

# Passive House construction method with FOAMGLAS®

## New and certified with architect details

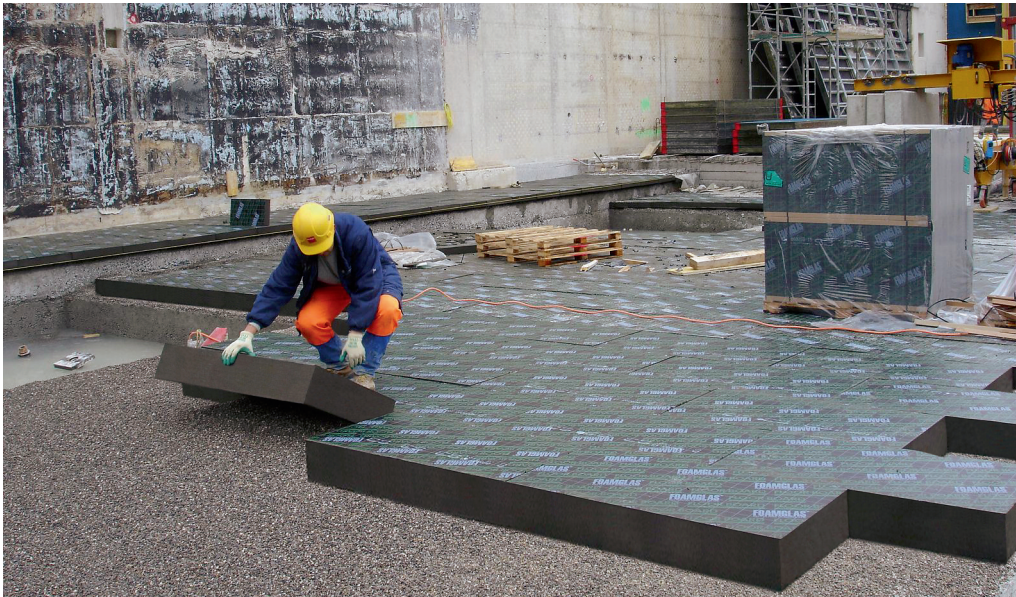
**FOAMGLAS®**  
Building

Sustainable,  
energy-saving,  
ecological



Germany's most modern  
Passive House project:  
New construction  
Sophienhof residential  
complex, Frankfurt/Main

[www.foamglas.co.uk](http://www.foamglas.co.uk)



FOAMGLAS® insulation built into 2 layers. For the Passive House standard, increased insulation thicknesses of 20 - 30 cm are required.

**Future-proof and sustainable constructions.**

## Quality standard FOAMGLAS® in the Passive House

FOAMGLAS® insulation slabs are certified as suitable Passive House components by the Passive House Institute (PHI) in Darmstadt. The idea for the first Passive House in Germany was developed in 1988. In 1991, following the concept of Dr. W. Feist of the PHI Darmstadt and Professor Bo Adamson of the University of Lund, a terrace of multi-family houses in Darmstadt was converted to this method of construction.

### Definition of a Passive House

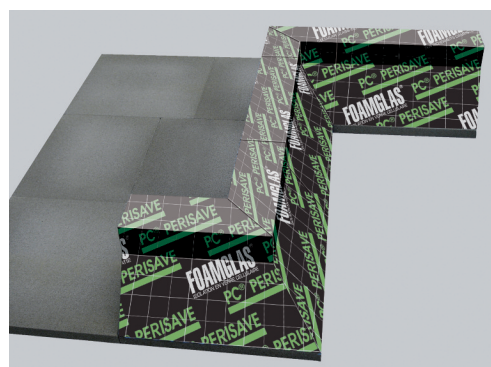
Buildings qualify as Passive Houses that, both in the winter and in the summer, reach a comfortable ambient temperature due to good thermal insulation with extremely small energy consumption.

A Passive House meets the following limit values, which makes possible to dispense with conventional heating and thus enables heating solely with a ventilation system.

<b>Heating requirement</b>	$\leq 15 \text{ kWh / m}^2\text{a}$
<b>Airtightness n50</b>	$\leq 0.60 / \text{h}$
<b>Primary energy requirement</b>	$\leq 120 \text{ kWh / m}^2\text{a}$

The energy conservation solutions are thereby based on the following points:

- Reduction of the ventilation heat losses
- Reduction of the transmission heat losses
- Guaranteeing the specified energy consumption over the entire service life of the building.



**New:** PC® PERISAVE – the FOAMGLAS® edging, with prefabricated inside or outside corners as required.

## Why build a Passive House?

### Advantages of a Passive House

The higher costs of building of a Passive House associated with the increased quality of construction can be kept within limits.

The building of a Passive House becomes economically interesting due to the additional benefit of the initial multiple investments:

- Sustainable low heating costs and greater independence from energy prices
- Noticeably higher comfort by even radiant area heating, no drafts and the avoidance of cold-air pools on the floors
- Healthy, fresh indoor air
- Better construction quality as a guarantee of increased real estate value
- Reduction of emissions and thus less burden on the environment.

### Conditions necessary for a Passive House

#### Irreversible Construction Units

Especially for construction units not and/or only accessible with difficulty, such as construction units in contact with the ground, the functionality of the thermal insulation over time is of crucial importance. Thermal protection that gradually gets worse over the course of the years can no longer be compensated for by the heating planned for Passive Houses. The insulation is directly subjected to higher stress in this respect and is accordingly subject to high quality requirements.

#### What stresses perimetric insulation is exposed?

##### Dampness, water, load, pressure

Apart from the familiar stresses of dampness and/or water and the mechanical loads from building loads as well as ground and water pressure, other points play a major role in the functionality of perimeter insulation.

##### Biochemical loads

The perimeter insulation is thus exposed to chemical loads such as partially halogenated hydrocarbons, humic acids, that form from the remains of dead organisms in the soil or in extreme cases even contaminated soil conditions.



New building, School Centre Neckargemünd.

The largest certified school building project in the country using the passive construction method.

#### Parasites

Furthermore, rodents and insects living in the soil can destroy the insulation, but roots can also damage the insulation so that the original thermal insulation value can no longer be achieved.

#### Radiation

Radiation loads from Radon and/or its decay products in buildings must also be considered. The main source of this is the influx of Radon radiation from the soil under the houses.

#### What tasks does insulation in contact with the soil have to fulfill?

##### Static

- Sufficient continuous pressure strength with well-known creep behaviour.
- Above average, general robustness of the material for the soil-side processing and subsequent work (reinforcement installation, concreting work, backfilling, consolidation).

##### Physical aspect of construction

- Limited and/or no water absorption with capillary porosity or through diffusion, taking into consideration the influence on the heat conductivity.

##### Materials technology

- Toxic safety including the additives needed for the processing, above all also with insulation within the water-saturated conditions.
- Resistance to rotting and dimensional stability.

# Airtightness of all standard construction units and connection details

Where it concerns material properties, FOAMGLAS® makes its mark

## Steam and waterproof

FOAMGLAS® is resistance against all water and dampness conditions and thereby guarantees a reliable thermal protection for the service life of the building. Beyond that you have additional security through the secondary sealing function. An additional vapour barrier in connection with a "white tank" is not necessary since FOAMGLAS® fulfils the sealing and vapour check functions.

With a continuous FOAMGLAS® insulation for all construction units in contact with the soil in connection with a groundwater-proof building sealing, additional drainage measures in the soil are superfluous.

Because FOAMGLAS® can be used without drainage with temporarily rising formation water or an increase in the ground-water level to a submersion depth of 12 m (Berlin Technical University, Institut für Baukonstruktionen und Festigkeit).

## Compression proof

FOAMGLAS® does not compress. Thus no deformations occur within the insulating material during the service life of the building. The insensitivity of FOAMGLAS® to settling creates favourable conditions for the very high total thickness of insulating material of 20–30 cm for passive houses.

## Pure mineral

FOAMGLAS® is purely mineral and is manufactured from glass components and/or recycled glass. Similar to the characteristics of glass, the building material is resistant to acids, oils and most alkalis.

## Radon resistant

FOAMGLAS® is resistant to the Radon load in the soil and serves as screen against the influx of the radiation into the building.

## Ecological and sustainable

FOAMGLAS® is purely mineral, environmentally-neutral and biologically harmless. The production uses a recycled glass content of up to 66 %, without the use of ozone-diminishing propellant gases or plastic content. Among industrially manufactured insulating materials, with respect to a low total energy consump-



High-grade recycled glass.



Environmental product declaration, Institut Bauen und Umwelt e. V.: FOAMGLAS® is a partner for sustainable and future-proof constructions.

tion and CO<sub>2</sub> emissions FOAMGLAS® takes a top place and thereby also follows the basic concept of CO<sub>2</sub> reduction through the construction of passive houses.

The Institut Bauen und Umwelt (IBU) has awarded FOAMGLAS® the first environmental declaration for insulating materials according to international rules.

## In conclusion

FOAMGLAS® thus provides the functional, secure basis that fulfils all the static, physical and ecological construction requirements set for the floor/perimeter insulation by the construction of passive houses.

# New: FOAMGLAS® PC® PERISAVE

## FOAMGLAS® PC® PERISAVE

### PC® PERISAVE base block

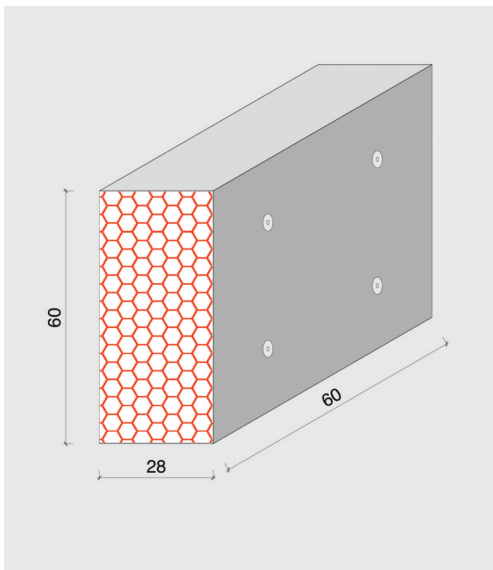
The universal base element for the construction of passive houses

The PC® PERISAVE base block is used in perimeter and above-ground splash-water areas as well as in more highly loaded mechanically areas as universal base element.

The PC® PERISAVE base element is manufactured in a standard dimension of 60 x 60 cm in a thickness of 28 cm and thus with a concrete wall enables a heat transfer coefficient of  $U \leq 0.15 \text{ W}/(\text{m}^2\text{K})$ , in accordance with certified systems. Other dimensions on request. The bitumen lamination applied on site allows if necessary the simple and fast welding onto a bituminous sealing course.

In addition, the PC® PERISAVE base block is equipped with 4 non-penetration attachment dowels. These cold bridge-free elements are used, for example, for the attachment of plaster fabrics.

The adhesion of the PC® PERISAVE base block is fully covering and overlapping on the underground with bitumen cold adhesive PC®56 and/or during creation of a "white tank" with PC®56 waterproof.



**PC® PERISAVE base block**  
with cold bridge-free mounting element

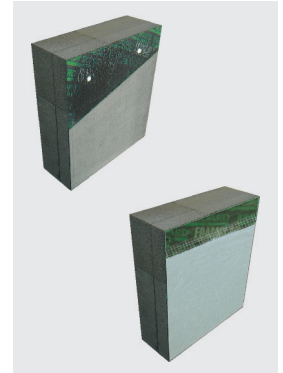
### PC® PERISAVE edging

#### The heat insulation form element for the construction of passive houses

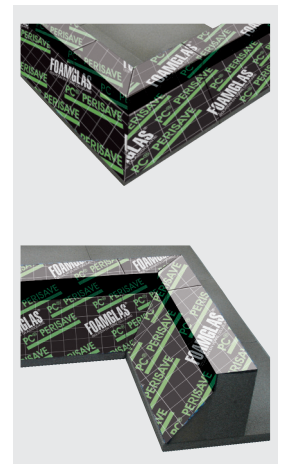
The PC® PERISAVE edging serves as a form element in concrete construction. The cost of transport, installation, cleaning and development of normal form materials are thereby saved. Furthermore, the PC® PERISAVE edging meets the heat insulation requirements in accordance with the passive house standard.

The PC® PERISAVE edging buttons is manufactured as standard in the dimensions stated. The bituminous lamination on the exterior, applied at the factory, makes direct welding onto a sealing course possible, as necessary.

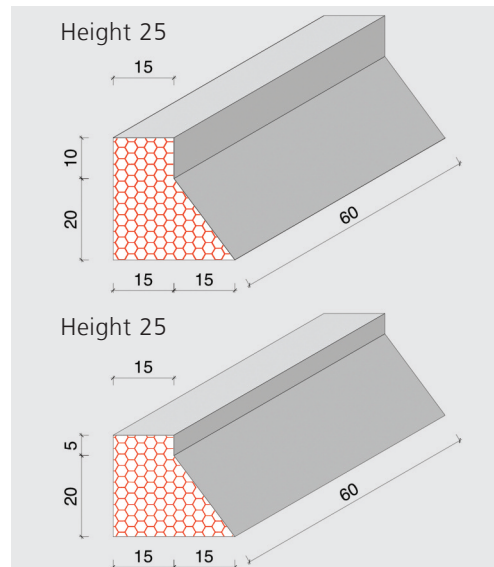
The adhesion of the PC® PERISAVE edging at the building site fully covers and overlaps on the existing floor insulation using FOAMGLAS® plates or FOAMGLAS® BOARD with bitumen cold adhesive PC®56 and/or during creation of a "white tank" with PC®56 waterproof.



**PC® PERISAVE base block**  
with sealing/with plaster



**PC® PERISAVE edging**  
are also available if required  
with prefabricated outside or  
inside corners.



**PC® PERISAVE edging**  
available in 30 cm and 25 cm heights

# Base detail 1: Heated cellar

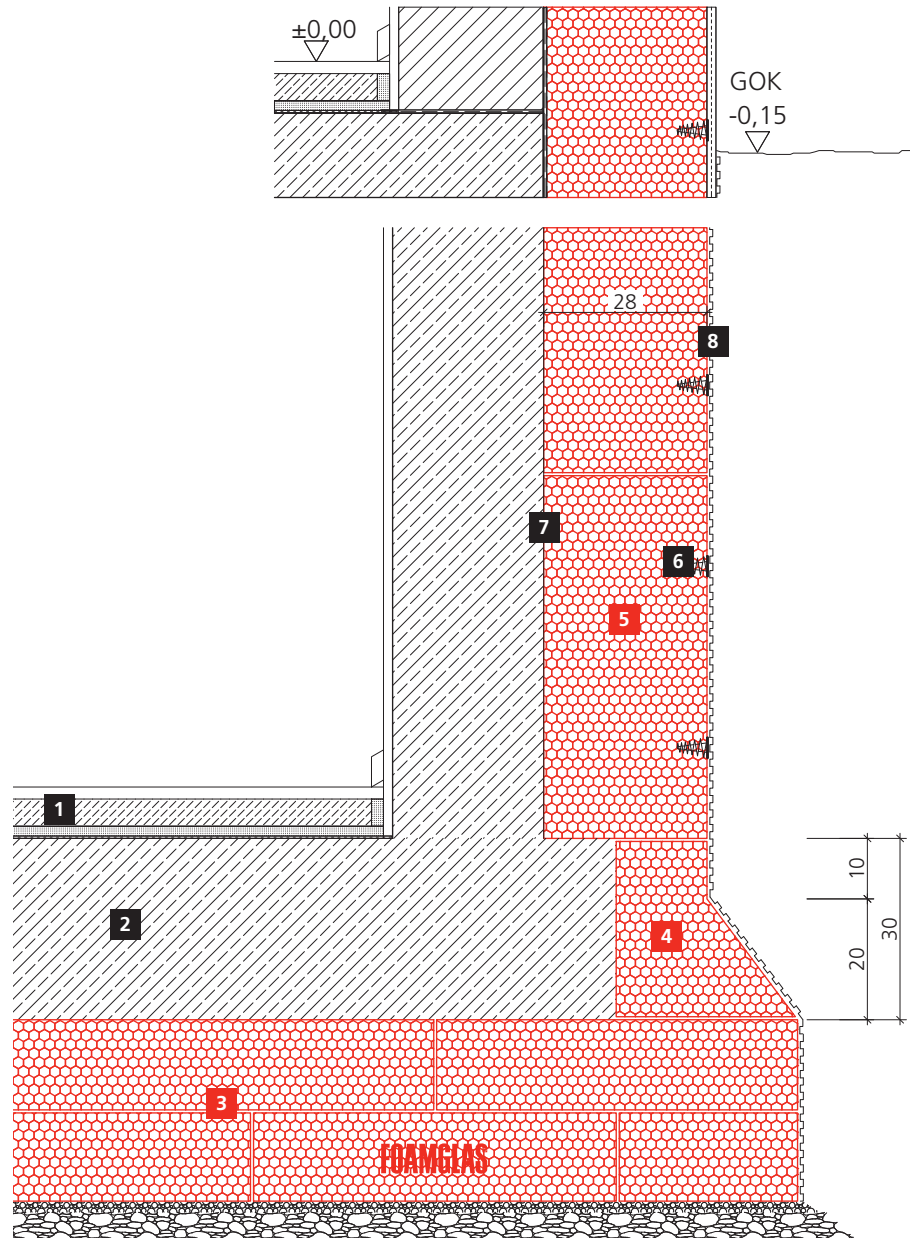
## Vapour-proof basis of FOAMGLAS® and PC® PERISAVE elements

### Floor from the inside outward

- 1 Floor inside
- 2 Base plate, waterproof concrete
- 3 **FOAMGLAS® plates**  
glued fully covering and overlapping in  
hot bitumen on stripped granular  
subbase or  
PE foil as separation and sliding layer on  
**FOAMGLAS® FLOOR BOARD**  
Joints glued, can be used on fine gravel/  
sand bedding/fresh concrete

### Structure wall

- 4 **PC® PERISAVE edging**  
glued with PC® 56 waterproof
- 5 **PC® PERISAVE base block**
- 6 cold bridge-free attachment parts
- 7 full surface gluing with PC® 56  
waterproof
- 8 Knobbed layer



Details are available for downloading from [www.foamglas.de/Passivhaus](http://www.foamglas.de/Passivhaus).

# Base detail 2: Near-surface Foundation

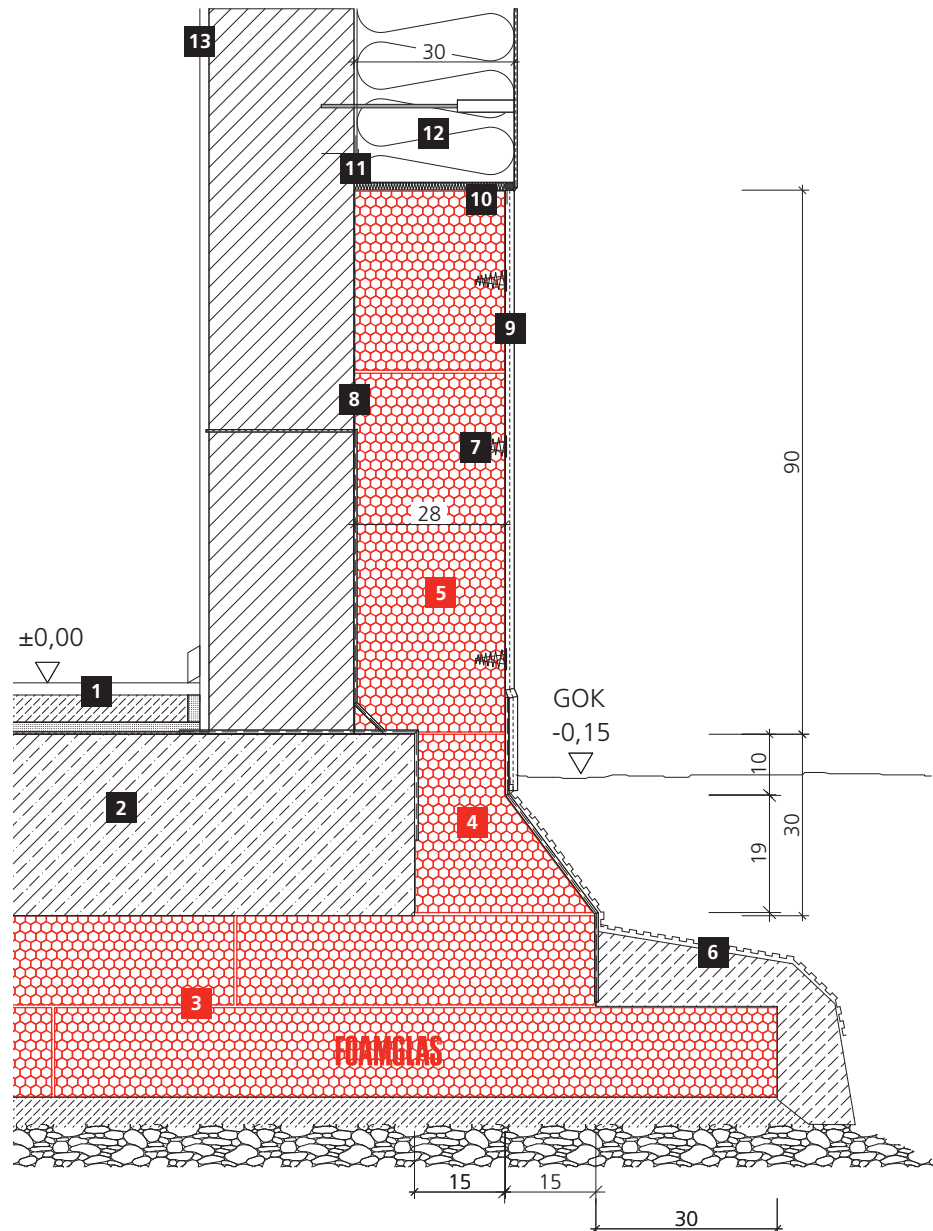
## Vapour-proof basis of FOAMGLAS® and PC®PERISAVE elements

### Floor from the inside outward

- 1 Floor inside
- 2 Base plate, waterproof concrete
- 3 **FOAMGLAS® plates**  
glued fully covering and overlapping in hot bitumen on stripped granular subbase or PE foil as separation and sliding layer on  
**FOAMGLAS® FLOOR BOARD**  
Joints glued, can be used on fine gravel/sand bedding/fresh concrete

### Structure wall

- 4 **PC®PERISAVE edging**  
glued with PC®56
- 5 **PC®PERISAVE base block**
- 6 protective layer from concrete C 8/10
- 7 cold bridge-free mounting parts
- 8 full surface gluing with PC®56
- 9 mineral base plaster with Armanet plaster base, galvanized
- 10 plaster layer
- 11 initial ETIC layer
- 12 ETIC
- 13 inner wall plaster



Frost protection  
according to  
location

Details are available for downloading from [www.foamglas.de/Passivhaus](http://www.foamglas.de/Passivhaus).

# Base detail 3: Strip foundation

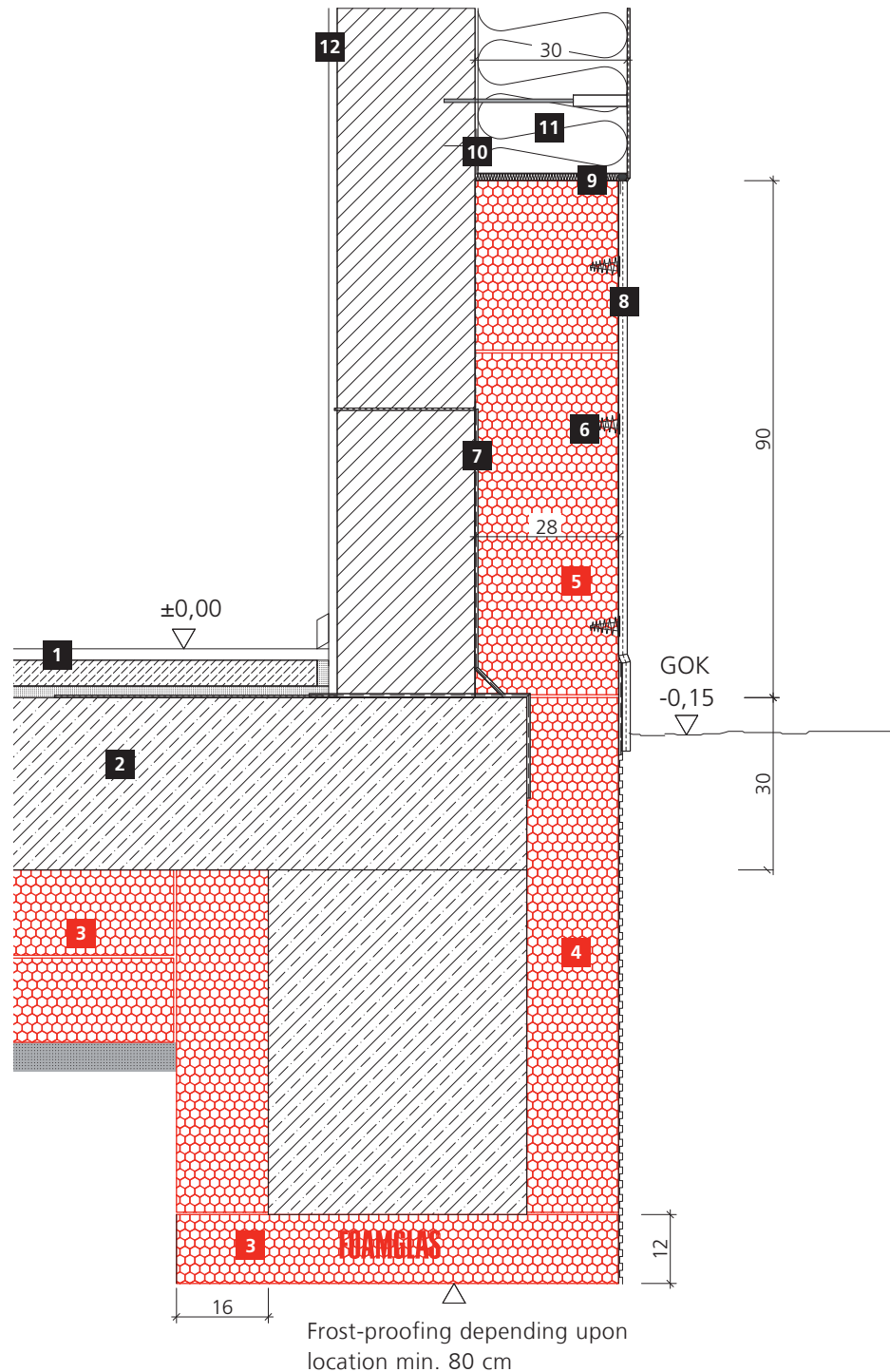
## Vapour-proof basis of FOAMGLAS® and PC®PERISAVE elements

### Floor from the inside outward

- 1 floor inside
- 2 base plate, waterproof concrete
- 3 **FOAMGLAS® plates**  
glued fully covering and overlapping in hot bitumen on stripped granular subbase or PE foil as separation and sliding layer on  
**FOAMGLAS® FLOOR BOARD**  
Joints glued, can be used on fine gravel/sand bedding/fresh concrete

### Structure wall

- 4 **FOAMGLAS® WALL BOARD**  
16–24 cm according to Passive House recommendation for insulation and lost formwork
- 5 **PC®PERISAVE base block**
- 6 cold bridge-free mounting parts
- 7 full surface gluing with PC® 56
- 8 mineral base plaster with Armanet plaster base, galvanized
- 9 plaster layer
- 10 initial ETIC border
- 11 ETIC
- 12 inner wall plaster



The connection is not cold bridge-free, however it is suitable for passive houses. The external surface cold bridge loss coefficient  $\psi_a = 0.072 \text{ W/(mK)}$  must be considered for the heat requirement. Details are available for downloading from [www.foamglas.de/Passivhaus](http://www.foamglas.de/Passivhaus).

# Base detail 4: Wooden post construction method

## Vapour-proof basis of FOAMGLAS® and PC® PERISAVE elements

### Floor from the inside outward

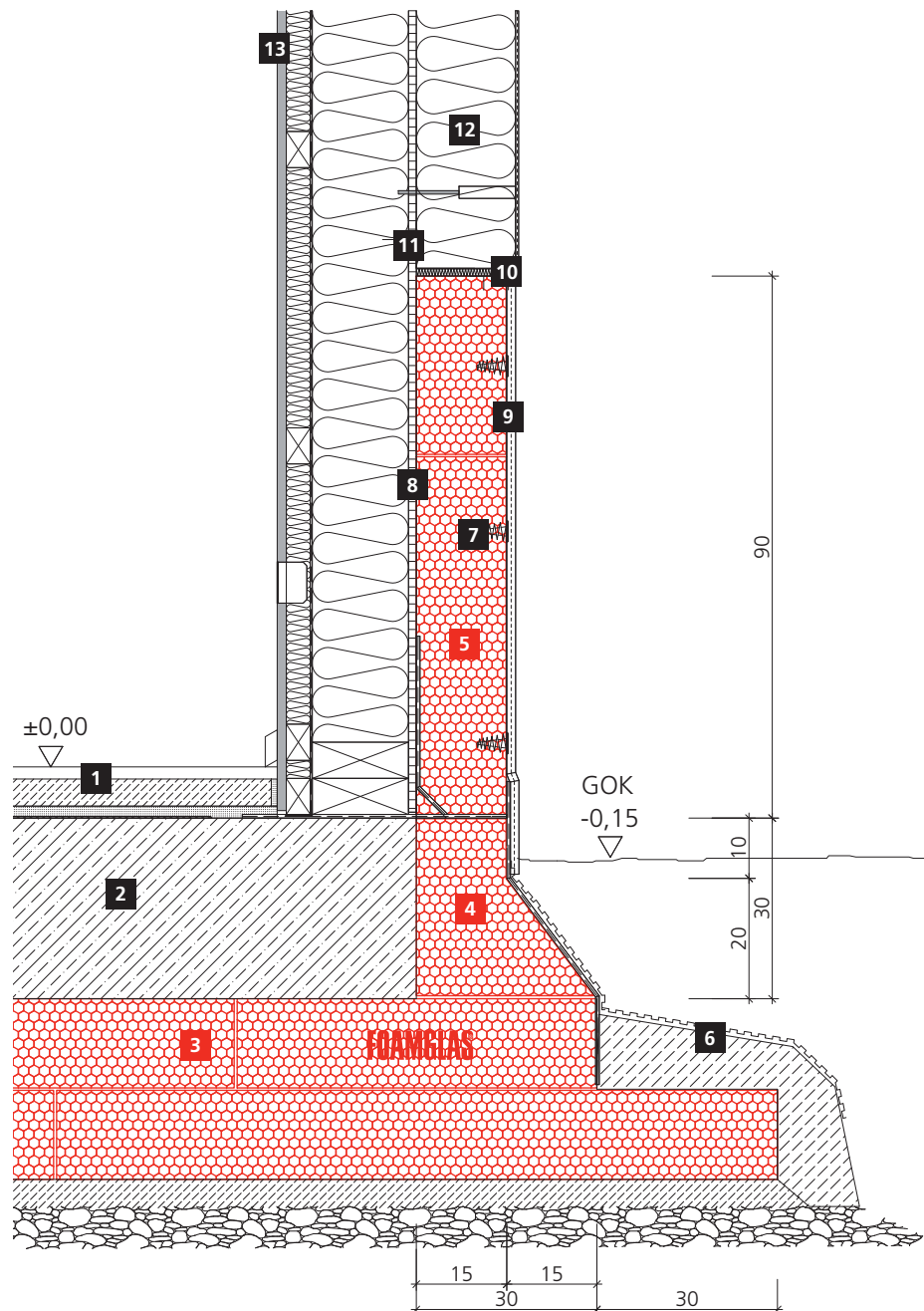
- 1 floor inside
- 2 base plate, waterproof concrete
- 3 **FOAMGLAS® plates**  
glued fully covering and overlapping in hot bitumen on stripped granular subbase or PE foil as separation and sliding layer on  
**FOAMGLAS® FLOOR BOARD**  
Joints glued, can be used on fine gravel/sand bedding/fresh concrete

### Base Structure

- 4 **PC® PERISAVE edging**  
glued with PC® 56
- 5 **PC® PERISAVE base block**
- 6 protective layer of concrete C 8/10
- 7 cold bridge-free mounting parts
- 8 full surface gluing with PC® 56
- 9 mineral base plaster with Armanet plaster base, galvanized
- 10 plaster layer
- 11 initial ETIC border
- 12 ETIC

### Wall construction from the inside outward

- 13 gypsum plasterboard  
Installation level  
Vapour barrier SD  
Wooden post  
OSB panel



Frost protection according to location

Details are available for downloading from [www.foamglas.de/Passivhaus](http://www.foamglas.de/Passivhaus).

# Base detail 5: Curtain wall

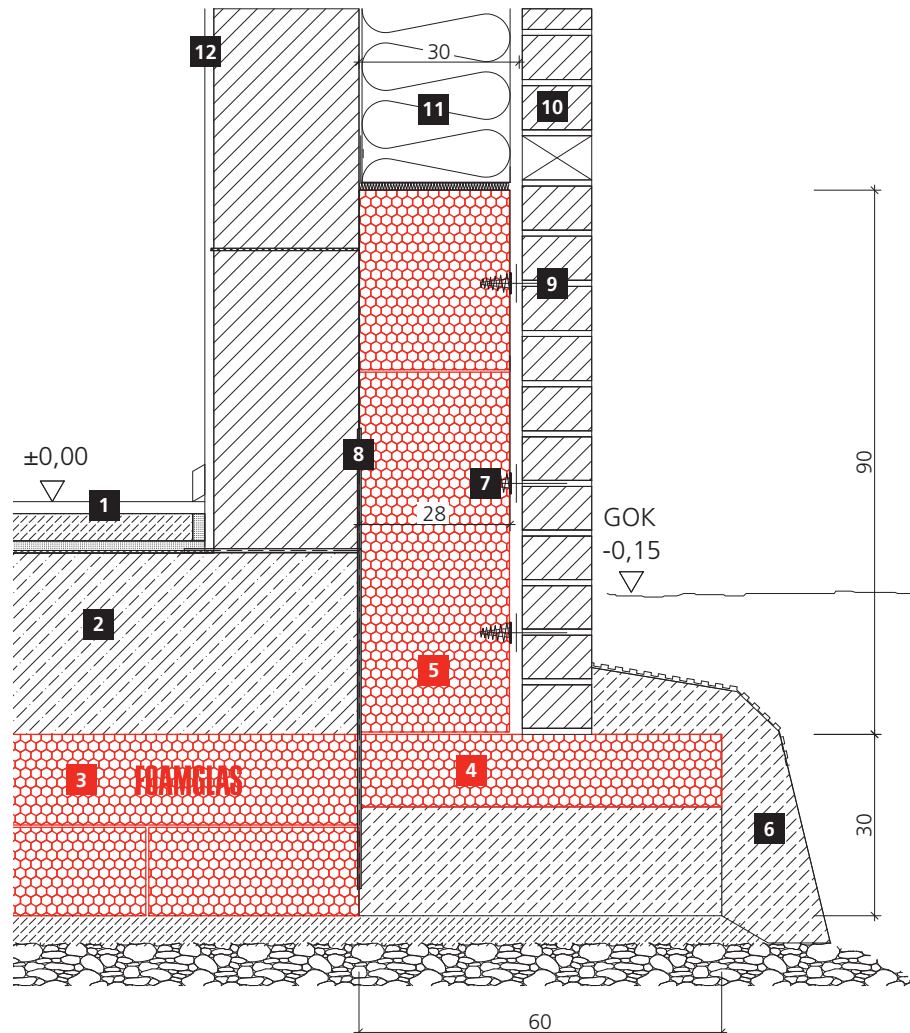
## Vapour-proof basis of FOAMGLAS® and PC®PERISAVE elements

### Floor from the inside outward

- 1 floor inside
- 2 base plate, waterproof concrete
- 3 **FOAMGLAS® plates**  
glued fully covering and overlapping in hot bitumen on stripped granular subbase or PE foil as separation and sliding layer on  
**FOAMGLAS® FLOOR BOARD**  
Joints glued, can be used on fine gravel/sand bedding/fresh concrete

### Structure wall

- 4 **FOAMGLAS® FLOOR BOARD**  
Type F, 120 mm
- 5 **PC®PERISAVE base block**
- 6 protective layer of concrete C 8/10
- 7 cold bridge-free mounting parts
- 8 full surface gluing with PC®56
- 9 wire nails V2A
- 10 curtain wall
- 11 core insulation
- 12 inner wall plaster



Frost protection  
according to  
location

Details are available for downloading from [www.foamglas.de/Passivhaus](http://www.foamglas.de/Passivhaus).

# Component suitable for Passive Houses

FOAMGLAS®  
PC PERISAFE avoids thermal bridges. This construction method for the building base is certified by Passive House Institute.

## Certificate

valid until Dec 31<sup>st</sup>, 2010

Passive House  
Institute  
Dr. Wolfgang Feist  
Rheinstraße 44/46  
D-64283 Darmstadt



Component suitable for Passive Houses: **Thermal-Bridge-Free Connection Detail**

Manufacturer: **Deutsche FOAMGLAS GmbH**

Name of product: **PC® PERISAVE SYSTEM**  
Foamglas Insulation for Passive Houses

The following criteria have been verified to award this certificate:

The criteria are valid for the cool temperate climate.

Regular heat transfer coefficient of the thermal envelope:

$$f * U_{opak} \leq 0.15 \text{ W/(m}^2\text{K)}$$

with f: temperature reduction factor

Avoidance of thermal bridges in Passive Houses:

$$\Psi_{\text{exterior}} \leq 0.01 \text{ W/(mK) for all standard connection details}$$

with  $\Psi_{\text{exterior}}$ : thermal bridge coefficient based on external dimensions

Temperatures of inner surfaces above 17°C (at  $\vartheta_e = -10^\circ\text{C}$  and  $\vartheta_i = 20^\circ\text{C}$ )

Airtightness of all standard components and all connection details

Certified construction details according to the certification documents:

The Passive-House-suitability of the "PC® PERISAVE SYSTEM – Foamglas Insulation for Passive Houses" was verified for the following connection details. All criteria to award the certificate have been fulfilled:

- Base detail 1: Heated basement
- Base detail 2.1: Slab on grade (Masonry wall)
- Base detail 2.2: Slab on grade (Concrete wall)
- Base detail 4: Timber frame construction
- Base detail 5: Cavity wall

The certificate is to be used as follows:



**Component Suitable for Passive Houses**  
Dr. Wolfgang Feist

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# FOAMGLAS® Building



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