with in-depth knowledge for coordinating construction sites of complex and/or larger residential and non-residential Passive House and EnerPHit building projects.
- Deliver concrete knowledge and illustrate the skills and responsibilities that are essential to successfully executing Passive House building design on-site through the review of numerous examples and practical information, particularly topics of Passive House construction management, opaque and transparent elements of the building envelope, airtightness and mechanical services. Additionally, the effects of the various construction site relevant aspects on the energy balance with PHPP are highlighted.
- Review issues that are relevant to most situations, no matter the place while providing the possibility to identify specific aspects that may be subject to national, regional or local norms, materials, staff and traditions

1.1. Construction management

- Review quality assurance factors of Passive House construction sites
- Communication for quality assurance of Passive House projects: orientation meetings, appropriate coordination and regular briefings during construction

- Defining interactions and interfaces of different trades throughout the construction process
- Use of mock-ups or model rooms as a tool for quality assurance and training
- Review of general good-practices from the perspective of Passive House building:
 - Adherence to project planning, including the different elements of a complete set of plans and the involvement of construction staff during planning
 - Clear procedures for on-site changes and substitutions
 - Delivery and appropriate storage of materials on site
 - Elements of an appropriate project photographic documentation
 - Relevance of cleanliness of the construction site
 - Keeping an organised construction log book
 - Scheduling of construction progress
 - Keeping a dry construction
 - Intermediate acceptance of works and final approval and initial use

1.2. Opaque thermal envelope: foundation and building structure

- Overview of the main types of thermal bridges to keep in mind for on-site quality assurance
- Review quality assurance items regarding the foundation and building structure of Passive House buildings during the early construction phases:
 - Necessary considerations before excavations
 - Compliance with geometry and structural design
 - Set-up and protection of below-grade installations
 - Penetrations, joints and thermal insulation of underground structures
 - Assessment of material properties to match the design
 - Execution of gaps for later installation of thermal insulation
- Review quality assurance items regarding the installation of insulation in contact with the ground:
 - Passive House relevant specifications: properties, thicknesses, protective membranes, adhesives, etc
 - Storage, handling and installation
 - Quality of installation and continuity of airtightness layer and thermal envelope
 - Specifications for unavoidable thermal bridges
 - Correct execution of penetrations

- Avoidance of damage or soiling of underground insulation

1.3. Opaque thermal envelope: thermal insulation

- Learn the typical deficiencies in the installation of thermal insulation
- Review quality assurance items regarding thermal insulation, prior to installation:
 - Assessment of material properties to match the design
 - Surface preparation
 - Storage and handling
- Review quality assurance items regarding thermal insulation, during installation:
 - Assessment of installed insulation, fixings and coating
 - Documentation of all installed insulation materials
 - Examination of correct finishing of insulated surfaces
 - Visual inspections of connections, joint overlaps, condition of surfaces and fixings
 - Correct execution of penetrations
 - General aspects of the installation of interior insulation
 - Protection of insulation against damages during further construction
- Review quality assurance items regarding the installation of ventilated facades:
 - Avoidance of cavities behind insulation
 - External cladding
 - Fixings and substructures
 - Windproofing
 - Avoidance of unplanned thermal bridges
- General considerations regarding the use of scaffolding in Passive House / EnerPHit construction sites.

1.4. Airtightness

- Review the difference between wind-proofing and airtightness as well as the importance of airtightness for Passive Houses
- Understand the airtightness concept, its definition and important elements
- Learn the relevance and elements of the airtightness coordination meeting as an aide for the execution of the airtightness concept, including the possible participants and main outcomes
- Recognise the main elements of quality control of airtightness on site, including the description and tasks of the airtightness supervisor

- Recognise and the main possible leaks to consider for quality control of airtightness on the construction site
- Comprehend and recognise the most important general airtightness details for the visual examination of the airtightness layer
- Understand the importance of the construction sequence in the supervision of airtightness
- Understand the particularities of airtightness for elevator shafts
- Recognise the importance of a clean construction site particularly for airtightness
- Review quality assurance items regarding examination of airtightness on-site for external wall solid construction, external wall lightweight construction, roof, windows and doors and other general issues. Exercise the assessment of the most relevant details through the analysis of photographic examples.
- Review of the airtightness test, its definition, procedures and requirements
- Understand building preparation for the airtightness test including preparations prior to and during the test
- Recognise the particularities of testing large buildings, including high-rise buildings and large but not tall buildings

1.5. Windows and doors

- Review the elements of Passive House windows and their installation:
 - Delivery and storage on-site
 - Understanding window installation design details
 - Examination of rough openings prior to installation
- Review quality assurance items during the installation of windows:
 - Ensuring that all necessary materials are available and in accordance with design
 - Continuity of airtightness layer and connection to thermal insulation layer
 - Examining the continuity of other barriers
 - Placement of pre-compressed sealing tape
 - Inspecting fastening details
 - Installation of wooden brackets or high-strength insulating blocks underneath the frame
 - Attachment to insulation
 - Airtightness of roller shutters or venetian blinds
 - Thermal bridge free continuity to unfinished floor prior to installation of floor build-up for French windows

1.6. Curtain wall facades

- Learn the typical deficiencies in the installation of curtain wall facades

- Review quality assurance items prior to the installation of curtain wall facades:
 - Appropriate set of details and specifications and testing of performance through mock-ups
 - Verification of equipment for transportation, assembly and execution
- Review quality assurance items during to the installation of curtain wall facades:
 - Location of panels or glazing
 - Engaging experienced curtain wall installers and working with special curtain wall consultant
- Review quality assurance items regarding airtightness of curtain wall facades
 - Connections of the façade to floor slab and exterior walls
 - Joints at the connections of the transoms to the mullions
 - Openings for the passage of electrical conduits and other penetrations (no leaks)
 - Upper connections of the mullion-transom construction to the building structure
- Review quality assurance items regarding thermal bridge avoidance of curtain wall facades:
 - Following design and avoiding the creating of additional thermal bridges
 - Installation of thermal insulation and anchors
 - Importance of proper alignment

1.7. Mechanical systems

- Review the relevant topics for tendering of mechanical services in general
- Review quality assurance items regarding the installation of mechanical services in general:
 - Assessment of the properties of materials and installation of all elements
 - Correct execution of penetrations
 - Centring pipes in the insulation layer
 - Continuity of thermal insulation
 - Protection of pipes, ducts and technical equipment against soiling and damaging
 - Well documented system calibration
- Review quality assurance items during the installation of ventilation systems:
 - Examination of installation of the entire ventilation system, including duct insulation, ventilation unit(s) and all other components
 - Examination of sound insulation and central unit
 - Implementation of air transfer openings

- Installation of fire-safety components
- Accessibility of openings and ventilation unit for maintenance
- Review quality assurance items regarding the airtightness of ventilation systems and hygiene and air quality of ventilation systems
 - Correct execution of penetrations
 - Building envelope: airtightness test passed as well as testing ventilation ducts in case of several flats
 - Suitable connecting components of ducts within a flat
 - Relevance of the cleanliness of ducts and other components
 - Installation of filters
 - Avoidance of standing water (subsoil heat exchanger, cooling coil)
- Review quality assurance items regarding the commissioning of ventilation systems:
 - Removal of temporary seals
 - General elements of the commissioning report
 - Appropriate documentation of all settings and completion of the user manual

2. Commissioning

- Provide a general overview of the concept of performance gap and definition of building commissioning for Passive House buildings
- Understand the definition of calculated energy demand vs. measured energy consumption, climate vs. weather, standard usage assumptions vs. actual usage indicators
- Understand the main drivers/influence factors on energy use for heating and cooling
- Become acquainted with building commissioning methodologies, per different sectors of building services and controls, with indication of proven approaches for control algorithms and control parameters
- Understand simplified performance monitoring and performance evaluation, from the perspective of user comfort and of energy use

2.1. Commissioning of MVHR systems

- Adjustments of air flow rate(s)
- Balancing of ODA – EHA (per flow rate)
- Operating hours / demand control / purging (pre occupation)
- Crosscheck of pressure losses (design vs. actual figures)
- Frost protection
- Shut dow with dry filters

- Hygiene considerations
- Importance of documentation and checklists

2.2. Commissioning of heating and cooling systems

- Condensing gas boiler
- Heat pump
- Control of forward flow temperature
- Concrete core activation
- Passive and mechanical night ventilation
- Active cooling
- Importance of documentation and checklists

2.3. Commissioning of shading

- Summer / winter shading programmes
- Importance of documentation and checklists
- Control parameters (indoor temperature, wind, different user programmes (schools, offices))
- Commissioning BMS (Building Management Systems)

2.4. Simplified Performance Monitoring

- Suggested procedure “minimal monitoring” for performance evaluation
- Measuring consumption, technology and influencing factors
- Data acquisition
- Measuring uncertainties and their impact

2.5. Performance Evaluation

- Monitoring of user comfort
- Monitoring energy use
- Software tools for performance evaluation and –optimisation
- Measuring uncertainty
- System losses
- Accumulated final energy
- Monthly target-performance

3. Navigating Passive House Certification

- Extend the knowledge of the different Passive House certification standards, the certification process and criteria and understand the certification process and the role of Passive House consultancy services within them in order to achieve it in an efficient and profitable manner.
- Learn about Accredited Passive House Certifiers and their role within the certification process and review the important elements of quality assurance for step-by-step retrofits.
- Become acquainted with the Passive House certification platform, including its main functions and review all the necessary documents that need to be submitted for achieving Passive House or EnerPHit certification understanding the necessary quality and detailing of information, including the boundary conditions for the PHPP calculation.
- Review some of the main tips and tricks, support documents and sources provided by the Passive House Institute to achieve a cost-efficient certification process from the perspective of Passive House design

3.1. Benefits of certification

- Review the main reasons and advantages with regards to Passive House building certification
 - From the perspective of the building owner
 - From the perspective of the designer

3.2. Energy Standards of PHI

- Overview of the main features of the different building certification standards of the Passive House Institute:
 - Passive House
 - EnerPHit
 - PHI Low Energy building
 - Plus and Premium seals

3.3. Certification Criteria

- General overview of the certification criteria and the relevant target values
- Review on how to deal with buildings with special uses from the perspective of building certification
- Understand the verification method for building certification with the help of the Passive House Planning Package (PHPP)
- Where to find the certification criteria and review of other sources that are relevant to the criteria

3.4. Certification process

- Understand the process of building certification, relevant parameters to be verified and how the designer can support the process
- Review the process of approaching and engaging a Passive House Certifier
- Understand the costs of building certification

- Review the building certification process step-by-step
- Review the aides and support to the certification process, including the Building Certification Guide and the Certification Platform

3.5. Quality assurance for stepwise retrofits

- Understand the concept of “lock-in” effects
- Overview of the process of stepwise retrofits and the EnerPHit Retrofit Plan (ERP)

3.6. Documents to be submitted

- Overview of the main documents to be submitted for building certification, including useful praxis-oriented tips regarding the following topics:
 - Passive House Planning Package (PHPP), including general guidelines for certification and the importance of using validated climate data
 - Architectural design documents, including standard and connection details, windows and doors, shading
 - Mechanical services documents, including heating and domestic hot water, cooling, electrical appliances and lighting and renewable energies
 - Airtightness and other relevant documents, such as the photographic documentation for certification, the construction manager's declaration, exemptions and economic feasibility and the general minimum requirements for certification

3.7. Keys to a cost-efficient certification process:

- Ensuring cost-efficiency for building certification
- Importance of integrated planning and design
- Working with Passive House professionals
- Use of PHPP as tool for integrated design
- Relevance of communication for certification projects, training, on-site inspections and documentation and use of certified components