

09.01\_PH-SUMMER SCHOOL

# QUALITY CONTROL – Passive House Checklist

Composition: Passive House Institut, Darmstadt (DE),

[www.passiv.de/English/Checklist.htm](http://www.passiv.de/English/Checklist.htm)

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This presentation is being used for non-commercial purposes.

## 1) Site Plan

- Proximity to public transportation.
- South orientation of the "main" side ( $\pm 30^\circ$ ), and large south-facing window areas.
- Freedom from unwanted shade from building elements, to allow passive solar energy use.
- Planting that will not cause unwanted shade in the future.
- Is a compact form possible? Row and multi-story buildings are advantageous.

## 2) Concept Development

- Use a compact building shell, and take advantage of opportunities to combine buildings.
- Glazed surfaces facing south are optimal; keep east, north and west windows small.
- Minimize shaded areas (very little or no shade in winter from railings, parapets, building projections, balconies, roof overhangs, divider walls, etc.)
- Use a simple shell form (if possible, without dormers, returns, etc.)

### Legend

„⇒“ : Quality control measures required.

## 2) Concept Development

- Use a building footprint that concentrates utility installation zones (e.g., bathrooms above or adjacent to kitchens and each other).
- Leave room for ventilation ducts.
- Separate basement (if any), airtight and free of heat bridges.  
⇒ Use the **PHVP** (passive house pre-planning package).
- Apply for passive house construction subsidies, if available. .

### Legend

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### 3) Building Permit Plans

- Determine insulation thickness of building envelope.
- Avoid heat bridges.
- Determine size of utility room(s).
- House footprint: short pipe runs (hot and cold water, sewage) und ventilation ducts. Cold air ducts outside; warm air ducts inside the insulated building envelope.

## 4) Detailed Design Drawings

- Construction standards for extra insulation. (Standard:  $U \leq 0.15$  W/(m<sup>2</sup>K) (0.026 Btu/h/ft<sup>2</sup>/°F); Desired:  $U \leq 0.1$  W/(m<sup>2</sup>K) (0.018 Btu/h/ft<sup>2</sup>/°F))
  - ⇒ Heat bridges: Use bridge-free connection details or calculate losses at heat bridges.
  - ⇒ Airtight connection details.
- Optimized windows (glazing type, super insulating frames, glass type and coatings, shading)
  - ⇒ Calculate energy rating *using the [PHPP](#) (Passive House Development Package)*.

### Legend

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## 5) Detailed Ventilation System Drawings

- Ductwork: Keep cold air ducts outside, and warm air ducts inside the insulated building envelope, unless they are well insulated and kept very short. Use short runs, smooth inside surfaces and airflow velocities  $\leq 3$  m/s (9.8 ft/s). Include measurement and adjustment capability, sound attenuation, and fire protection measures.
- Air vents: Avoid air current short-circuiting, consider air current projection distances and provide adjustability. Do not remove stale air over radiators.
- Overflow openings: Dimension for  $\Delta p \leq 1$  Pa (0.0075 Torr)

## 5) Detailed Ventilation System Drawings

- Ventilation: Place central unit and air-to-air heat exchanger near the thermal envelope (good locations are in the envelope, or on the lower floor). Place the air heater inside the insulated envelope, and provide additional insulation of the central unit and air heater as appropriate. Heat recovery rate should be <sup>3</sup> 75%, system should be air tight (leakage < 3%), with electricity efficiency < 0.4 Wh/m<sup>3</sup> (0.04 Btu/ft<sup>3</sup>), and should be adjustable, with a housing that is well insulated acoustically and thermally.



## 5) Detailed Ventilation System Drawings

- Ventilation controls: Provide user-operated settings for "low", "normal" and "high", and consider additional controls in kitchen and baths/toilets.
- Stove hoods: Use a unit with a high capture rate at low airflow rate and velocity. Unit must include an efficient grease filter.
- Underground earth-to-air heat exchanger (optional): System should be airtight, with colder parts away from the house, and a bypass (for periods when heating or cooling air to earth temperature is not desired).

## 6) Detailed Plumbing and Electrical Drawings

- Sewage and water lines should be short, and should be well insulated. Insulation must prevent sewer and cold water lines from sweating.
- Insulate water and heating system valves and other accessories.
- Use water-saving plumbing fixtures and provide hot water connections for washing machine and dishwasher.

## 6) Detailed Plumbing and Electrical Drawings

- Sewer system should preferably have only one stack, and be properly vented. Vent pipes must be insulated within the building envelope.
- Assure that electrical and plumbing penetrations of the airtight, insulated building envelope are well insulated and airtight.
- Use low energy household appliances (*list of appliances and their ratings is part of the PHPP*)
  - ⇒ Quality control check of all heating, plumbing and electrical systems.

### Legend

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## 7) Execution, Building Construction Supervision

- ⇒ Schedule on-site quality control inspections to check for/assure freedom from heat bridges.
- ⇒ Assure that insulation layers are continuous, and without air pockets.
- ⇒ Check joint details for air tightness while they are accessible.
- ⇒ Have a building shell pressure test performed.

When: As soon as the airtight envelope is complete and while it is still accessible; that is, before the interior is finished (coordinate with all trades). How: Blower Door *n50*-Test, including identification of leaks.

### Legend

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## 8) Execution, Ventilation Installation Supervision

- ⇒ Assure airtight penetrations.
- Ducts neatly installed and carefully sealed.
- Check central unit acoustic insulation (where required), and assure easy accessibility for changing filters.
- ⇒ Adjust ventilation in normal service; measure and balance supply and exhaust air volumes; balance supply and exhaust air distribution; and measure the system's electrical power consumption.

### Legend

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## 9) Execution, Plumbing and Electrical Building Installation Supervision

- ⇒ Check for airtightness of envelope penetrations.
- ⇒ Check for proper insulation of pipes.

### Legend

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## 10) Certification

*Application for „Geprüftes Passivhaus“ (Tested Passive House) certificate from the PHI.*