Combined Thermal Solutions Ltd
Moulded Foams Ltd
Unit 2 Hawtin Park
Gellihaf
Blackwood, Gwent NP12 2EU
Tel: 01443 441 491 Fax: 01443 441 549
e-mail: enquiries@combinedthermalsolutions.co.uk
website: www.combinedthermalsolutions.co.uk

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

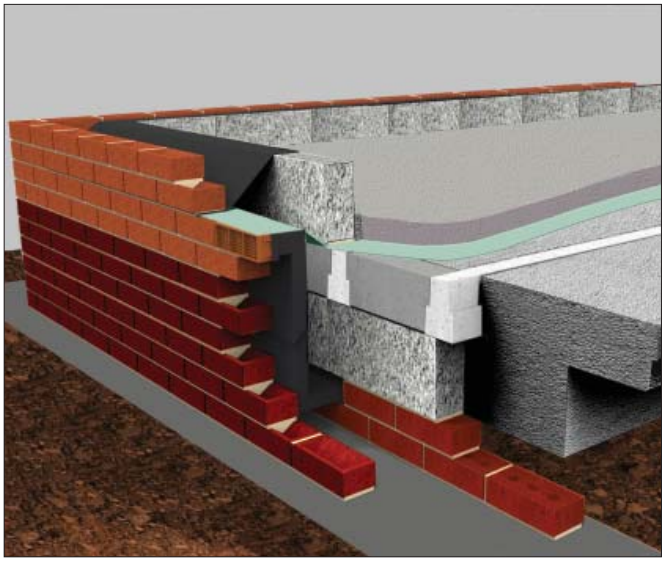
Agrément Certificate
06/4369
Product Sheet 1

COMBINED THERMAL SOLUTIONS FLOORING SYSTEMS

TDECK EPS PANEL SYSTEM

This Agrément Certificate Product Sheet[1] relates to the Tdeck EPS Panel System, a range of expanded polystyrene (EPS) blocks and toe extension dovetail pieces for use as thermal insulation in suspended concrete ground floors (over a sub floor void) in domestic, residential and commercial buildings. The blocks are for use in conjunction with prestressed concrete beams, masonry closure and coursing blocks and structural concrete toppings.

(1) Hereinafter referred to as 'Certificate'.



CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Thermal performance — The EPS blocks can enable a floor to meet the design U values specified in the documents supporting the national Building Regulations (see section 6).

Condensation risk — The EPS blocks can contribute to minimising the risk of interstitial and surface condensation in floors (see section 7).

Structural performance — The EPS blocks have adequate strength to carry short-term loads likely to be encountered during construction of the floor but make no further load bearing contribution once the structural concrete topping has reached full strength (see section 8).

Durability — The EPS blocks have adequate durability and will have a design life equivalent to that of the building in which they are incorporated (see section 10).

The BBA has awarded this Certificate to the company named above for the products described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 13 May 2014

Originally certificated on 29 November 2006

Brian Chamberlain
Head of Approvals — Engineering

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

Regulations

In the opinion of the BBA, Tdeck EPS Panel System, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):

The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	C2(c)	Resistance to moisture
Comment:		The blocks will contribute to limiting the risk of surface and interstitial condensation. See sections 7.1 and 7.4 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The blocks will contribute to meeting this Requirement. See section 6.3 of this Certificate.
Regulation	7	Materials and workmanship
Comment:		The blocks are acceptable. See section 10 of this Certificate and the *Installation* part of this Certificate.
Regulation:	26	CO_2 emission rates for new buildings
Regulation	26A	Fabric energy efficiency rates for new dwellings (applicable to England only)
Comment:		The blocks will contribute to meeting this Regulation. See section 6.3 of this Certificate

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Durability, workmanship and fitness of materials
Comment:		The blocks can contribute to a construction meeting this Regulation. See section 10 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	3.15	Condensation
Comment:		The blocks will contribute to limiting the risk of surface and interstitial condensation, with reference to clauses 3.15.1[(1)(2)], 3.15.4[(1)(2)] and 3.15.5[(1)(2)]. See sections 7.1 and 7.5 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building Insulation Envelope
Comment:		The blocks will contribute to satisfying the requirements of this Standard, with reference to clauses 6.1.1[(1)], 6.1.2[(2)] 6.1.6[(1)], 6.1.10[(2)] 6.2.1[(1)(2)], 6.2.3[(1)], 6.2.4[(2)], 6.2.5[(1)], 6.2.9[(1)], 6.2.10[(1)], 6.2.11[(2)], 6.2.12[(2)], 6.2.13[(1)]. See section 6.3 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The blocks can contribute to meeting the relevant Requirements of Regulation 9 Standards 1 to 6 and therefore, will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. In addition, the blocks can contribute to a construction meeting a higher level of sustainability as defined in this Standard, with reference to clauses 7.1.4[(1)(2)] (Aspects 1[(1)(2)] and 2[(1)]), 7.1.6[(1)(2)] (Aspects 1[(1)(2)] and 2[(1)]) and 7.1.7[(1)(2)] (Aspect 1[(1)(2)]). See section 6.3 of this Certificate.

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2012

Regulation:	23(a)(i)(iii)	Fitness of materials and workmanship
Comment:	(b)	The blocks are acceptable. See section 10 and the *Installation* part of this Certificate.
Regulation:	29	Condensation
Comment:		The blocks will contribute to limiting the risk of interstitial condensation. See section 7.1 of this Certificate.
Regulation:	39(a)(i)	Conservation measures
Regulation:	40(2)	Target carbon dioxide emission rate
Comment:		The blocks will contribute to satisfying these Regulations. See section 6.3 of this Certificate.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See section: 3 *Delivery and site handling* (3.2 and 3.3) and 8 *Structural performance* (8.2 to 8.4) of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of Tdeck EPS Panel System, provided it is installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 5.2 *Suspended ground floors*.

Note: Where Micro-Fibre structural toppings are proposed (see section 8.10, Table 4 of this Certificate), designers must demonstrate compliance with Technical Requirement R3 — *Materials requirement*.

CE marking

The Certificate holder has taken the responsibility of CE marking the product in accordance with harmonised European Standard BS EN 15037-4: 2010. An asterisk (*) appearing in this Certificate indicates that data shown is given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Tdeck EPS Panel System comprise a range of grey expanded polystyrene (EPS) blocks including; full, half, starter, end blocks and toe extension dovetail pieces (see Table 1 and Figure 1).

1.2 EPS toe extension dovetail pieces are used to increase the toe length where required (ie multiple beam situations) and incorporate 'dovetail' profile.

Table 1 EPS block properties

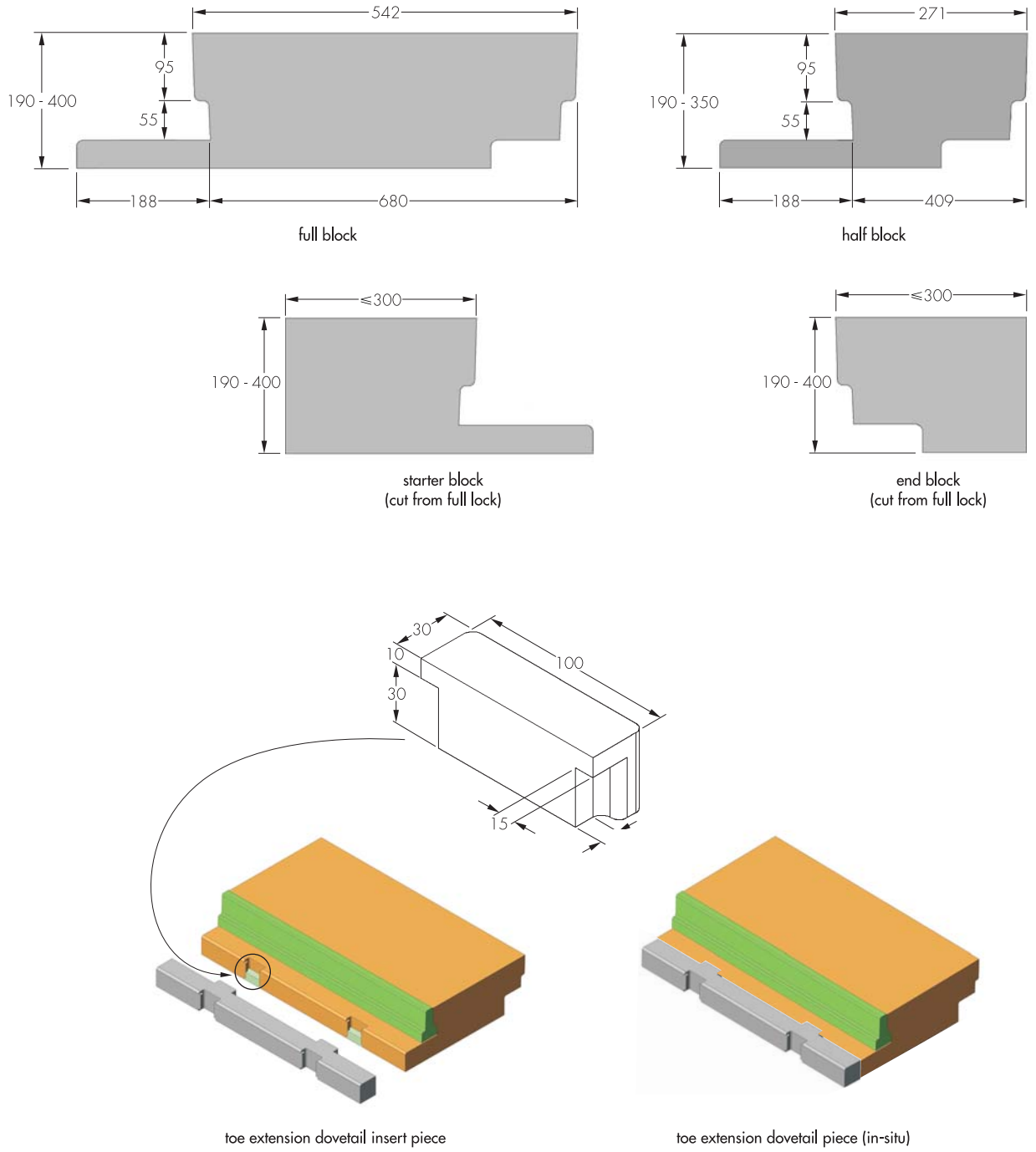
Property	Value
Length (mm)	1200[1]
– full blocks	
Top width (mm)	542
Overall thickness (mm)	190 – 400
Bottom width (mm)	680
Toe thickness	40 – 250
– half blocks	
Top width (mm)	271
Overall thickness (mm)	190 – 350
Bottom width	409
Toe thickness[2]	40 – 200
– Starter and end blocks[3]	
Top width (mm)	≤ 300
– Toe extension dovetail piece	various (to suit block dimension)
Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$) λ_D value	0.031
Moisture diffusion coefficient (μ)	20-40

(1) Other lengths from a minimum of 275 mm are available as specified by the Certificate holder.

(2) All available with toe widths to cover single, double and triple beams

(3) Starter and end blocks are used between the first and last prestressed concrete beam and the inner leaf of the external walls and party walls. These are formed by cutting a full width block lengthways on site.

Figure 1 Example EPS blocks dimensions

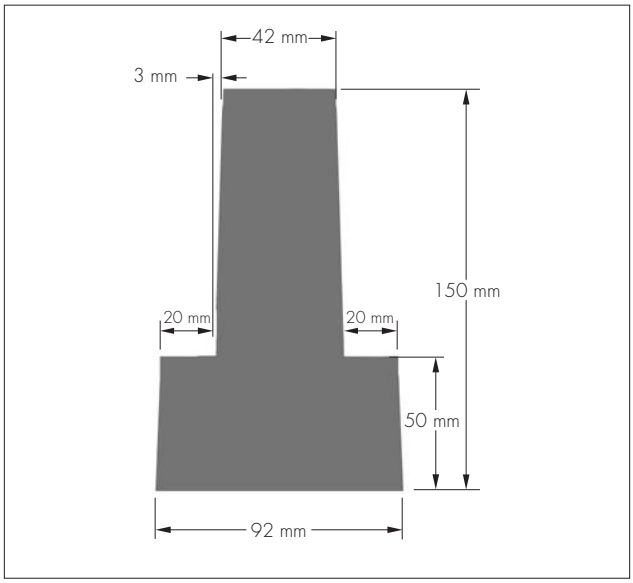


1.3 Polystyrene edge strips (30 mm thick), are used in conjunction with standard and aerated concrete perimeter blocks to provide continuous insulation cover of the floor.

1.4 Ancillary Items used in conjunction with the blocks to construct a suspended ground floor (but not covered by this Certificate) include:

- pre-stressed concrete beam — see section 8.7 designed to BS EN 1992-1-1 : 2004. Dimensions of typical widely-available prestressed concrete beams are given in Figure 2
- concrete toppings — see section 8.10
- concrete closure and edge blocks — aerated concrete perimeter blocks manufactured in accordance with BS EN 771-3 : 2011. The blocks should have BBA (or other third party) certification and must have a compressive strength equal to, or greater than, that of the blocks used to form the inner leaf of the wall.
- insulation strips — for perimeter of structural concrete toppings
- gas barriers — where required
- structural concrete toppings — see sections 8.8 to 8.10.

Figure 2 Pre-cast concrete T beam



2 Manufacture

2.1 The EPS blocks are manufactured using conventional moulding techniques from expanded polystyrene beads.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Combined Thermal Solutions Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by the SGS (Certificate No GB11/83916).

3 Delivery and site handling

3.1 The EPS components are shrink-wrapped and bonded in cube packs. Reasonable care must be taken during transit and storage to avoid damage to the blocks.

3.2 The blocks should be stacked on a flat base, clear of the ground and protected against direct sunlight and secured to avoid wind damage. Care must be taken to avoid contact with solvents and with materials containing volatile organic components.

3.3 The blocks must not be exposed to flame or ignition sources. Careful consideration should also be given to the management of fire risk when in storage.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Tdeck EPS Panel System.

Design Considerations

4 General

4.1 An appropriately qualified and experienced individual (such as the system supplier) should perform a site-specific assessment/design to ensure that the infill block, concrete beam and concrete topping are suitable for the intended use based on the recommendations in this Certificate and appropriate parts of BS EN 15037.

4.2 Tdeck EPS Panel System is assessed as suitable for use as part of a suspended ground floor (over a sub floor void) in domestic, residential and commercial buildings.

4.3 The minimum void depth of 150 mm is required but this may need to be increased where clay soils susceptible to volume change potential are present. The void depth should therefore be carefully considered and specified as part of the design of the overall floor construction for each project.

4.4 Electrical cables running within the polystyrene should be enclosed in a suitable conduit, such as rigid PVC.

4.5 The EPS blocks can be used in floors with suitable underfloor heating systems. Care must be taken to ensure that the minimum design thickness of structural concrete topping is maintained (see Table 4), and the pipework be covered by a minimum 40 mm thick concrete.

5 Practicability of installation

The system is designed to be installed by a competent general builder, or contractor, experienced with this type of product.

6 Thermal performance

6.1 The overall floor U value will depend significantly on the deck U value, the ratio of the exposed (and semi-exposed) floor perimeter length to floor area (p/a), the amount of underfloor ventilation and the ground thermal conductivity. Each floor U value should therefore be calculated to BS EN ISO 13370 : 2007 and BRE Report 443 : 2006).

6.2 A floor deck U value (from inside to the underfloor void) will depend significantly on the size and number of precast concrete beams, toe thickness, EPS block type and width of any gap between adjacent EPS blocks in the toe layer. The thermal resistance of each beam and EPS block configuration should be numerically modelled to BS EN ISO 10211 : 2007 and BS EN 15037-4 : 2010. The floor deck U value may then be taken as an area weighted average and the overall floor U value calculated as described in section 6.1

6.3 Example floor U values given in Tables 2 indicate that the EPS blocks can enable a floor to meet, or improve upon, design floor U values of 0.15 to 0.25 $W \cdot m^{-2} \cdot K^{-1}$ specified in documents supporting the national Building Regulations.

Table 2 Example U values[1] ($W \cdot m^{-2} \cdot K^{-1}$)

Beam size (mm)	p/a ratio	EPS block thickness (mm) and Beam configuration (A and B)													
		190		210		245		285		315		360		400	
		A[2]	B[3]	A[2]	B[3]	A[2]	B[3]	A[2]	B[3]	A[2]	B[3]	A[2]	B[3]	A[2]	B[3]
150 x 92	0.4	0.19	0.21	0.17	0.18	0.14	0.15	0.12	0.13	0.11	0.11	0.10	0.10	0.09	0.09
	0.6	0.20	0.22	0.18	0.19	0.15	0.16	0.12	0.13	0.11	0.12	0.10	0.11	0.09	0.09
	0.7	0.21	0.23	0.18	0.20	0.15	0.16	0.13	0.13	0.11	0.12	0.10	0.11	0.09	0.10
	0.9	0.21	0.23	0.18	0.20	0.15	0.16	0.13	0.14	0.12	0.12	0.10	0.11	0.09	0.10

Notes:

- These calculations are in accordance with sections 6.1 and 6.2 and assume:
  - The beam dimensions shown in Section 1.3 and beam straightness is < 5 mm
  - The beam λ is 2.0 $W \cdot m^{-1} \cdot K^{-1}$ and a 75 mm concrete screed λ is 1.15 $W \cdot m^{-1} \cdot K^{-1}$
  - A 300 mm thick perimeter wall with a U value of 0.35 $W \cdot m^{-2} \cdot K^{-1}$
  - Underfloor ventilation area is 0.0015 $m^2 \cdot m^{-1}$
  - Ground conductivity is 1.5 $W \cdot m^{-1} \cdot K^{-1}$
  - All other parameters are default values from BRE Report 443 : 2006.
- Configuration A = 100% area comprising single beams at full centres
- Configuration B = 75% area comprising single beams at full centres and 25% area comprising any combination of single or double beams at full or half centres.

Junction psi values

6.4 Care must be taken in the overall design and construction of junctions between the floor and external, internal and party walls, to limit excessive heat loss and air infiltration.

6.5 For the purpose of SAP or SBEM calculations, Junction psi values for T-Deck can be taken from:

- the Book 6 on the Constructive Details website (www.constructivedetails.co.uk), or
- Table 3 of this Certificate, or
- modelled in accordance with the requirements and guidance in; BRE Report 497, BRE Information paper IP01/06 and the provisions in the documents supporting the national Building Regulations relating to competency to perform calculations, determine robustness of design/construction and limiting heat loss by air infiltration.

Table 3 Junction psi values

Junction	ψ ($W \cdot m^{-1} K^{-1}$)
External wall – Note[1] – Other[2]	0.06 0.32
Party wall[2]	0.16

(1) Beams parallel to the external wall with uncut starter or end blocks and full fill masonry wall (U value < 0.20 $W \cdot m^{-2} \cdot K^{-1}$) with 100 mm inner block leaf at < 0.19 $W \cdot m^{-2} \cdot K^{-1}$ and edge insulation to the structural concrete topping.

(2) Conservative defaults from SAP Conventions Document.

7 Condensation risk

Interstitial condensation

7.1 Floors will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2011 and this Certificate.

7.2 To help minimise the risk of condensation, the void space beneath the lowest point of the floor construction should be at least 150 mm high, with provision for adequate through ventilation, in the form of ventilation openings provided in two opposing external walls. The ventilation openings should be sized at not less than 1500 $mm^2 \cdot m^{-1}$ run of external wall or 500 $mm^2 \cdot m^{-2}$ of floor area, whichever is greater. Where pipes are used to carry ventilating air, these should be at least 100 mm diameter.

7.3 To minimise the risk of condensation at junctions with external walls, specifiers should ensure that wall insulation extends to at least 150 mm below the top of the EPS blocks.

Surface condensation

7.4 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 0.7 $W \cdot m^{-2} \cdot K^{-1}$ at any point and the junctions with walls are in accordance with the relevant requirements of *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings* TSO 2002 or BRE Information Paper IP 1/06.

7.5 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point and is designed and constructed to BS 5250 : 2011. Additional guidance can be found in BRE Report 262 : 2002.

7.6 To minimise the risk of surface condensation at service penetrations care should be taken to minimise gaps in the insulation layer, for example, with expanding foam insulation.

8 Structural performance

General

8.1 The structural engineer must ensure that the concrete beams and structural topping are suitable for the intended application.

EPS blocks

8.2 The blocks provide a temporary formwork to the structural concrete topping. They make no further contribution to the long-term structural performance of the floor, once the structural concrete topping has been placed and obtained its full design strength.

8.3 Subject to compliance with the design and installation requirements of this Certificate, the EPS blocks have adequate strength to carry normal temporary loads expected during the construction phase of the floor system; including the weight of the structural concrete topping when poured.

8.4 EPS blocks must be cut not less than 275 mm length to accommodate varying beam lengths, should be positioned at the floor edges. Starter and end blocks should not be more than 300 mm wide at the top, see section 14.5.

8.5 The blocks are designed to have a normal bearing of 20 mm with a 5 mm allowance for misalignment and manufacturing tolerances in the straightness of the beam. A minimum bearing width of 15 mm must therefore be ensured.

8.6 Spacers for supporting mesh reinforcement should be located along the beams or on spreader plates over the EPS blocks. This will reduce the risk of accidental penetration of the EPS during the construction phase and resulting misalignment of the reinforcement within the structural concrete topping depth. Spacer dimension must not be less than 50 mm by 50 mm and minimum four spacers per m2 are required.

Prestressed concrete beams

8.7 The EPS blocks are for use with self-bearing prestressed concrete beams which provide the final strength of the floor system independently of any other constituent part of the floor system. The prestressed concrete beams must be made of reinforced or prestressed normal weight concrete and designed in accordance with BS EN 1992-1-1 : 2004 (Eurocode 2). A suitably qualified and experienced individual (such as system supplier) must ensure that the beams are adequate to resist the applied loading.

Structural concrete toppings

8.8 The concrete topping thickness and reinforcement specification must be determined by appropriately qualified and experienced individual (such as the system supplier) to BS EN 1992-1-1 : 2004. Above EPS starter and end units, the topping must be designed as a cantilever (see also section 8.3) and must not exceed 300 mm.

8.9 The concrete forming the topping must be in accordance with BS 8500-1 and -2 : 2006, complementary British Standard to BS EN 206-1 : 2013, and aggregate in accordance with BS EN 12620 : 2013. Concrete should be manufactured in plants covered by the QSRMC scheme and laid by personnel having appropriate skill and experience.

8.10 Testing and calculations indicate that the specifications given in Table 4 are suitable for self-contained dwelling units occupied by single-family application with the characteristic imposed load defined in Table 5.

Table 4 Concrete topping specifications

Nominal thickness (mm)	Grade	Type	Maximum aggregate size (mm)	Reinforcement
75 -80	C25/30	Conventional	10	Fibrin 23[1] polypropylene fibres at a rate of between 0.90 kgm^{-3} and 0.91 kgm^{-3}
75 -80	C28/35	Self-levelling self-compacting concrete	10	Fibrin PC12[1] polypropylene fibres at a rate of 0.75 kgm^{-3} and an admixture PCP or PCE superplasticer
75	C20/25	Conventional	10	One layer of A142 mesh to BS 8666: 2005

(1) On NHBC sites, designers must demonstrate that Micro-fibre structural concrete toppings meet NHBC Technical Requirement R3.

Table 5 Characteristic imposed load for concrete topping reinforced with polymer fibres or steel mesh A142[1] for self-contained dwelling units occupied by a single-family

Characteristic imposed loads	Value
Characteristic imposed point load (kN)	2.0[2][3]
Characteristic imposed UDL (kN·m^{-2})	1.5[2]
Allowance imposed load for lightweight partitions[4] (moveable) (kN·m^{-2})	1.0[5]
Maximum line load from partitions perpendicular or parallel to beams (kN·m^{-1})	3.0[5]

(1) All steel fabric mesh is to be made using ribbed bar in accordance with BS 4483 : 2005 and BS 4449 : 2005.
(2) Point load of 2 kN must not be combined with the uniformly distributed load of 1.5 kN·m^{-2} or other variable actions.
(3) Imposed point load of 2 kN to be applied on a square plate of area not less than 50 mm x 50 mm.
(4) Where partitions other than stud wall (e.g. blockwork) are proposed to run parallel to the beams specific provisions should be made to accommodate these e.g. providing additional beam, mesh reinforcement or separate foundations.
(5) Allowance for moveable partition must not be combined with line load partition.

Table 6 Characteristic imposed load for concrete topping reinforced with steel mesh[1] for commercial buildings

Characteristic imposed loads	Value
Characteristic imposed point load (kN)	4.5[2][3]
Characteristic imposed UDL (kN·m^{-2})	5.0[2]
Allowance imposed load for lightweight partitions (moveable) (kN·m^{-2})	1.0[4]
Maximum line load from partitions perpendicular or parallel[5] to beams (kN·m^{-1})	5.0[4]

(1) All steel fabric mesh is to be made using ribbed bar in accordance with BS 4483:2005 and BS 4449:2005. Size of steel mesh shall be designed in accordance with BS EN 1992-1-1: 2004 and NA to BS EN 1992-1-1: 2004.
(2) Point load must not be combined with the uniformly distributed load or other variable actions.
(3) Imposed point load to be applied on a square plate of area not less than 50 mm x 50 mm.
(4) Allowance for moveable partition must not be combined with line load partition.
(5) Where partitions run parallel to the beams, provisions should be made to accommodate these by other means e.g. providing additional beam or separate foundations.

9 Maintenance

The blocks are designed to be installed within the floor structure; therefore, they do not require maintenance.

10 Durability

The EPS blocks are protected in service from agencies liable to cause deterioration and will be effective as insulation for the life of the building which they are installed in.

11 Re-use and recyclability

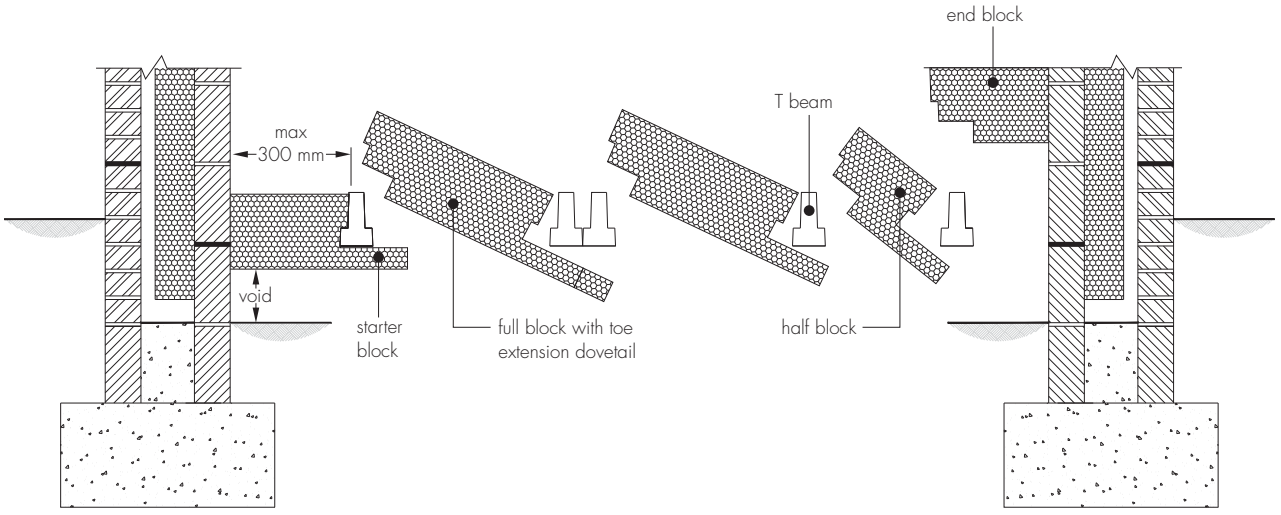
EPS material can be recycled if free from debris and contamination.

Installation

12 General

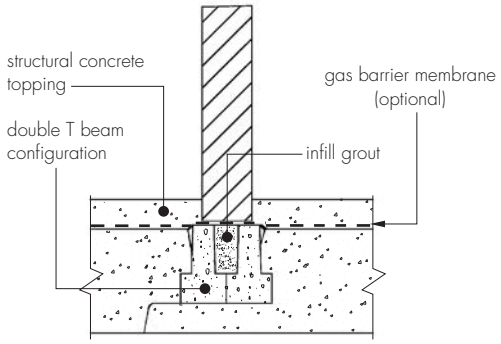
Details of typical prestressed concrete beams and EPS block assemblies are shown in Figure 3 and the Certificate holder's literature; Code of Practice for Safe Erection of Precast Concrete Flooring, the design drawings and the installation guidelines.

Figure 3 Basic system layouts

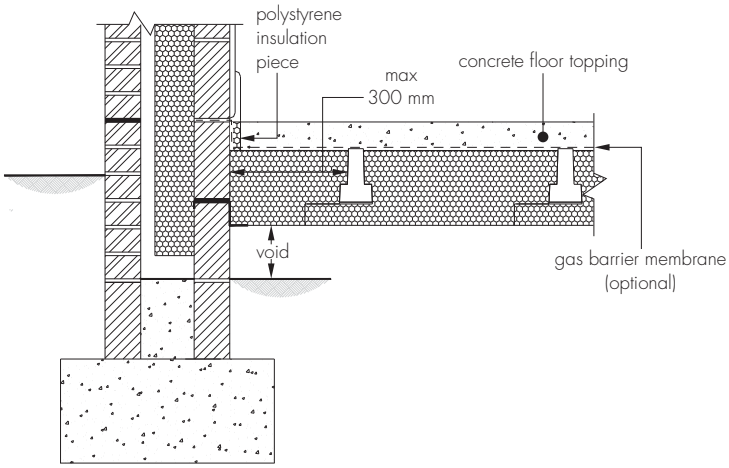


block installation process

alternative toe extension dovetail detail (in-situ)



loadbearing wall detail



construction adjacent to wall detail

13 Site preparation

13.1 A void at least 150 mm deep must be provided between the underside of the polystyrene floor construction and the ground surface. Where clay soil of medium or high-volume change potential exists, the final minimum void depth should be increased appropriately to prevent problems associated with heave. With good natural drainage or where site drains are provided to prevent water collecting and standing, the ground level beneath the floor does not need to be raised to the external ground level but, where the levels differ, the ability of the perimeter walls to act as retaining walls must be checked.

13.2 The ground beneath the floor should be free of topsoil and vegetation. Oversite concrete or other surface seal is not required.

13.3 Damp-proofing and ventilation arrangements must be in accordance with normal good practice and the Certificate holder's instructions (for example, provision of damp-proof sleeves to ventilators and adequate drainage of the sub-floor).

13.4 A continuous damp-proof course should be laid along the support wall below the floor in accordance with BS 8102 : 2009.

13.5 All bearings should be level and true, care should be taken to ensure that a minimum bearing on blockwork of 90 mm and on steelwork 75 mm is maintained.

13.6 The blockwork should be brought up to finished floor level where running parallel to the beams.

14 Procedure

14.1 The beams are laid in the approximate position as shown on the floor plan. An offcut of an EPS block can be used as template to space the beams accordingly.

14.2 The first beam is accurately positioned and a starter block as shown in Figure 3 (cut flush at the other end) with a top width not exceeding 300 mm is installed and the beam is manually butted tightly against the EPS block to ensure a snug fit.

14.3 Care must be taken to cut the polystyrene accurately to size and to push the beam uptight to ensure that the polystyrene achieves its full 20 mm bearing on the beam.

14.4 If necessary, to ease the process of inserting the EPS blocks, the beams can be splayed slightly and pushed up tight to ensure the EPS blocks are locked tight as installation progresses. The blocks are installed in this way row by row, rotating the blocks in place and taking care not to damage the toe extension as it slips under the beam. If there is a risk that the toe extension will foul the ground and/or services, toe extension jointing pieces can be vertically inserted in-situ, prior to the installation of the next row of EPS blocks or beam (ie in multiple beam situations).

14.5 Half EPS blocks are used where reduced beam centres are specified and for the last row, end blocks are cut from standard or half blocks to fit flush to the wall width a top width not exceeding 300 mm.

14.6 Any awkward gaps (eg. around services) are to be filled with expanding foam and excess foam to be cut off flush with the top of the EPS.

14.7 At the perimeter, concrete edge closures should follow the prestressed concrete beam manufacturer's drawings. The usual method is to use special closure blocks or aircrete blocks cut to suit bridging the gap between wall and prestressed concrete beam shoulder and insulation cut to suit from the 60 mm polystyrene sheet.

14.8 To provide damp-proof, airtight radon or methane barrier, a membrane is laid in accordance with that manufacturer's instruction.

14.9 When used in conjunction with underfloor heating, the minimum design thickness of concrete topping (see Table 4) must be used and the pipework be covered by a minimum 40 mm thick concrete. The Certificate holder's instructions should also be sought regarding installation of these systems.

14.10 Once the panels are installed, care must be taken not to walk on them. If a temporary working platform is required the panels should be covered with a suitably rigid board. To avoid damage to the polystyrene panels, the structural floor screed should be laid as soon as possible after the blocks have been installed.

14.11 Prior to pouring the structural floor screed it must be ensured that the polystyrene blocks are centrally located between the prestressed concrete beams with a maximum gap of 5 mm between the polystyrene and the prestressed concrete beam face. These gaps may be due to normal construction or manufacturing tolerances.

14.12 Where gaps occur, concrete is placed along the edges of the polystyrene blocks to prevent displacement during the main concreting operation.

14.13 When using a concrete pump, truck or skip, concrete should not be discharged onto the polystyrene blocks from heights greater than 300 mm and concrete heaps must not be formed over 150 mm high.

14.14 When wheelbarrows are used, planks must be placed to spread the wheel load to the prestressed concrete beams. Spot boards must be used when tipping and shovelling.

14.15 The concrete screed should be placed and compacted. Provision should be made for a suitable concrete finish to be achieved without standing on or overloading the polystyrene panels, for example compacting beams. Alternatively, self-levelling and self-compacting concrete screed can be used

Technical Investigations

15 Investigations

15.1 An examination was made of existing data to assess:

- tests on finished floor with cantilever on polymer micro reinforced concretes
- resistance to construction loads
- practicability of installation
- thermal conductivity ($\lambda_{90/90}$ *values*)
- dimensional accuracy
- durability.

15.2 Floor deck U values were derived by modelling to BS EN 10211 : 2007 and BS EN 15037-4 : 2010 Annex F and example floor U values calculated to BS EN ISO 13370: 2007.

15.3 The risk of condensation was examined to BS 5250: 2011.

15.4 The manufacturing processes for the EPS blocks was examined including the methods adopted for quality control, and details obtained of the quality and composition of the materials used.

Bibliography

BRE Information paper IP01/06 *Assessing the effects of thermal bridging at junctions and around openings*

BRE Report 262 : 2002 *Thermal insulation : avoiding risks.*

BRE Report 443 : 2006 *Conventions for U-value calculations.*

BRE Report 497 : 2007 *Conventions for calculating linear thermal transmittance and temperature factors*

BS 4449 : 2005 *Steel for the reinforcement of concrete — Weldable reinforcing steel — Bar, coil and decoiled product —Specification*

BS 4483:2005 *Steel fabric for the reinforcement of concrete — Specification*

BS 5250 : 2011 *Code of practice for control of condensation in buildings*

BS 8102 : 2009 *Code of practice for protection of below ground structures against water from the ground*

BS 8500-1 : 2006 *Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier*

BS 8500-2 : 2006 *Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete*

BS EN 206:2013 *Concrete — Specification, performance, production and conformity*

BS EN 1992-1-1 : 2004 *Design of concrete structures — General rules and rules for buildings*

BS EN 14889-2 : 2006 *Fibres for concrete. Polymer fibres. Definitions, specifications and conformity*

BS EN 15037-1 : 2008 *Precast concrete products. Beam-and-block floor systems. Beams*
BS EN 15037-4 : 2010 *Precast concrete products. Beam-and-block floor systems. Expanded polystyrene blocks*

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

BS EN ISO 10211 : 2007 *Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations*

BS EN ISO 13370 : 2007 *Thermal performance of buildings — Heat transfer via the ground — Calculation methods*

BS EN ISO 14001 : 2004 *Environmental management systems. Requirements with guidance for use*

TSO 2002 : *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings*

16 Conditions

16.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

16.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

16.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

16.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

16.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

16.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

British Board of Agrément
Bucknalls Lane
Watford
Herts WD25 9BA

tel: 01923 665300
fax: 01923 665301
e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk