



**Passiv
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Certification as "Quality Approved Passive House" Criteria for Residential-Use Passive Houses

Passive Houses are buildings, in which a comfortable temperature in winter as well as in summer can be achieved with only a minimal energy consumption. They are more demanding in regard to conception, design and execution of construction work. For reasons of quality approval, Passive Houses can be checked and certified. The certification criteria, applicable to residential buildings, are described below.

1 Evaluation Criteria for the Certification

Specific Space Heat Demand	max. 15 kWh/(m²a)
or Heating Load	max. 10 W/m²
Pressurization Test Result n₅₀	max. 0.6 h⁻¹
Entire Specific Primary Energy Demand	max. 120kWh/(m²a) incl. domestic electricity

If active cooling is necessary, the useful cooling demand must not exceed 15 kWh/(m²a). The primary energy criterion stays unaltered in this case as well. The energy demand for cooling has to be compensated elsewhere.

The reference value (Treated Floor Area) is the net living area inside of the thermal envelope according to the German 'Wohnflächenverordnung'. For details please refer to the PHPP handbook.

For the calculation of the demands all units inside a thermal envelope, e.g. terraced houses or apartment buildings may be considered as a whole. The verification may be carried out using calculations for the entire building or with weighted average values for several partitions. Combining thermally divided buildings is not permitted. For the certification of refurbished old buildings or building extensions, the zone in question must contain at least an exterior wall, a roof area, and a floor slab or basement ceiling. Individual flats within an apartment building will not be certified.

The criteria have to be verified with the Passive House Planning Package 2007 (PHPP2007). For the specific space heat demand, the monthly as well as the annual method can be applied. If the space heat demand is below 8 kWh/(m²a) or the



relation of free heat to heat losses is above 0.70 in the annual method, the monthly method has to be applied.

The most recent certification criteria have to be applied (to obtain most recent ones please refer to: www.passiv.de). The calculation method described in the PHPP handbook and the PHPP software is subordinate to this.

2 Documentation Required for the Passive House Quality Approval Certificate

2.1 PHPP (signed) containing at least the following calculations (Please enclose the calculations as MS-Excel file or send them via e-mail)

	<u>Name of Worksheet</u>
<input type="checkbox"/> Building registration and Passive House verification	Verification
<input type="checkbox"/> Summary of areas, u-value assignment, radiation data and thermal bridges	Areas
<input type="checkbox"/> Calculations of U-values of building elements.....	U-Values
<input type="checkbox"/> List of the project's building elements	U-List
<input type="checkbox"/> Window U-value calculations	Windows
<input type="checkbox"/> List of employed windows and glazing types	Win-Type
<input type="checkbox"/> Reduction factors for building elements against the ground, if applicable	Ground
<input type="checkbox"/> Shading factor calculations	Shading
<input type="checkbox"/> Calculations of air flow rate and efficiency of heat recovery; analysis of pressurization test results	Ventilation
<input type="checkbox"/> Verification of space heat demand using the PHPP annual method	Annual Heat Demand
<input type="checkbox"/> Verification of space heat demand using the PHPP monthly method (if selected in the verification worksheet)	Monthly Method
<input type="checkbox"/> Heating load verification using the PHPP.....	Heating Load
<input type="checkbox"/> Calculation of the frequency of overheating in summer.....	Summer
<input type="checkbox"/> Summer shading factor determination	Shading-S
<input type="checkbox"/> Determination of summer ventilation (if applicable).....	SummVent
<input type="checkbox"/> Heat loss calculations of space heating and DHW distribution systems.....	DHW + Distribution System
<input type="checkbox"/> Solar fraction calculations of solar thermal DHW system (if applicable)	SolarDHW
<input type="checkbox"/> Verification of the annual use efficiency of the heat generator	Compact, Boiler or District Heat
<input type="checkbox"/> Calculation of electricity demand	Electricity
<input type="checkbox"/> Calculation of auxiliary electricity demand.....	Aux Electricity



- ☐ Calculation of primary energy demand..... **PE-Value**
- ☐ Selection of climate data, if “standard” is not used..... **Climate Data**
- ☐ Verification of useful cooling energy demand, if active cooling is being used **Cooling**
- ☐ Verification of cooling load, if active cooling is being used **Cooling Load**
- ☐ Calculation of cooling units, if active cooling is being used **Cooling Units**

2.2 Construction Drawings:

- ☐ Site plan showing building orientation, location and elevation of neighbouring buildings, prominent tree lines, or any ground levels that cast lateral shadows. If appropriate, photographs of the surroundings. The shading situation must be comprehensible.
- ☐ Planning drawings (plans, sections, elevations) as 1:100 planning application drawings (design development), or 1:50 construction drawings (incl. construction documents) with comprehensive dimensions of all calculated areas: room dimensions, overall building and room areas, and all rough openings in the exterior envelope.
- ☐ Location plans of the thermal envelope, the windows and if existent of the thermal bridges for a clear allocation of the areas and thermal bridges calculated in the PHPP.
- ☐ Comprehensible record of the calculation of the treated floor area.
- ☐ Mechanical plans or sketches showing ventilation, heat supply, DHW and (if existent) climatisation. Description of the heat generation, storage and distribution and the corresponding insulation standards. Description of the ventilation system with declaration of the layout, air flow rates, soundproofing, filters, supply and extract air valves, outdoor air intake and exhaust air outlet, insulation of air ducts, subsoil heat exchanger (if existent), control etc.
- ☐ Detail drawings of all junctions of the thermal envelope, e.g. exterior and interior wall junctions to the basement floor or floor slab; exterior wall junctions to roof and ceiling; ridge joint, lateral; window installation (lintel, parapet and reveals), anchorage systems of balconies etc.. All details have to be provided with dimensions and information about materials and thermal conductivity groups. The air tight layer has to be marked and it's realization at junctions has to be described.

2.3 Technical specifications, if necessary with product data sheets:

- ☐ The following details about window and doorframe installations are to be provided: manufacturer, type, U_f -value, $\Psi_{\text{Installation}}$, Ψ_{Spacer} , and drawings showing all



planned installations in the exterior wall. The calculated values¹ are to be verified in accordance with EN 10077-2. Data for products certified by the Passive House Institute is already available.

- ☐ Specifications to be submitted for glazing: manufacturer, type, U_g -value according to EN 673 (accuracy: 2 digits), total solar transmittance according to EN 410 (g-value), spacer type.
- ☐ A brief description of the building services system, if necessary, supplemented with schematic diagrams.
- ☐ Manufacturer, type, and specifications of all components: ventilation system, space heating and DHW systems, DHW storage tank, auxiliary heater, frost protection, etc.
- ☐ Specifications of the subsoil heat exchanger (if existent): length and depth of the installation, layout type, soil quality, pipe material and sizes, verification of heat exchange efficiency (e.g. using PH-Luft.²).
When using brine subsoil heat exchangers: Control, category temperatures for winter and summer, verification of the heat exchange efficiency
- ☐ Specifications on plumbing and ducts: length and insulation of the supply pipes (DHW and space heating), and of the ventilation ducts between the heat exchanger and the thermal building envelope.
- ☐ A concept for efficient household electricity consumption: e.g. high-efficiency household appliances, user's guide and energy-saving incentives for homebuyers). If no evidence for an efficient use of electricity is provided, average values of the appliances which are available on the market are used (standard values PHPP)

2.4 Verification of the Airtight Building Envelope According to DIN EN 13829

Deviant from the DIN EN 13829 a series of overpressurization and underpressurization tests is necessary for every project. The pressurization test should only be performed for the heated building envelope (basements, front buildings, conservatories etc., which are not integrated in the thermal envelope, have to be omitted from the pressurization test) It is recommended to perform the test when the airtight plane is still easily accessible and corrections can be implemented.

The pressurization test must be carried out by an institution or person independent of the clients and homeowners. If a client conducts the pressurization test himself, it is

¹ The calculated values of certified components are available through the internet at <http://www.passivehouse.com>.

² PH-Luft: A program to support designers of Passive House ventilation systems. It is available as a free download from the Passive House Institute website: <http://www.passivehouse.com>.



only accepted if an independent witness signs the test results and thereby certifies the correctness of the data.

2.5 Record of the adjustment of the ventilation system

The record must contain at least the following information: object, address of the building site, name and address of the inspector, time and date of the adjustment, manufacturer and type of the ventilation system, adjusted air flow rates for every valve at standard operating mode, balancing of mass and air flow volume for fresh and exhaust air (max. 10% disbalance).

2.6 Declaration of the construction supervisor

The realization according to the verified Passive House project planning has to be documented with the declaration of the construction supervisor. Deviant realizations are to be declared. Evidence of conformity has to be provided for deviant products.

2.7 Photographs

Photographs of the realized building have to be provided (preferably digital), which can document the construction of the Passive House.

Under certain circumstances additional test reports or data sheets for the components used in the building can become necessary. If more favourable assumptions than those used in the standard PHPP calculation should be applied, they have to be documented with more precise evidence.

3 Procedure of the Quality Approval

There is no specific form needed for the application for the certificate. The verifier has to be provided with the necessary documents which are to be filled in completely. The documents have to be examined at least once for the certification. Depending on the procedure, more examinations can be agreed upon.

Please note: The documents which are relevant for the Passive House standard should favourably be examined during the planning period, so that potential corrections or suggestions for improvement can be taken into account at an early stage. If the planner does not have any experience building passive houses, we suggest at least one preliminary counselling interview and if appropriate also an continuous, accompanying counselling for the project.

When the examination has been finished, the applying party receives the results of the examination, if necessary with the corrected calculations and suggestions for improvement. An examination of the execution of construction work is not automatically included in the process of certification. However from the execution of the construction work the following documents have to be provided: verification of the



air tightness, record of the adjustment of the ventilation system, declaration of the construction supervisor and at least one photograph. If the necessary verifications have been found to be correct and the above criteria have been met, the following certificate is being issued.



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The issued certificate only declares accuracy of the provided documentation, in accordance with the current technological development of the Passive House standard. The examination neither applies to the surveillance of the execution of construction work nor to the observation of the user behaviour. The warranty for the design remains with the technical planner, the warranty for the execution of construction work remains with the responsible construction supervisor. The logo of the Passive House Institute may only be used in association with the certificate.

An additional quality assurance of the execution of construction work does make sense, especially if the construction supervisor in charge does not have any experience building Passive Houses.

The right to adapt the criteria and the methods of calculation to the progress of technical development remains reserved.

4 Calculation Methods, Basic Conditions, Reference to Norms

In the PHPP the following basic conditions and calculation methods respectively have to be used:

- Climate data for Germany: alternatively Standard-Germany or regional data set (adequate to the building's location; deviant altitude of the location: use temperature correction of -0.6 °C for each 100 m of difference in altitude)
- Climate data other countries: regional data set (adequate to the building's location; deviant altitude of the location: use temperature correction of -0.6 °C for each 100 m of difference in altitude)
- Own climate data of the applicant: For approval of usability please ask the responsible certifying party
- Lay-out temperature: 20 °C without lowering of temperature at night
- Internal heat sources: 2.1 W/m^2 , as long as the Passive House Institute has not specified any other national values



- Occupancy: 35 m²/person, deviant values may be used with an explanation (actual occupancy or specification of the building design) in the range of 20-50 m²/person
- Domestic hot water demand: 25 litres / person / day of 60 °C water; cold water temperature is 10 °C if no other national values have been specified by the Passive House Institute
- Average air flow rate is 20-30 m³/h per person in a household; use at least an air change rate of 0.3 times an hour applied to the treated floor area multiplied by 2.5 m of room height. The applied air flow volumes have to correspond with the actual values of the adjustment of the ventilation system.
- Domestic electric energy demand: use standard values of the PHPP; deviant values only with individual verification by the building owner or domestic electric energy concept respectively
- Thermal envelope: Use exterior dimensions without exception
- U-values of opaque building elements: PHPP-method on the basis of EN 6946 with rated value of the thermal conductivity following the national norm or the technical approval of the governmental authority in charge
- U-values of windows and doors: PHPP-method following EN 10077 with calculated rated values for window frame U-Value U_f , glass edge thermal bridge Ψ_g , and installation thermal bridge $\Psi_{\text{Installation}}$
- Glazing: calculated U-value U_g (accuracy: two digits) following the EN 673 and g-value following the EN 410
- Efficiency of heat recovery: examination method of the Passive House Institute (refer to www.passiv.de); alternatively following the DiBt-method (German Institute for Building Technology) or equivalent subtracting 12% of the value
- Efficiency of the heat generator: PHPP-method or individual verification respectively
- Primary energy factors: PHPP data set

Last changes made: 06. August 2009

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