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Certification Criteria for

EnerPHit Insulation Systems

1 Boundary conditions

1.1 Initial values

Indoor air temperature	(T_i):	20	°C
Outdoor air temperature	(T_e):	-10	°C
Basement air temperature	(T_c):	10	°C
Ground temperature	(T_g):	10	°C
Thermal resistance – Inside (horizontally)	(R_{si}):	0.13	m²K/W
Thermal resistance – Inside (up)	(R_{si}):	0.10	m²K/W
Thermal resistance – Inside (down)	(R_{si}):	0.17	m²K/W
Thermal resistance – Outside (horizontally)	(R_{se}):	0.04	m²K/W
Thermal resistance – Outside (up)	(R_{se}):	0.04	m²K/W
Thermal resistance – Outside (down)	(R_{se}):	0.04	m²K/W
Thermal resistance – Outside, ventilated (horizontally)	(R_{se}):	0.13	m²K/W
Thermal resistance – Outside, ventilated (up) up to an inclination of 60° of the building component	(R_{se}):	0.10	m²K/W
Thermal resistance – Outside, ventilated (up) from an inclination of 60° or more of the building component	(R_{se}):	0.13	m²K/W
Thermal resistance – Outside, ventilated (up)	(R_{se}):	0.17	m²K/W
Thermal resistance – Basement	(R_{sc}):	0.17	m²K/W
Thermal resistance – Ground	(R_{sg}):	0.00	m²K/W

An outside temperature of -10 °C is used to determine the minimal internal surface temperature. The higher thermal resistances inside the room (R_{si} = 0.25 m²K/W) are used to determine surface temperatures in accordance with ISO 13788, and the limit for the temperature reduction factor is set to f = 0.7.

1.2 Measurement reference

External dimension

1.3 Climatic range

These certification criteria and, if applicable, the certificate issued on the basis of these criteria are only valid for the cool temperate climate zone (e.g. Central Europe).

2 Requirements for standard building elements

2.1 General Requirements

2.1.1 Airtightness

All building components must be installed in a permanently airtight manner. The airtight level must be clearly indicated in the graphical representation (e.g. using a red line). The practical implementation must be explained clearly in writing.

2.1.2 Penetrations

If punctiform or linear penetrations are required by the insulation system being certified, then the requirements for the thermal transmittance of the standard building components must be complied with, taking into account the thermal bridge loss coefficient.

2.1.3 Thermal transmittance

The thermal transmittance is determined in a simplified form by disregarding the existing building components, unless this results in a higher thermal transmittance (e.g. in case of insulation between rafters).

2.1.4 Humidity

A harmful increase in the level of humidity inside the component or on its surface must be safely ruled out. Evidence of this is required in case of doubt.

2.2 Opaque building envelope

Exterior insulation[1]: $f_t * U \leq 0.15$ W/(m²K)

where f_t = temperature reduction factor
towards the outdoor air: $f_t = 1$
towards the ground: $f_t = 0.7$

[1] Building components with interior insulation cannot yet be certified at the moment.

(Based on the EnerPHit building certification criteria with an overall "ground reduction factor" of 0.7 from the "Ground" Sheet in the PHPP)

3 Requirements for component connections

3.1 Thermal bridge loss coefficient

Ψ_e = 0.01 W/(mK) for the main standard connection details (see 3.5) where Ψ_e= thermal bridge loss coefficient based on external dimensions

Exception:
If thermal bridge free detail formation is obviously uneconomic (assessment of the life cycle) or not possible in terms of practical construction, then the thermal bridge should at least be reduced as far as is economically and practically possible. In this case the Passive House Institute will specify this requirement within the context of the certification process. The requirements for moisture protection (interior surface temperature >12.6 °C at the boundary conditions given in 1.1) must be complied with in either case.

The Passive House Institute reserves the right to demand that existing thermal insulation systems are supplemented with easy to use and cost-effective products for reducing the heat losses through thermal bridges as a prerequisite for certification (e.g. insulation wedges for flanking insulation).

3.2 Interior surface temperatures

> 12.6 °C (boundary conditions in accordance with 1.1)

3.3 Airtightness

All component connections must be carried out in a permanently airtight manner. The airtight layer must be clearly indicated in the graphical representation (e.g. using a red line). The practical implementation must be explained clearly in writing.

3.4 Humidity

A harmful increase in the level of humidity inside the component or on its surface must be safely ruled out. Evidence of this is required in case of doubt.

3.5 Connection details to be tested (if applicable)

- Roof ridge
- Roof connection detail, monopitch roof
- Roof connection detail, verge
- Roof connection detail, eaves
- Exterior wall to insulation on uppermost ceiling (eaves)
- Exterior wall to insulation on uppermost ceiling (gable)
- Interior wall in roof area to insulation on uppermost ceiling
- Wall at head of stairs to insulation on uppermost ceiling
- Exterior wall to flat roof
- Outer edge of exterior wall
- Inner edge of exterior wall
- Base point of exterior wall on floor slab
- Base point of interior wall on floor slab
- Interior wall on floor slab
- Base point of exterior wall on basement ceiling, unheated basement
- Base point of interior wall on basement, unheated basement
- Window installation in exterior wall at sides
- Window installation in exterior wall above
- Window installation in exterior wall below
- Window installation in exterior wall roller shutter casing
- French window installation in exterior wall at threshold
- Protruding balcony slab of reinforced concrete to exterior wall
- Protruding balcony slab of reinforced concrete to balcony door
- Other details depending on the system (provide details!)

Window installation:

A typical Passive House window frame (real or fictive) which is barely certifiable ($U_W \approx 0.80$ W/(m²K) with Ug = 0.7 W/(m²K), e.g. frame width 130 mm, $U_{Frame} = 0.78$ W/(m²K), $\Psi_{Glazing\ edge} = 0.03$ W/(mK)) is used in the construction system under consideration. The U_W of the standard installed window (1.23 m width, 1.48 m height) may be 0.85 W/(m²K) at the most, i.e.:

$U_{w,installed} \leq 0.85$ W/(m²K).

Building component variants:

In order to approximate the different features of existing buildings, the wall connections are assessed as several variants. The selection of suitable component configurations to be tested takes place in agreement between with the Passive House Institute and the manufacturer, the following list is therefore only meant as an example.

Exterior walls:

- Oak timber framework 15 cm with loam infill
- Oak timber framework 15 cm with cobblestone infill
- Solid brick 30 cm
- Solid brick 50 cm
- Solid brick 2x12 cm with 6 cm air layer
- Hollow brick 24 cm
- Lime-sandstone 24 cm
- Lime-sandstone 24 cm, 4 cm insulation, ventilation from behind, 11.5 cm facing brickwork
- Sandwich elements of reinforced concrete with 5 cm cavity insulation
- Reinforced concrete 17.5 cm

Interior walls:

- Reinforced concrete 17.5 cm
- Solid brick 11.5 cm
- Solid brick 30 cm
- Solid brick 50 cm
- Hollow brick 11.5 cm
- Hollow brick 24 cm

4 Proof of material characteristics

4.1 Thermal conductivity

Rated value of the thermal conductivity in [W/(mK)] for the insulation thicknesses used in the respective installed state.

4.2 Fire performance

Evidence regarding fire performance.

4.3 Insulation materials in contact with the ground

Evidence required in addition:

- Water absorption when completely submerged for a long period
- Water absorption through diffusion
- Closed-cell structure