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CERTIFICATION OF PROFESSIONAL QUALIFICATIONS ACCORDING TO ISO 17024

Certification Programme

„PASSIVE HOUSE CRAFTSPERSON – PLUS / PHCC^{PLUS} [PASSIVE HOUSE (PH) / PLUS ENERGY BUILDING (PEG) / ZERO ENERGY BUILDING (NEG)]“

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Note to the document:
Female styles were used in the original German text, and when gender is indicated the masculine form is included as well. This document was produced, tested and released according to the specifications for the control of documents.

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1 Required Proof

Certification programmes for persons should be established only on the basis of specific public service requirements (for example, protect the public) or because of a demonstrated need / desire of the market (credibility, trust and improvement of the profession in particular).

The obligation of Austria to generate 34 % of its energy needs from renewable sources by the year 2020, as well as the European Union directive 2010/31/EU, which for construction allows only "nearly zero energy buildings" from 2020, and the Energy Efficiency Directive 2012/27/EU will require substantial investments and joint efforts of the public sector, municipalities, organizations and the private sector, while also representing a great opportunity for the construction business and its employees.

Flexible companies and organizations with highly trained employees with ecological, economic and interdisciplinary and multicultural understanding will compete successfully in this environment. Deepening theoretical and practical actionable knowledge for the construction of low energy, passive or plus energy buildings and structuring learning outcomes in terms of knowledge, skills and personal, social and methodological skills will empower passive house craftspeople to holistically understand processes and procedures, both in the professional sphere and across disciplines. Their expertise will allow them to switch efficiently between practices and therefore be sustainable in the public sector, in companies and organizations as well as in private sector, both ecologically and economically.

The move towards an economically, ecologically and socially sustainable energy supply while reducing the energy demand is one of the greatest challenges of our time. This also entails the optimum use of potential energy in remodelling and new construction, and the exploration of the possibilities of state-of-the-art technologies for heat supply, energy production, and energy optimization.

In addition to massive savings in energy operating costs, higher comfort, pollution relief through lower CO_2 emissions and resource-efficient, high-quality materials, the use of renewable energy is in line with ecological, economic and social aspects and makes environmentally friendly, resource-saving, economic sense. These are only some of the many advantages of sociological, demand-driven and user-oriented sustainable practices with regards to energy-optimized construction.

The increasing renovation of existing buildings can be expected in the near future to result in a massive increase in demand for skilled workers. However, education and training opportunities are nearly completely lacking in the field of high energy-efficient construction and renovation.

Due to the requirements of the European Union and corresponding national targets, economic stimulus in the form of jobs and regional value creation is essential, especially in the field of renovation and modernization of buildings to create a "promotion of energy-optimized construction and renovation".

This theoretical potential is currently still that; too little dissemination is found at the level of practice - in the general population, with those responsible in the local and regional authorities, and especially the executive and planning functions of construction companies, which are essential leaders for the implementation of innovation in construction activities on site.

Here there is a large backlog of demand-optimized and targeted forms of education and training in the focal area " Energy-optimized construction and renovation " with its associated secondary themes of renewable energy, energy efficiency and awareness.

Despite the necessary broad qualification of employees due to the continuous reorientation towards low energy or energy-plus building - with the simultaneous continuation of the single, structurally defined building standards, the passive house standard - there is a lack of a formal education system and certification of already experienced practitioners (informal level) and related non-formal education and training offers. Therefore, there is a need for the skilled workers-training measure

„Passive House Craftsperson^{PLUS} / PHCC^{PLUS} "
[Passive House / Lowest or Plus Energy Buildings]

as well as efforts to standardize this training and to certify the graduates, supported by stakeholders. Specifically, the need is demonstrated by:

- *EU 2020 Strategy for sustainable, smart and inclusive growth (Sustainable Growth, Energy 2020, Energy Efficiency Plan 2011 of the EU together with Energy Efficiency Directive 2012/27/EU and the Energy Performance of Buildings Directive 2010/31/EU.*
- *OIB document on the definition of nearly zero-energy buildings and the setting of intermediate objectives in a "national plan" acc. Art. 9 (3) 2010/31/EU, in March 2014.*
- *NEEAP 2014 - First National Energy Efficiency Action Plan of the Republic of Austria in 2014 according to Energy Efficiency Directive 2012/27/EU.*
- *Federal Act on increasing energy efficiency in business and the federal government (Federal Energy Efficiency Act - EEffG), August 2014.*
- *Conclusions and needs assessments of the projects CEEBEE - Center of Excellence for Energy-optimized Construction and Renewable Energy, PHCC - Passive House Craftsmen-Course, ESPAN - Energy Strategy Pannonia, CEPH - Certified European Passive House Designer, SOLUTION - Sustainable Oriented and Long-lasting Unique Team for Energy, CertCraft ISO & ECVET - Future Certification of Crafts(wo)men for Lowest Energy Buildings Following Energy Efficiency Directive 2012/27/EU based on ISO 17024:2012 and ECVET and BuildUpSkills CrossCraft - Development of a qualification scheme for across-the-crafts training of professionals in the Construction Industry.*
- *Industrial companies (for example, Stadtwerke Hartberg, Internorm, Röfix, Pichler ventilation, Drexel & Weiss, ISOCELL)*
- *Commercial enterprises (for example, BM Leitner, Fa. Singer Building Hartberg)*
- *Interest groups (for example, CERE, ETRI, Holzcluster Steiermark, klimaactiv, IG PASSIVHAUS PLUS, ÖGUT, TOB Technology Offensive Burgenland, Innovative Gebäude Österreich)*
- *Training organizations (TU Graz Lifelong Learning, HTBL Pinkafeld, HTBLVA Graz – Ortweinschule, HTBL Zeltweg, HTBL Villach, WIFI Styria and Vienna)*

2 Consultation of Stakeholders

The certification body or the organization that proposes the certification programme should consult stakeholders with respect to the following points:

a) a description of the specific area for which people are to be certified
b) a description of the qualification / competence requirements, evaluation requirements and
c) procedures, including those for monitoring and recertification
d) the degree of support for the programme by the interested parties and evidence of the acceptance of the content of the programme
e) which organization / body or person should be responsible for developing the proposed programme

2.1 Fields of Expertise

The conception of the present certification programme took place in consultation with representatives of the interested areas. These are also represented in the programme committee by:

- Trainers for zero-energy buildings | Passive or plus energy building experts,
- Education institutions which offer qualifications in the subject,
- Organizations active in the department,
- Stakeholders from national and international trade associations and
- Experts of the certification body.

2.2 Certification Programme

The certification programme was based on the Passive House Craftsmen Course PLUS (PHCC^{plus}) developed within the project CertCraft ISO & ECVET. It takes into account the requirements of the job description based on passive houses (PH), plus-energy buildings (PEG) and zero-energy buildings (NEG) and the technical standards and regulations relating to passive houses, plus energy or zero-energy buildings, and focuses on the:

- **ÖNORM B 8110-BGBl.1: 2011 11 01** - Heat insulation in buildings - Part 1: Declarations of the thermal protection of low- and zero-energy buildings - heating demand and cooling demand
- **ÖNORM B 8110-6 BGBl.1: 2014 11 15** - Heat insulation in buildings - Part 6: Fundamentals and methods of verification - heating demand and cooling demand, Supplement 1: Single-family house and small apartment house - validation example for calculating the heating demand of an air heated zero-energy building (Passive house)
- **OIB Guideline 6 Energy economy and heat retention**, Austrian Institute for Structural Engineering, March 2015

2.3 Support from Interested Parties

The certification programme is supported by the organizations listed in section 1. People of these organizations are partly represented in the programme committee.

2.4 Responsibility

The main responsibility in terms of development of the certification programme lies with the programme committee.

3 Certification Programme

A work / practice analysis should be conducted at regular intervals (at least every 5 years) to create the following or confirm:

a) a description of the target group and a statement regarding the purpose or the planned effect of certification
b) a list of important and critical tasks that are carried out by professionals in the occupational field
c) a list of certification requirements, including the underlying basic principles, and the evaluation mechanisms that have been selected for each request
d) a specification for the design of the test(s), including a formal oral or written content description, question types, cognitive levels of questions, number of questions for each area, test time, method for establishing the acceptance of evaluation and the methods of assessment, provided that an examination forms part of the evaluation process
e) opinions on how the proposed programme can create market transparency

3.1 Target Group / Purpose

The target group includes passive house, plus energy and zero-energy buildings craftspeople in construction and related industries, as well as the staff of developers and housing associations in the field of high energy efficient buildings and renovation.
The passive or plus-energy buildings craftspeople will be selected based on their relevant professional training in all necessary technical, environmental and economic knowledge as well as the necessary skills and competence to operate successfully in this area.
Training for Passive House | Plus-energy buildings | Nearly zero energy buildings - craftspersons builds on the basic knowledge in apprenticeships and experience in trades such as

- Roofers
- Electrical Installation Technology
- Electronics
- Precast construction
- Installation and building services
- Masonry and Bricklaying
- HVAC
- Solar protection technology
- Plumbing and
- Carpentry

and provides for required expertise for "highly energy efficient construction and renovation", taking into account the achievement of the objectives and compliance with the criteria:

- Energy balance in practical implementation
- Healthy living and comfort

The purpose is to:
- Improve the professional skill of the target group
- Create a certification option for the target group
- Set an objective classification criterion
- Anchor it in corporate human resource development
- Improve transparency for customers

3.2 Components of the Programme

From the perspective of practice, graduates of training opportunities in accordance with the present certification programme should be able to know the following teaching content, and be able to understand and apply it.
The passive house craftsperson tutorial PHCC^{plus} includes special consideration of practice-oriented curriculum and outcomes-oriented teaching methods, which consist of four main modules of 24 teaching units (TU) with a total of 17 learning modules and a final Refresher:

3.2.1 Basics

3.2.1.1 Introduction and Building Physics Fundamentals

History, definition / criteria, components of a passive house, compactness, orientation, cost-effectiveness, comfort, heat loss and heat gain, humidity and moisture protection, mathematical proofs

3.2.1.2 Energy Performance Certificate and PHPP

Calculation after the Austrian energy performance certificate and the PHPP package, including significant differences

3.2.1.3 Materials and Ecology

Calculation after the Austrian energy performance certificate and the PHPP package, including significant differences

3.2.2 New Construction

3.2.2.1 Thermal Insulation and Heat Storage

Thermal insulation and storage

3.2.2.2 Air and Wind Tightness

Planning rules, execution instructions, air exchange rate, air tightness test

3.2.2.3 Thermal Bridges

Types and minimizing thermal bridges, heat loss through thermal bridges

3.2.2.4 Windows, Doors, and Sun Protection

Transparent building envelope and sunscreen, gains and losses, low-energy and passive house windows and doors

3.2.2.5 Details & Examples

Selected details, built examples

3.2.3 Building equipment

3.2.3.1 Basics

Requirements and particularities of building equipment for low-energy and passive houses

3.2.3.2 Heating and Hot Water

Specific requirements for low-energy and passive houses, heat pumps, solar systems, Biomass heating, district heating, conventional heat generators, cogeneration or CHP, water heating

3.2.3.3 Heat Input

Heat transport via supply air and / or water, surface and bathroom heating, radiators, (reference) room sensor

3.2.3.4 Residential Insulation

Requirements, design, components and dimensions of a ventilation system, air handling units, antifreeze heater, fresh air intake and exhaust, filter, vent lines, overflow, soundproofing and silencers, fire and smoke protection, maintenance, cooling in low-energy and passive houses, summer mode ventilation systems, summer night cooling, surface cooling

3.2.3.5 Plumbing and Electrical Installation

Hot water distribution losses, airtight sanitary and electrical installations, and cable penetrations

3.2.4 Refurbishment

3.2.4.1 Basics

Comprehensive thermal and energy renovation, passive house standard refurbishment contracts, energy-saving potential of remedial measures, efficiency, quality control, klmaaktive rating system TQB - Total Quality Building.

3.2.4.2 Building Condition Analysis

Inventory and documentation, investigation of building physics, windows and doors, roof, ceilings, fireplaces, home automation, conservation, evaluation of the data

3.2.4.3 Building Envelope

Thermal insulation systems (EIFS), curtain wall, core and interior insulation, high quality renovation of the roof, top floor ceiling, basement ceiling, contact with the ground floor windows, quality assurance

3.2.4.4 Building Equipment

Subsequent installation of ventilation, heating, cooling, hot water, electricity, final energy demand and investment expenditure

3.2.5 Refresher

The refresher is an overall summary of the subject matter and an overarching discussion of the relevant skilled trades. In this way, participating craftspeople are acquainted with unusual situations for purposes of the exam, while also optimizing interfaces.

3.3 Requirements and Rationale (training content)

The audit-related content is located in Appendix 1. The entire training comprises 72 TU classroom and 10 TU eLearning (distance learning content). The distance learning content within individual modules is limited to 30%. The "Operational Manual PHCC^{plus}", managed and updated by IG PASSIV PLUS, defines the relevant curricula and is to be used as the basis for all mandatory training. Individual contents within the basic module may be skipped upon recognition of relevant professional practice of at least 6 months. The confirmation of eligibility is up to the Chairman of the Programme Committee.

3.4 Evaluation and Settlement of Audit

3.4.1 Requirements for Testing

The prerequisite for admission to the examination includes the items described in more detail below:

- Education and professional practice
- Completion of the course or passive low-energy house craftsperson/PHCC^{plus}

3.4.1.1 Education and Professional Practice

Completed vocational training (at least one under previously listed apprenticeships), recognized equivalent training, HTL Matura, higher education or an apprenticeship examination equivalent to professional experience within the scope of 4 years is accepted as credit.

The credit equivalent qualification may be carried out by the Programme Committee and the certification authority only during the equivalency exam. Evidence may include:

- Equivalent creditable training (with confirmation) - the training may not be older than 7 years
- Evidence of professional experience in the subject of at least 4 years. A confirmation of employment or a contract with an explanation of duties is required.

3.4.1.2 Compulsory Attendance at Course

The scope of the classroom teaching is 96 TU, while that of distance learning portion 10 TU (1 TU is set with a minimum duration of 50 minutes). For permission to test for certification it must be shown that at least 75% of the classroom teaching has been completed from at least three modules (24 TU each) within a two-year span.

3.4.2 Components of the Examination and Evaluation of the Results

For certification, completion of both a written and an oral test is required. Both parts of the test can be taken a second and a third time if necessary. If after the third examination there is no positive result, renewed participation in the course is required.

The examination to/for certified passive house craftspeople^{plus} is standardized, developed by subject matter experts and has been released by the Programme Committee. All apprenticeships undertake the use of harmonized test documents. These are part of the certification body managed and made available on an ad hoc basis.

The test documents are comprised of:

a) List of questions for the multiple choice test
b) Questions with case studies, caluculations, and definitions
c) List of questions for the expert meeting

3.4.2.1 Written Exam

The written exam consists of:

a) a multiple choice test with 40 questions from the questionnaire
b) 10 definitions of terms, case studies and rough calculations, comprehensively testing both all course content and the chosen specialization module.

For successful completion it is required to achieve:
- At least 24 points on the multiple choice test and
- At least 12 points must on the case studies, calculations and definitions,

with the assessment of each task according to the following criteria:

0 Points = false
1 Point = rudimentary right
2 Points = flawlessly

The **time allotted** for the **written examination** is a maximum of **180 minutes**. The documentation issued at the training course, such as lecture notes and formula sheets, are allowed to be used during the test. "Teamwork" on the part of the candidates can be inhibited in various ways (for example, through seating arrangements, different questions and question combinations etc.).

3.4.2.2 Oral Exam

An attempt at the final oral exam is only possible after positive completion of the written examination. The oral exam consists of the following elements:

a) Comprehension questions referring to incorrectly answered examples from the written exam

Duration: 30 minutes maximum

b) Technical discussion
For the issuance of the certificate, a technical discussion with the aim of determining an overview of the acquired knowledge of the training, skills and competence of the candidate is carried out. Here, the candidate will answer 5 questions from a predefined list. The aim is to explicitly involve the use of practical methods such as models or sketches.
Duration: 30 minutes maximum

The assessment of the oral examination is carried out according to the following evaluation criteria:

a) comprehension questions for the written examination

(maximum 10 points possible)

"The participant is able to professionally/objectively comment on the replies to the written part of the exam, any supplements or answer clarifying questions."

0 points = the participant may have little or no reference to establish the given answers
5 points = the participant is able to reproduce what they have learned
7 points = the participant has obviously dealt with the subject, and is ably defending their statements
10 points = the participant is able to combine answers from different questions, accompanies statements with their own findings, and confidently draws comparisons.

b) Technical discussion - Answering the questions

(maximum 10 points possible)

The evaluation of five answers is according to the following scheme:

0 points = false
1 point = largely correct answer, learned material can be reproduced
2 points = The correct answer is confidently justified, relationships are recognized

For successful completion of the oral examination at least 10 points must be achieved, in which neither of the two parts is a lower rating than 5 points permissible.

Certificate Issuance

To obtain the certificate "Passiv House Craftsperson PHCC^{plus} [Passive House / plus energy buildings / zero-energy buildings]" the participant must successfully complete the written and oral exam. Certification language is the national language of the country.

3.4.3 Monitoring / Recertification

Competency certificates must be issued for a limited period. The period of validity is three years. To monitor the certified skills, certificate holders are obliged to bring the certifying body **evidence of relevant professional activities** in the amount of **at least 18 months**, or evidence of an activity audited/developed by the programme committee or, where appropriate, take a **refresher course** for a total of **at least 8 teaching units**. The refresher course must be attended at the earliest 18 months after the initial certification or after recertification has been renewed. If the complete submission of the above-mentioned evidence happens within the validity period of the certificate recertification (renewal), it is in turn obtained for another 3 years.

If the certificate is already expired, the entire examination process must be carried out again.

3.4.4 Qualification of Lecturers (SHOULD) and Auditors (MUST)

Speakers or examiners for the course "Passive House Craftsperson PHCC^{plus} [Passive House / plus energy buildings / zero-energy buildings]" have the following minimum requirements. Internal auditors are to apply the following to speakers as guidelines, although speakers are not monitored by the certification body.

Speakers (SHOULD)	**EXAMINERS (MUST)**
Completed vocational training and at least 5 years of relevant professional experience	Have completed vocational training and possess at least 5 years of relevant professional experience.
OR Relevant specialist HTL or FH or university with 3 years of relevant work experience	**OR** HTL, FH or university degree in the Department of Building Construction, Building technology and management, or equivalent.
OR PHI certified passive house planner or consultant	**OR** Current activities specializing in the field of high energy-efficient construction and renovation for at least 5 years.
OR Certified passive house craftsperson	**OR** PHI certified passive house planner or advisor.
AND Practice as a speaker with a minimum duration of 50 TU within the last two years.	**OR** Certified passive house craftsperson.

The examiners must be approved in writing by the certification authority after presentation of the relevant evidence and are assigned individually to each area of study (see guidelines for apprenticeships).

3.5 Communication and Market Transparency

The communication of the certification programme to stakeholders (trainees, organizations) takes place via the website of the certification authority and provider of education, through course programmes and advertising folders. The acceptance of the programme may be found under inquiries, and will be discussed in the regular programme committee meetings.

4 Mechanisms for Certification (Confidentiality)

All mechanisms should be created by persons who are familiar with certification, the relevant work area, and have experience and demonstrated skill in the creation of such mechanisms.

Settlement of certification (evaluation, certification) is treated and monitored by the certification body of SystemCERT. The Austrian Federal Ministry of Economy, Family and Youth (BMWFJ) ensures the regulated operations are carried out by an appropriate quality management system at SystemCERT through regular accreditation. To ensure a controlled process and accountability (training, coaching and auditor approval, examination committee, subscriber etc.) records are kept of all activities listed above. The certification body will randomly check the expiration of the evaluation (testing) through a special audit.

5 General Validity (Conformity)

All tests are to comply with the test specifications, ensure equal application and be unbiased.

The conformity of the examination with the specifications of the programme is carried out through standardized, accredited procedures of the certification body SystemCERT. This is also aided by the curriculum of this Programme Committee.

6 Rotation/Revision (Objectivity)

The certification body should define procedures to ensure objectivity and confidentiality.

Objectivity is ensured by the procedures of the accredited certification body SystemCERT. The programme committee holds additional regular (but at least every two years) sessions where revision of the certification programme is discussed and the audit arrangements are revised as appropriate.

7 Sample Certificate

Passive House Craftsperson - PHCC^{PLUS} - New Building

«Salutation»

«GenderName1»

born on «Birthday»

has the audit at "Only_Acquired" in "test site" "Passive House Craftsperson^{plus} - Specialization NEW BUILDINGS'' and has successfully passed according to the SystemCERT certification programme and therefore has demonstrated the prerequisite for the use of "Passive House Craftsperson^{plus} / NEW BUILDINGS''.

The certificate holder in certifying this competence has proof that he/she has the necessary knowledge, skills and competencies for practicing highly energy efficient buildings with the following priorities:

- Executing suitable work for Passive House construction in wood, solid and composite construction in particular
- Proper detail design of building physics
- Producing an airtight building envelope
- Prevention of thermal bridges
- Assessment of building materials
- Standard-compliant installation of Passive House windows

In addition, he/she acquired a good overview of the requirements and implications of Passive House related building systems and interaction with respective trades.
These skills were demonstrated by a combined written and oral examination including a technical discussion.

Passive house craftsperson - PHCC^{PLUS} – RENOVATION

«Salutation»

«GenderName1»

born on «Birthday»

has the audit at "Only_Acquired" in "test site" "Passive House Craftsperson^{plus} - Specialization RENOVATION'' and has successfully passed according to the SystemCERT certification programme and therefore has demonstrated the prerequisite for the use of "Passive House Craftsperson^{plus} / RENOVATION".

The certificate holder in certifying this competence has proof that he/she has the necessary knowledge, skills and competencies for practicing highly energy efficient buildings with the following priorities:

- Executing suitable work for Passive House construction in wood, solid and composite construction in particular
- Proper detail design of building physics taking into account traditional construction
- Producing an airtight building envelope
- Preventing thermal bridges
- Assessment of historical and modern building materials,
- Standard-compliant installation of Passive House windows

In addition, he/she acquired a good overview of the requirements and implications of Passive House related building systems and interaction with respective trades.
These skills were demonstrated by a combined written and oral examination including a technical discussion.

8 The Programme Committee

Members of the Programme Committee confirm with their signature or by circular resolution, the validity of this certification programme.

Graz, 17. September 2015

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