



April 2012

## Section 5

Basements



# Basements

## Basement design

### Waterproofing

BS 8102: 2009 Code of practice for protection of structures against water from the ground, gives three categories of waterproofing for a basement:

#### Tanking

A continuous waterproof barrier is applied to the inside or outside of the basement structure.

#### Structurally integral protection

Usually water resistant concrete in combination with a waterproof membrane

#### Drained cavity

Cavities are formed within the walls and floor to collect and drain away water entering the basement.

### Heat loss

The pattern of heat loss from a basement wall is complex, with the rate of heat loss diminishing as the depth of the basement increases. This is due to the insulation value of the ground behind the basement wall.

A method for calculating U-values for basements is given in BS EN ISO: 13370.

### Position of insulation

Installing rigid insulation externally is the preferred method for insulating new basement walls.

### 1. Externally insulated

External insulation is the preferred option for basements as the whole structure is kept warm, with negligible risk of condensation. The insulation should be placed up against the waterproofing membrane. Polyfoam ECO Floorboard (extruded polystyrene) is recommended because it has negligible moisture absorption and high compression resistance.

A drainage membrane or layer of washed no fines gravel should be placed adjacent to the insulation. This relieves hydrostatic pressure and channels water to the foundation drain. The membrane or gravel should be covered with a geotextile to prevent fines from blocking the drainage material.

### 2. Internally insulated

Internal insulation of basement walls is only recommended for existing basements where it is not possible to insulate the basement externally. New basements should be insulated externally.

Any insulation system applied to the interior of the basement should have the following properties:

- It must allow the basement wall to dry out to the inside, for example by means of a cavity drainage system
- It must prevent warm moist air reaching the cold basement wall and condensing.

A vapour control layer (vcl) should always be installed on the warm side of the insulation to prevent water vapour from the basement rooms condensing on the cold cavity drainage system.

All joints, tears, overlaps and perforations in the vcl should be well sealed with an aluminised tape.

Materials in contact with the basement wall and floor must be moisture tolerant, like Polyfoam ECO Floorboard, a closed cell extruded polystyrene board that is unaffected by moisture.

The detail opposite shows a solution for an existing basement with solid brick walls, there is a drained cavity system directly behind the wall which drains to a sump.

### Other considerations

The land around the building should slope away from the basement walls. Ideally the area adjacent to the building should have an impermeable finish, such as concrete paving.

For new basements, a drain should be located around the perimeter of the basement and positioned at least 200mm below the finished level of the basement floor. It should be bedded and surrounded in free draining aggregate and wrapped in a geotextile before backfilling, to prevent fines from blocking the drain.

#### Key

 Thermal insulation achievable by constructions within this document.

 Find online. Visit [knaufinsulation.co.uk](http://knaufinsulation.co.uk) and key in construction code to find the most up to date information on your chosen solution.

#### Knauf Insulation solution

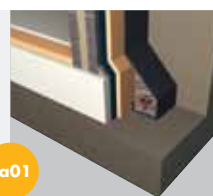
#### U-values

0.36 0.35 0.34 0.33 0.32 0.31 0.30 0.29 0.28 0.27 0.26 0.25 0.24 0.23 0.22 0.21 0.20 0.19 0.18 0.17

**Wall insulated externally**  
Product: Polyfoam ECO Floorboard Standard or Extra

See page: 260

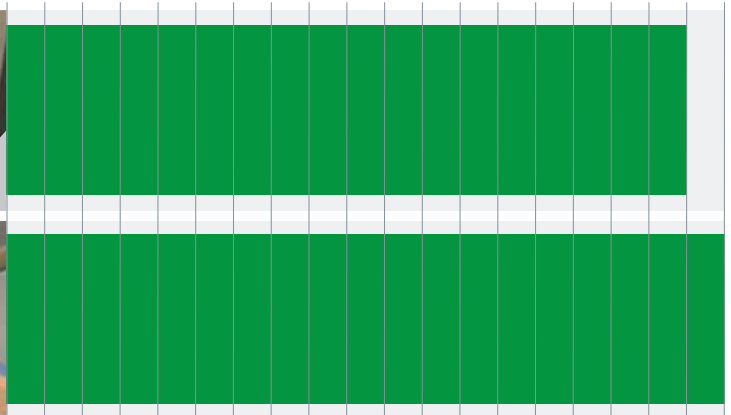
**Ba01**



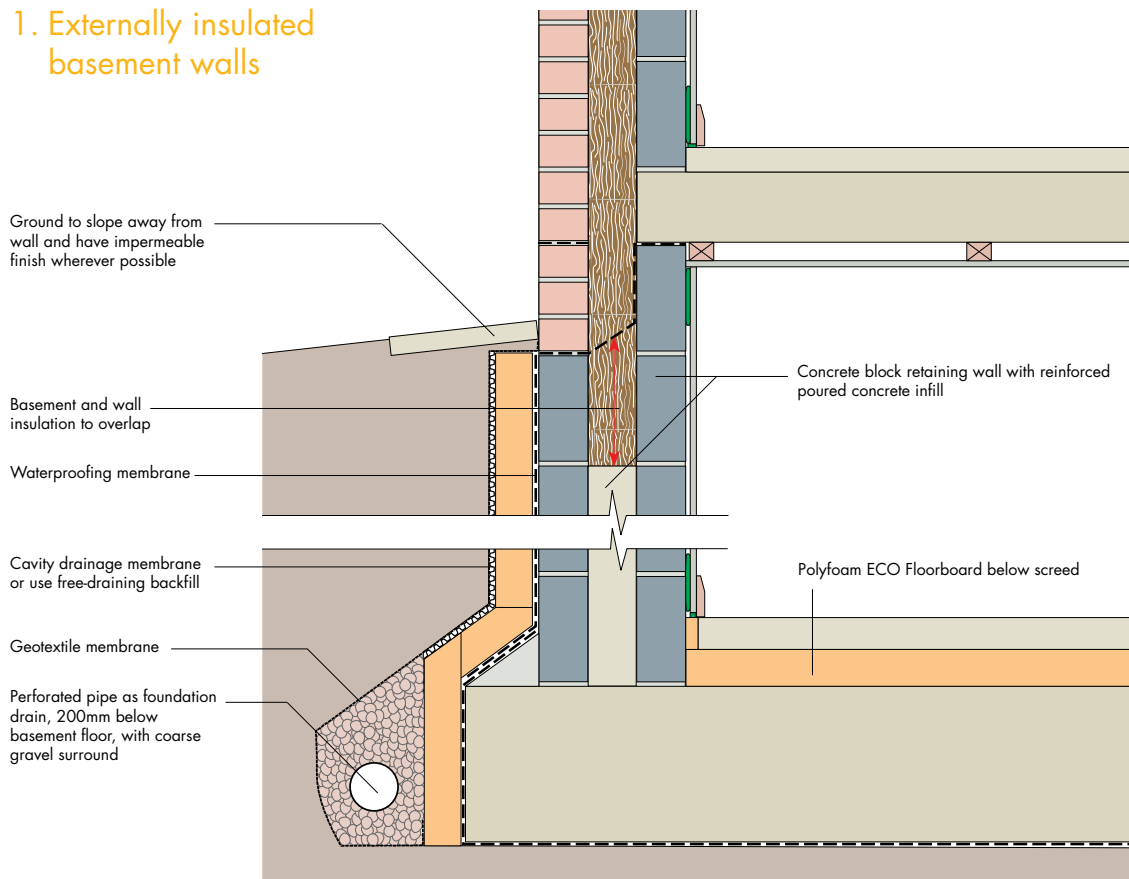
**Wall insulated internally**  
Product: Polyfoam ECO Floorboard Standard or Extra

See page: 262

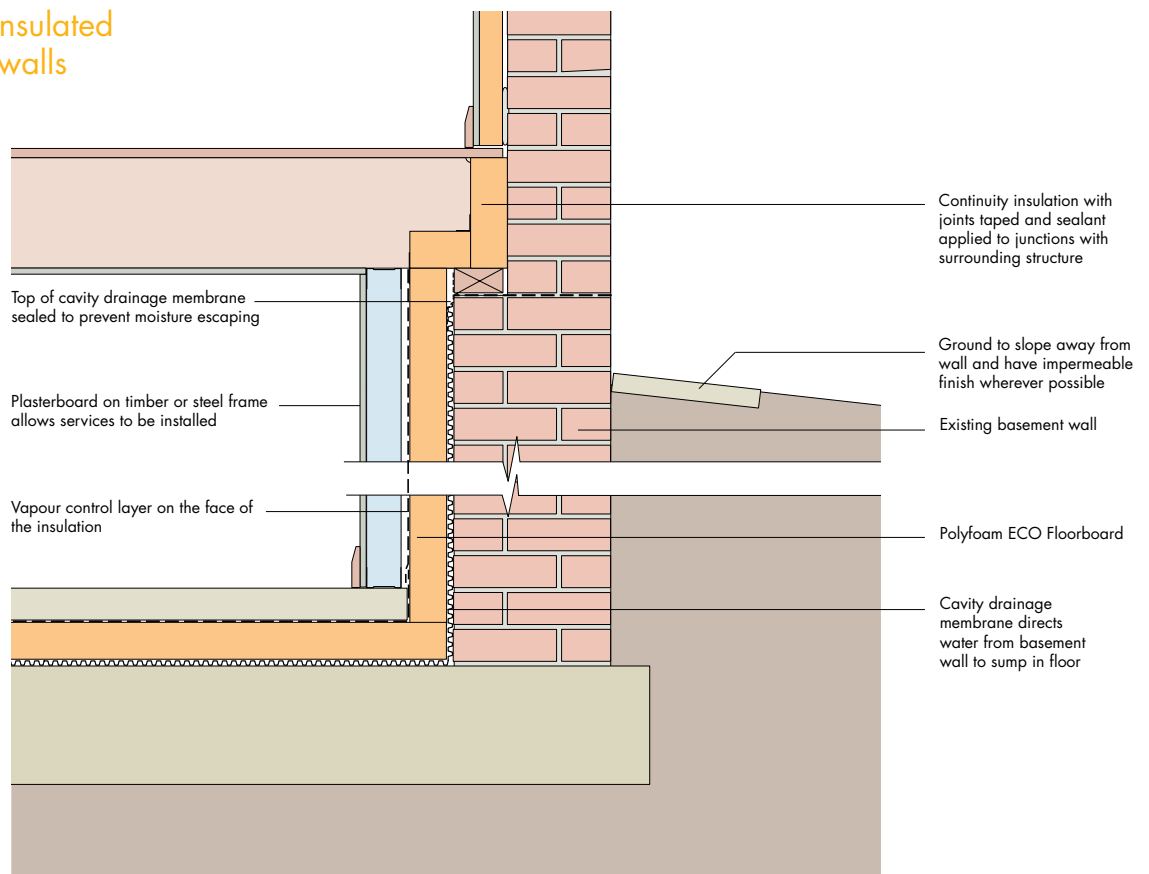
**Ba02**



### 1. Externally insulated basement walls



### 2. Internally insulated basement walls



# Basements

Wall insulated externally

## Polyfoam ECO Floorboard

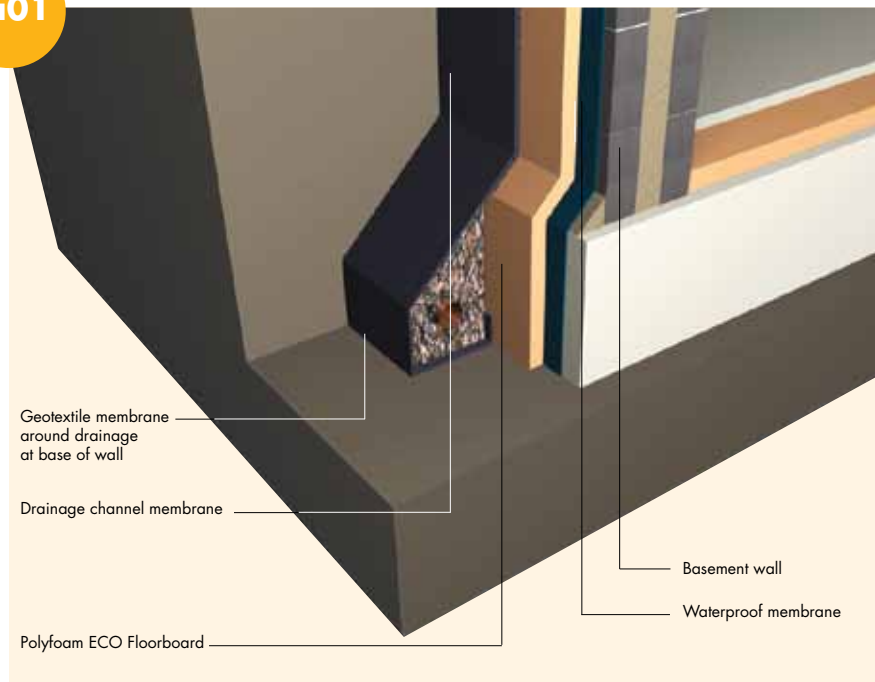


Ba01

- Moisture resistant - long term exposure to water has a negligible impact on thermal performance
- Robust product, protects the waterproofing layer from damage
- High compressive strength, withstands the pressure exerted by the backfill

### Polyfoam ECO Floorboard

- Zero Ozone Depletion Potential (ODP)
- Global Warming Potential (GWP) <5



### Products

**Polyfoam ECO Floorboards** are rigid extruded polystyrene boards, they are lightweight, yet have excellent structural strength and long term effectiveness.

Polyfoam ECO Floorboard Standard and Extra are suitable for the external insulation of basement walls.

### Typical construction

Masonry or in-situ concrete basement walls (up to 2.5m deep) insulated with Polyfoam ECO Floorboard Standard placed against the tanking membrane.

For basements between 2.5m and 5m deep, Polyfoam ECO Floorboard Extra is recommended for its greater compressive strength. The basement wall insulation is protected by a drainage cavity membrane which also reduces hydrostatic pressure and directs water to the foundation drain.

### Installation

Polyfoam ECO Floorboards are placed against the tanking membrane and protected by a drainage cavity membrane. Carefully backfill with free-draining granular material to hold the drainage cavity membrane and insulation in place.

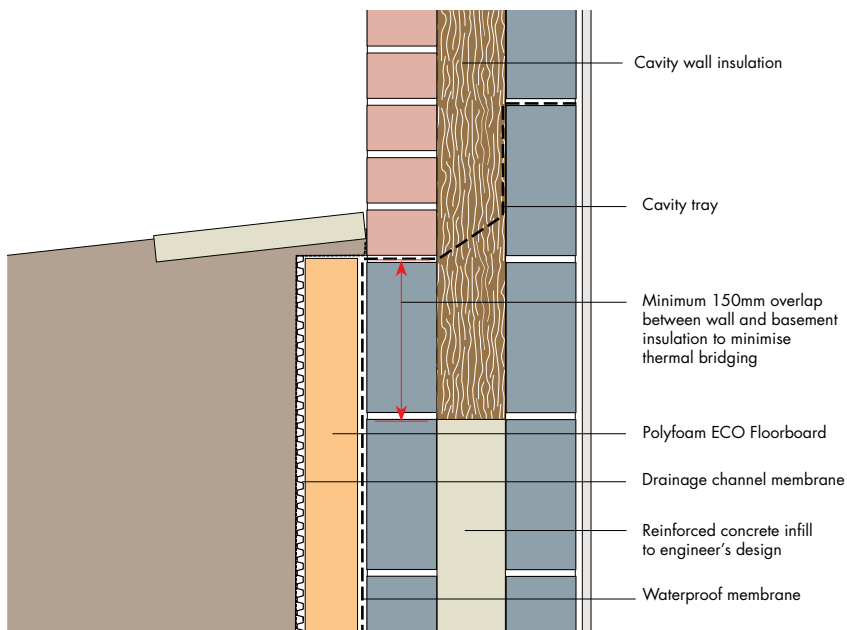
Where Polyfoam ECO Floorboards project above the ground they should be covered by a reflective or light coloured flashing board, or similar, to prevent long term exposure of the insulation to Ultra Violet (UV) light.

### Performance

#### Thermal insulation

Polyfoam ECO Floorboards have a thermal conductivity value of 0.033 or 0.035 W/mK, determined by thickness and product grade.

## Junction of basement and external wall



### Typical specification

Install Polyfoam ECO Floorboard Standard\*/ Extra\*, .....mm thick, against the tanking membrane. Cover with a drainage cavity membrane, manufactured by ..... and carefully backfill to hold the insulation in place.

(\*delete as appropriate)



Alternatively, consult the National Building Specifications, Standard version clause/ clauses...M21/210.....

Knauf Insulation specification clauses can be downloaded from [knaufinsulation.co.uk/nbs](http://knaufinsulation.co.uk/nbs)

### Compression resistance

Polyfoam ECO Floorboards are highly resistant to compression and are capable of withstanding both occasional and long term high static loads. Load bearing construction elements should be designed to adequately support the combination of imposed and dead loads without creating excessive deflection.

### Moisture resistance

Polyfoam ECO Floorboards have negligible water absorption and are unaffected by standing in ground water.

### Fire performance

In the construction detailed above, Polyfoam ECO Floorboards are completely enclosed by other materials and will not contribute to the development stages of a fire or present a smoke or toxic hazard.

Table 1 - Typical U-values for basement walls insulated externally

Thickness (mm)	U-values (W/m <sup>2</sup> K) for basement depth (m) of:			
	2.0	2.5	3.0	3.5
<b>Polyfoam ECO Floorboard Standard</b>				
100	0.19	0.18	n/a	n/a
75	0.25	0.23	n/a	n/a
65	0.27	0.25	n/a	n/a
50	0.30	0.28	n/a	n/a
35	0.36	0.33	n/a	n/a
<b>Polyfoam ECO Floorboard Extra</b>				
75	n/a	n/a	0.22	0.20
65	n/a	n/a	0.23	0.22
50	n/a	n/a	0.26	0.25
35	n/a	n/a	0.31	0.29
25	n/a	n/a	0.35	0.32



Notes: The calculations assume that the basement floor has a U-value of 0.25 W/m<sup>2</sup>K.

CERTIFICATE CS1001-2  
U-Value Competency Scheme

# Basements

Wall insulated internally

## Polyfoam ECO Floorboard



Polyfoam Floorboard

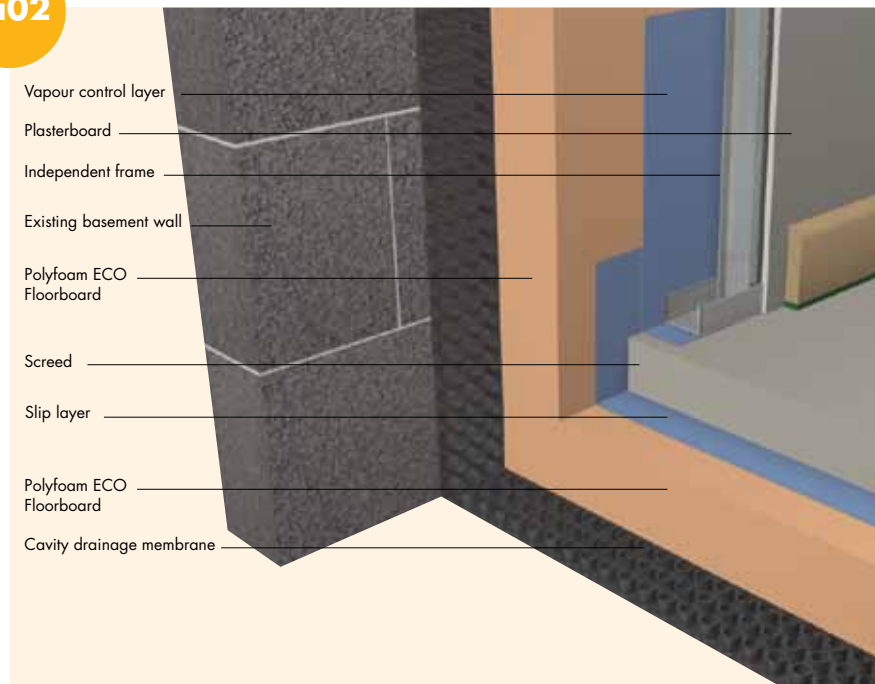


**Ba02**

- Versatile product, can be used to insulate both walls and floors
- High compressive strength accommodates the loads associated with the fit out of the basement
- Robust and lightweight, making it easy to cut and handle on site

### Polyfoam ECO Floorboard Standard

- BBA certified (floors)
- Zero Ozone Depletion Potential (ODP)
- Global Warming Potential (GWP) <5



### Products

**Polyfoam ECO Floorboard Standard** is a rigid extruded polystyrene board, it is lightweight, yet has excellent structural strength and long term effectiveness.

Polyfoam ECO Floorboard Standard is suitable for the internal insulation of basement walls.

### Typical Construction

Existing solid masonry basement wall with new cavity drainage membrane, Polyfoam ECO Floorboard Standard insulation and Knauf I stud independent lining.

This system is most suitable for existing basement walls. The cavity drainage membrane collects any water that passes through the basement wall and drains it to a sump, from where it is pumped to a drain. The internal lining allows services to be accommodated.

### Installation

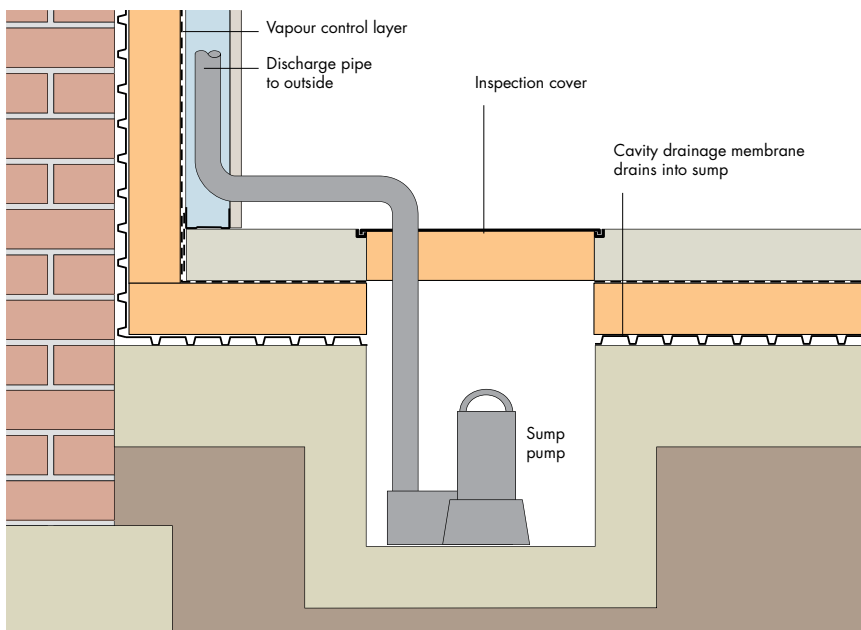
Polyfoam ECO Floorboard Standard is fixed to the cavity drainage membrane using a non-solvent based adhesive such as plaster adhesive. Ensure the floor and wall insulation are in intimate contact with each other and all joints fully closed.

Install a vapour control layer on the warm side of the insulation. The vapour control layer should be free from holes and any gaps should be made good with tears repaired and overlaps sealed with aluminised tape.

The wall vapour control layer should be sealed to the slip layer placed below the screed.

After the floor slab or screed has been laid, construct the Knauf I stud lining and line the steel studwork with plasterboard.

## Sump in basement floor



### Typical specification

Polyfoam ECO Floorboard Standard .....mm thick, to be fixed directly against the drainage cavity membrane, with dabs of plaster adhesive. Tape all joints with an aluminium faced self-adhesive tape. Seal the junction between the Polyfoam ECO Floorboard Standard and the surrounding construction with a water resistant, solvent free silicone sealant.

**nbsPlus**

Alternatively, consult the National Building Specifications, Standard version clause/clauses...M10/40 or M10/290.....

Knauf Insulation specification clauses can be downloaded from [knaufinsulation.co.uk/nbs](http://knaufinsulation.co.uk/nbs)

### Performance

#### Thermal performance

Polyfoam ECO Floorboard Standard has a thermal conductivity value of 0.033 or 0.035 W/mK.

#### Compression resistance

Polyfoam ECO Floorboard Standard is highly resistant to compression and withstands both occasional and long term static loads. Load bearing construction elements should be designed to adequately support the combination of imposed and dead loads without creating excessive deflection.

#### Moisture resistance

Polyfoam ECO Floorboard Standard has negligible water absorption and is unaffected by standing in ground water.

#### Fire performance

In the construction shown above, Polyfoam ECO Floorboard Standard is completely enclosed by other materials and will not contribute to the development stages of a fire or present a smoke or toxic hazard.

Table 2 - Typical U-values for basement walls insulated internally

Thickness (mm)	U-values (W/m <sup>2</sup> K) for basement depth (m) of:			
	2.0	2.5	3.0	3.5
<b>Polyfoam ECO Floorboard Standard</b>				
100	0.20	0.18	0.17	0.17
75	0.25	0.23	0.22	0.20
65	0.27	0.25	0.24	0.22
50	0.31	0.28	0.26	0.25
35	0.36	0.33	0.31	0.29



Notes: The calculations assume that the basement floor has a U-value of 0.25 W/m<sup>2</sup>K.

Table 3 - Compressive creep results for Polyfoam Floorboards

Product	Load applied (kPa)	Initial compression (%)	Further compression after 50 years (%)
Polyfoam ECO Floorboard Standard	60	2	1.5

# KNAUF INSULATION

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