Section 4.2

Exposed Soffit Floors

Below concrete soffit

Product: Earthwool Soffit Linerboard Standard

Es01

Above concrete floor

Product: Polyfoam ECO Floorboard

Es02

Between timber joists

Products: Earthwool Loft Roll or Earthwool Flexible Slab

Es03 /04

Exposed soffit

Exposed soffit design

Many clients perceive that rooms above exposed upper floors will be cold. However, it is possible to achieve very high levels of thermal insulation in exposed upper floors. The designer has a choice of where to position the insulation: for concrete floors, either above or below the floor, or for timber joist floors, between the joists.

If insulating below the structural floor, the insulation can be laminated to a variety of materials thus the floor can be insulated and finished in one process.

Insulating above the structural floor reduces the thermal mass of the floor allowing for fast warm up. However, if only part of the floor on that storey is exposed it may cause problems with steps between finished floor levels.

When insulating between timber joists, the whole depth of the joist can be utilised as an insulation zone. If mineral wool insulation is installed between the joists, a very high insulation value can be achieved without increasing the depth of the floor construction or adding significant weight to the structure.

Shelter factors

Where an exposed floor is over an enclosed but unheated space, such as an integral garage in a dwelling, the shelter factor of the garage improves the U-value of the exposed floor. BRE publication BR 443 Conventions for U-value calculations, sets out the shelter factors to be applied to separating floors in these locations.

There are specific additional requirements that need to be taken into consideration when calculating the U-values for elements that are adjacent to unheated spaces. The U-value of an exposed floor (soffit) which separates a heated area from an unheated area, can be calculated by including an additional amount of thermal resistance (R_U) due to the sheltering effect of the unheated area.

Standard default values of R_U can be taken from BR 443 (Conventions for U-value calculations) or SAP 2009. For situations not covered by default values, or where additional guidance is required contact our Technical Advice and Support Centre on 01744 766666.

Concrete upper floors

Insulation can be positioned above or below the concrete floor. When above the floor, the insulation is usually located below a floating screed or chipboard deck. If only part of a concrete slab is insulated, careful detailing may be needed to avoid steps in the floor level.

Insulation located below the floor should be covered, usually with plasterboard or other fire resistant boards.

Suspended timber upper floors

In timber joist floors, the insulation is usually located between the joists. A vapour control layer is not usually included because of the risk of trapping water spillages within the floor construction.

Care is needed to minimise air leakage. The floor perimeter should be sealed by applying expanded foam tape under the skirting and a continuous bead of sealant to the back of the skirting prior to fixing. The perimeter of the ceiling should also be sealed with a flexible sealant. Gluing the joints between the floor deck boards can also reduce air leakage through the floor.

Heated floors

When the floor is to be heated by hot water pipes or electrical cables then the position of the insulation will be determined by whether the floor slab or the screed is to be heated.

If the screed only is to be heated then the insulation is laid between the structural slab and the screed. The insulation should be overlaid with a vapour control layer/building paper which acts as a slip layer and prevents wet concrete screed penetrating between the boards. Alternatively, pre-channelled insulation boards can be used.

Compressive strength

All materials are compressed under load. Insulation materials used below screeds and floating chipboard decks should be capable of accommodating the applied loads with the minimum of compression. The applied load has two components:

- The dead load, which is due to the weight of the materials laid on the insulant, and
- The design load

The guidance in BS EN 1990 : 2002+A1: 2005 and BS EN 1991 -1 - 1 : 2002 should be followed when determing the relevant loading factors for floors. However, in a sector where future use is potentially unknown and point loads can be large, the structural engineer is often required to assess the service needs of the floor on a project by project basis.

Weather resistance

The soffits of exposed floors may need to be finished with a weather resistant finish. Although not exposed to direct driving rain, wind turbulence can result in wind-driven drain being blown up onto soffits. Another consideration is that soffits, being sheltered from the washing effect of wind driven rain, tend to collect dirt and grime over time.

Fire resistance

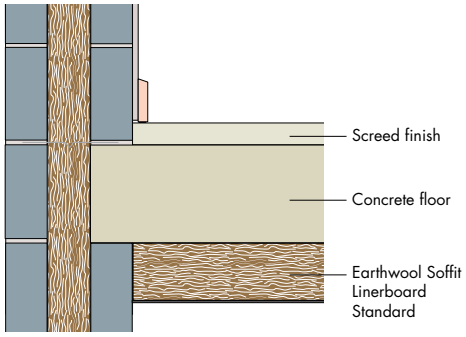
The fire resistance of the exposed floor should comply with Building Regulation requirements. This will be between 30 and 120 minutes, depending on the purpose group of the building and its height above ground.

British Standards

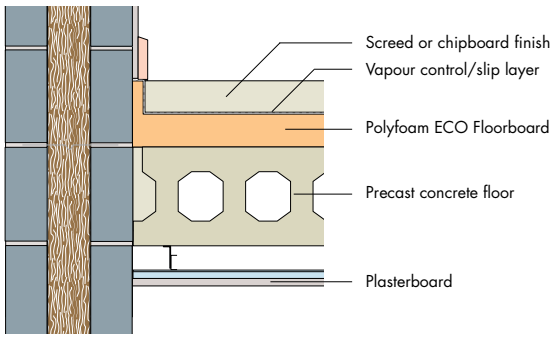
Designers should consult BS EN 312 : 2010 and BS EN 300 : 2006 when selecting floor decking boards.

Positions for floor insulation

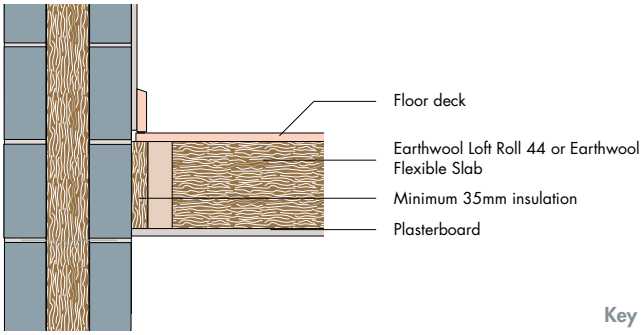
1. Insulation below concrete floor



2. Insulation above pre-cast concrete slab



3. Insulation between joists

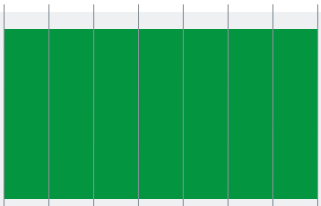
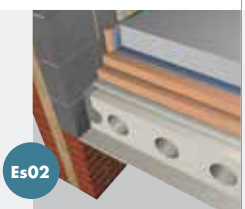
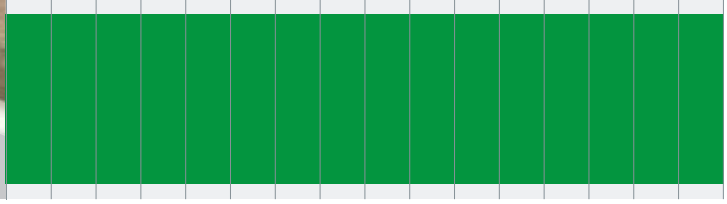


Solution optimiser and pathfinder

Key

Thermal insulation achievable by constructions within this document.

Pb01 Find online. Visit 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	0.29 0.28 0.27 0.26 0.25 0.24 0.23 0.22 0.21 0.20 0.19 0.18 0.17 0.16 0.15 0.14 0.13
Below concrete soffit **Product:** Earthwool Soffit Linerboard Standard See page: 224	 Es01	
Above concrete floor **Products:** Polyfoam ECO Floorboard See page: 226	 Es02	
Between timber joists **Product:** Earthwool Loft Roll or Earthwool Flexible Slab See page: 228	 Es03 Es04	

Exposed soffit

Below concrete soffit

Earthwool Soffit Linerboard Standard

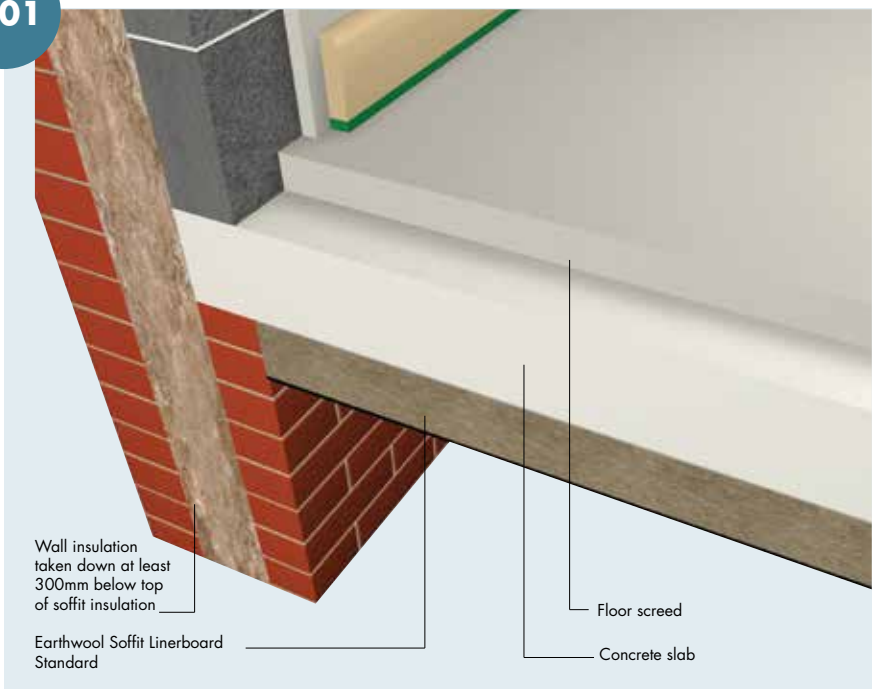
NEW BUILD REFURB

Es01

- Installed without the need to access areas above the floor
- Provides a solution to upgrade thermal performance of existing floors without reducing floor height

Earthwool Soffit Linerboard Standard

- Non-combustible with a Euroclass A1 reaction to fire rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)



Products

Earthwool Soffit Linerboard Standard is a non-combustible rock mineral wool slab with a black tissue facing.

Typical construction

A concrete upper floor slab or beam and block floor insulated on the underside with Earthwool Soffit Linerboard Standard. The linerboard can either be screw fixed directly to the slab, or to timber battens either fixed directly to the soffit or nailed to ceiling clips held within the joints of prestressed concrete units.

Installation

Fixing directly to soffit

Ensure the structure is stable and suitable to support the extra load of the lining boards. If in doubt, seek specialist advice.

Earthwool Soffit Linerboard Standard is screwed to the structure using suitable fixings, set in at least 50mm from any board edge. All boards to be butt jointed.

There are a wide range of fixings available from suppliers such as Hilti, Ejot and Fischer. Typically 4 fixings per board are required for Earthwool Soffit Linerboard Standard. However, due to variations in the specification of concrete, Knauf Insulation advise you to seek specialist advice from the fixing manufacturer.

Where board edges are exposed, ensure insulation is covered with either a cement board or a suitable flashing.

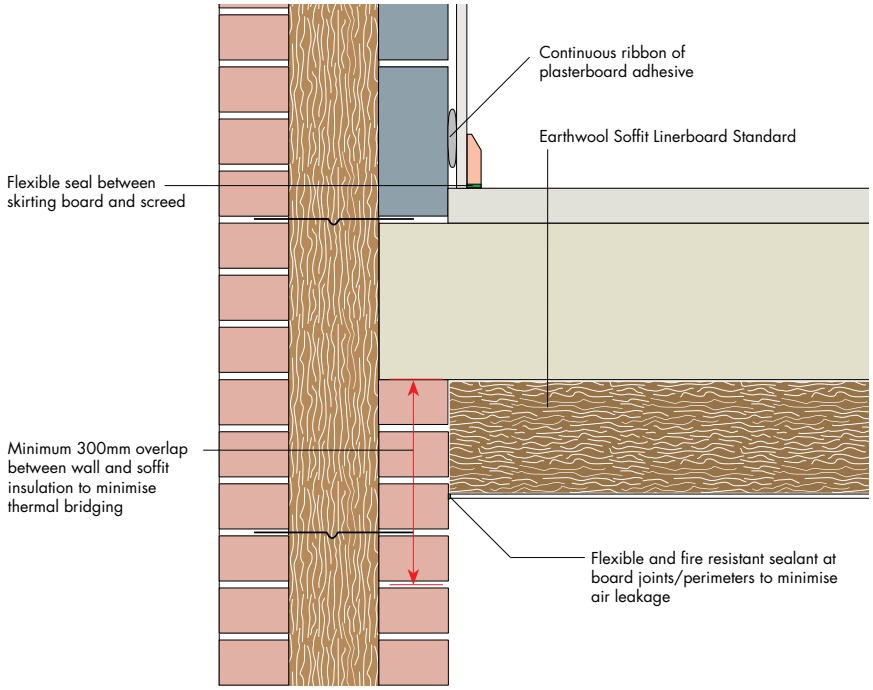
Use a flexible and fire resistant sealant to seal any imperfection of fit at junctions between boards and walls.

Fixing to timber battens

Fix treated timber battens at maximum 400mm centres using fixings suitable for the substrate. When fixing battens below prestressed concrete units (whether planks or beams), always consult specialist fixing manufacturers for further advice.

Earthwool Soffit Linerboard Standard is screwed to the timber battens at maximum 400mm centres along the length of the battens, fixing to each timber batten, using suitable fixings (set in at least 50mm from any board edge) that penetrate more than 40mm beyond the back of the Earthwool Soffit Linerboard Standard. All boards to be butt jointed.

Typical wall/floor junction Earthwool Soffit Linerboard Standard



Typical specification

Earthwool Soffit Linerboard Standard thickness.....mm to be screwed to the structural soffit using ..... fixings manufactured by ..... Fixings to be set in at least 50mm from any board edge. Boards to be butt jointed.

(* delete as appropriate)

NBSPlus Alternatively, consult the National Building Specifications, Standard version clause/clauses... P10/185.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Performance

Thermal performance

Earthwool Soffit Linerboard Standard has a thermal conductivity of 0.037 W/mK.

Fire performance

Earthwool Soffit Linerboard Standard is faced with a black, glass tissue facing and is Class 1 surface spread of flame to BS 476: Part 7: 1987.

Earthwool rock mineral wool is classified as Euroclass A1 to BS EN 13501-1.

Table 16 - Weight of Earthwool Soffit Linerboard Standard

Product	Thickness (mm)	Weight kg/m²
Earthwool Soffit Linerboard Standard	165	9.5
Earthwool Soffit Linerboard Standard	130	7.5

Table 17 - Typical U-values of upper concrete floor with 50mm screed finish

	U-values (W/m²K)						
Thickness (mm)	Beam and block floor thermal conductivity					Precast plank 150mm	Cast concrete 200mm
Es01	1.13	0.51	0.34	0.16	0.11	1.30	2.30
Earthwool Soffit Linerboard Standard							
165	0.21	0.21	0.20	0.20	0.19	0.21	0.21
130	0.26	0.26	0.25	0.24	0.23	0.26	0.26

BBA CERTIFICATE CS/1001-2 U Value Competency Scheme

Note: There are specific additional requirements that need to be taken into to consideration when calculating the U-values for elements that are adjacent to unheated spaces. The U-value of an exposed floor (soffit) which separates a heated area from an unheated area can be calculated by including an additional amount of thermal resistance (R_u) due to the sheltering effect of the unheated area. Standard default values of R_u can be taken from BR 443 (Conventions for U-value calculations) or SAP 2009. For situations not covered by default values, or where additional guidance is required contact our Technical Advice and Support Centre on 01744 766666.

Exposed soffit

Above concrete soffit

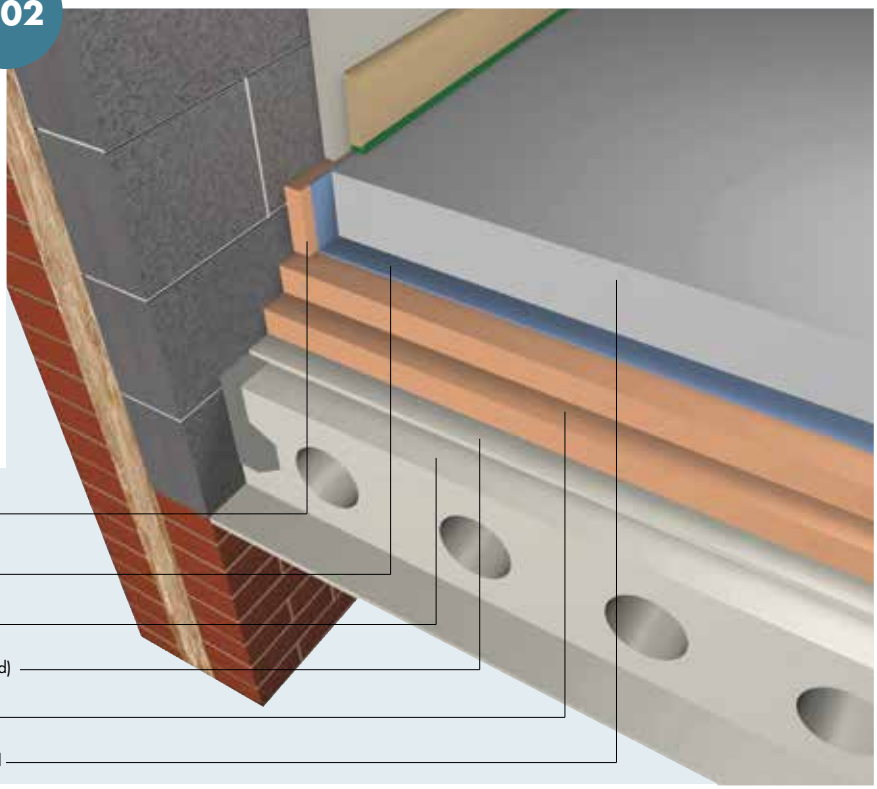
Polyfoam ECO Floorboard

Polyfoam ECO Floorboard

Es02

- Robust and can tolerate traffic from following trades without damage prior to floor finish being laid
- Can support machinery required for pumped screeding applications

Polyfoam ECO Floorboard
- BBA certified
- Zero Ozone Depletion Potential (ODP)
- Global Warming Potential (GWP) <5



Products

Polyfoam ECO Floorboard is a range of rigid extruded polystyrene insulation boards.

They are lightweight, have excellent structural strength and long term effectiveness and are available in two grades suitable for this application:

Polyfoam ECO Floorboard Standard – domestic and light commercial loading

Polyfoam ECO Floorboard Extra – commercial, industrial flooring and cold storage.

Typical construction

A suspended precast concrete floor overlaid with Polyfoam ECO Floorboard and finished with either flooring grade chipboard or a floating screed of either sand/cement or a proprietary liquid screed.

A vapour control layer should be placed between the insulation and the screed.

This method of insulating an upper floor is suitable for all types of concrete floor, including, beam and block, cast in-situ and concrete cast on metal profile shuttering.

Installation

The surface of any floor should be smooth and flat to within 5mm when measured with a 2 metre straight-edge. Provided the surface is smooth and flat, the insulation may be laid directly onto the flooring system. Otherwise, lay a thin levelling screed prior to laying the insulation. Irregularities greater than those detailed above must be removed.

Where a precast floor has a camber or uneven upper surface a levelling screed is recommended.

Screeded finish

Place a minimum 25mm thick vertical piece of Polyfoam ECO Floorboard to the full depth of the screed around the perimeter of each room to minimise thermal bridging. Ensure these perimeter insulation boards are securely held in place to prevent dislodgement by following trades.

Lay the vapour control layer over the insulation and turn up at the junction with the walls.

Lay a 65/75mm sand/cement or a proprietary screed minimum 35mm thick. If a sand/cement screed is used, it is important to ensure it is well compacted in order to produce a durable floor surface.

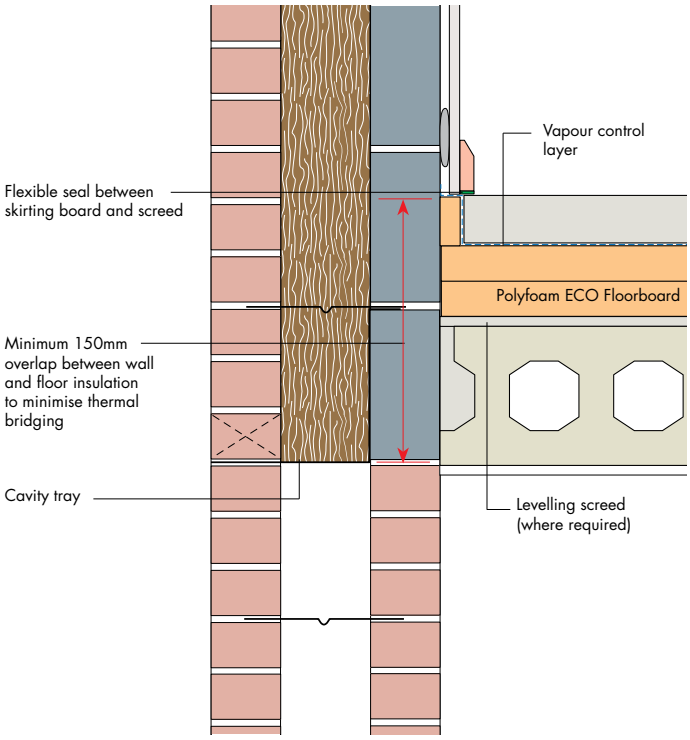
Chipboard finish

The insulation should be laid with staggered, tightly butted joints over the whole of the floor area.

Lay the chipboard in a staggered pattern with all joints glued using a waterproof PVA adhesive. Leave an expansion gap of at least 10mm or 2mm per metre run of floor at the room perimeter. At doorways or access traps to pipework runs, support the cut edges of chipboard on preservative treated battens. No battens are required in the main area of the floor.

This solution is also suitable for use with underfloor heating – see pages 220 - 221.

Typical wall/floor junction



Typical specification

Insulation below screed

Polyfoam ECO Floorboard Standard*/Extra* .....mm thick, to be laid over the whole area of the concrete floor, all boards to be butted together. Polyfoam ECO Floorboard Standard*/Extra* minimum 25mm thick, to be cut and placed to full depth of screed at the floor perimeter.

The insulation to be overlaid with 1000 gauge polythene, taken up and over the perimeter insulation. A 65*/75*mm thick sand/cement screed with wire mesh*/ polypropylene reinforcing fibres* to be laid on top. Floor finish as specified by the designer. Alternatively install a proprietary liquid screed (minimum thickness 35mm) laid in accordance with manufacturers instructions.

(* delete as appropriate)

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

NBSPlus

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Insulation below chipboard

Polyfoam ECO Floorboard Standard*/Extra* .....mm thick, to be laid over the whole area of the concrete floor, all boards to be butted together.

The insulation to be (overlaid with a vapour control layer of 1000 gauge polythene and)* covered with 18mm t and g flooring grade chipboard.

(*delete as required)

NBSPlus

Alternatively, consult the National Building Specifications, Standard version clause/clauses...K11/25 or K11/225.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Performance

Thermal performance

The thermal conductivity of Polyfoam ECO Floorboard Standard and Extra is 0.033 W/mK.

Fire performance

When Polyfoam ECO Floorboard is installed in a floor construction it will not contribute to the development stages of a fire.

Compression resistance

Polyfoam ECO Floorboard 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.

Table 18 - Compressive creep results for Polyfoam ECO Floorboards

Product	Load applied (kPa)	Initial compression (%)	Further compression after 50 years (%)
Polyfoam ECO Floorboard Standard	60	2	1.5
Polyfoam ECO Floorboard Extra	120	2	1.5

Table 19 - Typical U-values of above ground concrete floors

	U-values (W/m²K)						
Insulation thickness	Beam and block floor Thermal conductivity					Precast plank	Cast slabs
(mm)	1.13	0.51	0.34	0.16	0.11	150mm	200mm
Polyfoam ECO Floorboards under screed (75mm)							
175 (2x50+75)	0.18	0.18	0.18	0.17	0.17	0.18	0.18
150 (2x75)	0.22	0.21	0.21	0.20	0.19	0.21	0.21
130 (2x65)	0.25	0.24	0.24	0.23	0.22	0.24	0.24
Polyfoam ECO Floorboards under chipboard							
175 (2x50+75)	0.18	0.18	0.17	0.17	0.16	0.18	0.18
150 (2x75)	0.21	0.21	0.21	0.20	0.19	0.21	0.21
130 (2x65)	0.24	0.24	0.23	0.22	0.22	0.24	0.24

BBA CERTIFICATE CS/1001-2 U Value Competency Scheme

Notes: There are specific additional requirements that need to be taken into to consideration when calculating the U-values for elements that are adjacent to unheated spaces. The U-value of an exposed floor (soffit) which separates a heated area from an unheated area can be calculated by including an additional amount of thermal resistance (R_U) due to the sheltering effect of the unheated area. Standard default values of R_U can be taken from BR 443 (Conventions for U-value calculations) or SAP 2009. For situations not covered by default values, or where additional guidance is required contact our Technical Advice and Support Centre on 01744 766666.

Exposed soffit

Between timber joists

Earthwool Loft Roll or Earthwool Flexible Slab

NEW BUILD REFURB

Es03 Es04

- Friction fitting between timber joists closes joints, preventing air movement and infiltration
- Significantly improves acoustic performance restricting airborne noise

Earthwool Loft Roll and Earthwool Flexible Slab

- Non-combustible with a Euroclass A1 reaction to fire rating
- A+ Generic BRE Green Guide rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)

Products

Earthwool Loft Roll 44 is made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible.

Earthwool Flexible Slab is a multi purpose, rock mineral wool flexible slab designed for friction fitting in a range of acoustic, thermal and fire resisting applications.

Typical construction

A timber joisted floor finished with 22mm tongue and groove flooring grade chipboard or similar decking, the underside finished with either 12.5mm plasterboard, 6mm calcium silicate board or similar. Earthwool Loft Roll 44 or Earthwool Flexible Slab is laid between the joists to fully fill the void.

Installation

Install the floor joists so that any joists running parallel with masonry walls have a minimum gap of 35mm between themselves and the wall to allow for insulation to be installed.

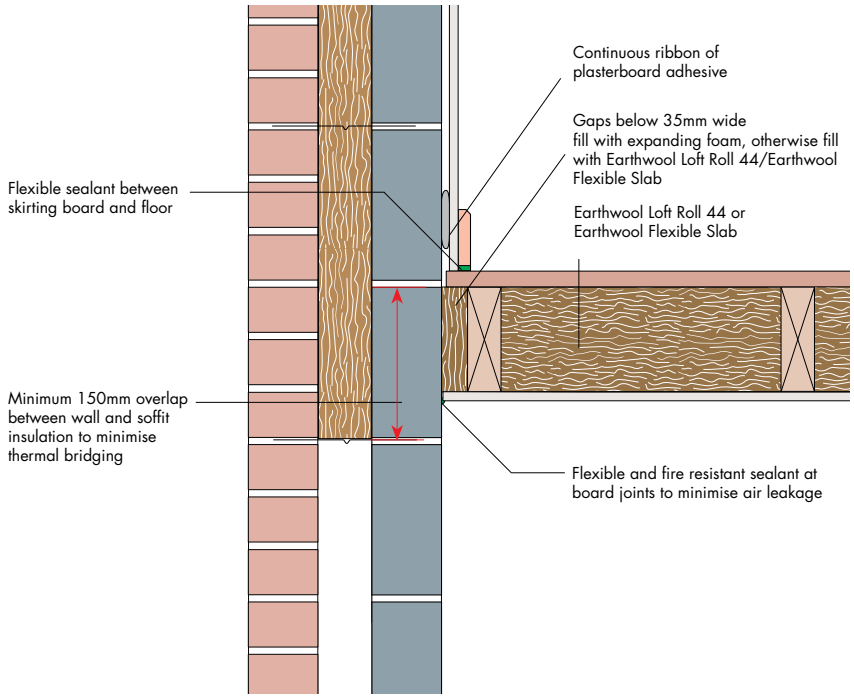
Install the ceiling. Seal the joint between the ceiling and the surrounding walls with a flexible sealant, to prevent air leakage.

Friction fit the Earthwool Loft Roll 44 to completely fill the ceiling void. Alternatively, cut slabs of Earthwool Flexible Slab to fit between the joists. Ensure the insulation is in contact with the underside of the floor deck and the ceiling. Between the last joist and the wall, cut insulation to size and install in the gap.

Screw fix the chipboard deck to the timber joists, with all joints glued using a waterproof PVA adhesive. Leave an expansion gap of at least 10mm or 2mm per metre run of floor at the room perimeter.

When fixing the skirting board, apply a self-adhesive foam strip to the underside of the skirting and two beads of sealant to the back surface. Apply pressure to ensure the foam strip is compressed immediately before fixing the skirting in place.

Typical wall/floor junction



Typical specification

Earthwool Loft Roll 44*/Earthwool Flexible Slab* .....mm thick, supported on the ceiling to friction fit tightly between the joists and fully fill the ceiling void. Earthwool Loft Roll 44*/ Earthwool Flexible Slab* to be cut to fully fill the gap between the last joist and the perimeter wall.

(* delete as appropriate)

Flooring grade t and g chipboard to be screwed to the floor joists, all as specified by the designer.

NBSPlus

Alternatively, consult the National Building Specifications, Standard version clause/clauses...
P10/240 or
P10/250.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Performance

Thermal performance

Earthwool Loft Roll 44 has a thermal conductivity of 0.044 W/mK.

Earthwool Flexible Slab has a thermal conductivity of 0.035 or 0.037 W/mK.

Fire performance

Earthwool Loft Roll 44 and Earthwool Flexible Slab are classified as Euroclass A1 to BS EN 13501-1.

Table 20 - Typical U-values of above ground timber floors

Es03		U-values (W/m²K)			
	Thickness (mm)	*0.33[1]	0.25[2]	0.26[3]	No R_u[4]
Earthwool Loft Roll 44	300 (2x150)	0.15	0.15	0.15	0.16
	250 (150+100)	0.17	0.18	0.18	0.19
	200	0.21	0.21	0.21	0.23
	150	0.27	0.27	0.27	0.29
Es04		U-values (W/m²K)			
	Thickness (mm)	*0.33[1]	0.25[2]	0.26[3]	No R_u[4]
Earthwool Flexible Slab	300 (3x100)	0.13	0.13	0.13	0.13
	250 (2x100+50)	0.15	0.15	0.15	0.16
	200 (2x100)	0.18	0.18	0.18	0.19
	150 (2x75)	0.23	0.23	0.23	0.25

BBA CERTIFICATE CS/1001-2 U Value Competency Scheme

Notes: The U-values have been calculated assuming that the timber joists are 48mm wide, spaced at 600mm centres and are the same depth as the insulation.

* Additional thermal resistances for shelter effect of enclosed unheated spaces R_U (m^2K/W) [1] 0.33, [2] 0.25, [3] 0.26, [4] no R_U.

There are specific additional requirements that need to be taken into to consideration when calculating the U-values for elements that are adjacent to unheated spaces. The U-value of elements between the dwelling and an integral garage should be adjusted using Ru from Table A1 or A2 of BR 443. An additional amount of thermal resistance (Ru) can be included in U-value calculations, the amount of additional thermal resistance is dependent (in part) on whether or not the insulated walls wrap around the integral garage, or separate the dwelling from the garage space. Standard default values can be taken from BR 443 (Conventions for U-value calculations) or SAP 2009. For situations not covered by default values or where additional guidance is required contact our Technical Advice and Support Centre on 01744 766666.

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KNAUF INSULATION
it's time to save energy