




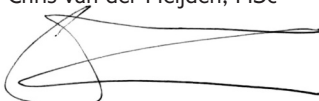


<b>Number</b> BAF 17-056/01/A <b>Replaces:</b> -	<div>   </div>		<b>Category</b> Insulated suspended concrete ground floors <b>Phase</b> Assessment <b>Subject</b> Thermal insulation systems
<b>Date</b> 2017-07-24	<div>  </div> <div> <b>BDA Agrément® BAF 17-056/01/A</b> </div>		
<b>Project number</b> 15-B-0535 / 2048			
<b>Validity</b> www.kiwa.co.uk/bda			
<b>Systems</b>  <b>Agrément holder</b>  <b>Description</b>  <b>Scope (use)</b>  <b>Objective</b>  <b>Summary of Agrément</b>  <b>Major points of assessment</b>  <b>Statement</b>	<div> <b>Springvale Beamshield Top Sheet/UFH and Beamshield Plus Top Sheet/UFH Flooring Insulation Systems</b>  </div> <p>Springvale EPS Ltd. Dinting Vale Glossop Derbyshire SK13 6LG, UK</p> <p>T. : +44 (0) 845 769 7452 E. : technical@springvale.com W. : www.springvale.com</p> <p>Flooring insulation systems comprising a range of expanded polystyrene (EPS) blocks, Infill and top sheets for use as thermal insulation in conjunction with (but not manufactured by the Agrément holder) structural concrete toppings, precast concrete beams, masonry closure and coursing blocks in suspended concrete ground floors (over a sub floor void).</p> <p>Thermal insulation for use in the building envelope in domestic, residential and commercial buildings, designed and constructed in accordance with the relevant clauses of this Agrément and the Agrément holder's requirements. See also section 3 of this document for the full range of Beamshield Top Sheet &amp; UFH Blocks.</p> <p>This document provides independent information to specifiers, building control personnel, contractors, installers and other construction industry professionals considering the fitness for the intended use of the systems.</p> <p>This Agrément covers the following:</p> <ul style="list-style-type: none"> <li>• Conditions of use;</li> <li>• Sources, including codes of practice, test and calculation reports;</li> <li>• Independently assessed system characteristics and other system information;</li> <li>• Factory Production Control and annual verification procedure;</li> <li>• Points of attention for the specifier and typical details;</li> <li>• Installation procedure;</li> <li>• Compliance with national Building Regulations and non-Regulatory Standards.</li> </ul> <p><b>Thermal performance aspects (sections 8.4 &amp; 8.5)</b> The EPS blocks, infill and top sheets can enable a floor to meet the design U values specified in the documents supporting the national Building Regulations.</p> <p><b>Condensation and water (vapour) infiltration risk (section 8.6)</b> The EPS blocks, infill and top sheets can contribute to minimising the risk of interstitial and surface condensation in floors.</p> <p><b>Structural performance (sections 8.7.1 to 8.7.4)</b> The systems have adequate strength and stiffness to sustain and transmit dead and imposed floor loads in residential, domestic or commercial buildings.</p> <p><b>Durability (section 8.9)</b> The EPS blocks, infill and top sheets are stable, rot-proof and durable and will remain for the life of the building in which it is installed.</p> <p>It is the opinion of the Kiwa BDA Expert Centre Building Envelope (ECBE) that Springvale Beamshield Top Sheet/UFH and Beamshield Plus Top Sheet/UFH Flooring Insulation Systems (hereafter The Systems) are fit for their intended use, provided they are specified, installed and used in accordance with this Agrément.</p> <div> <div>           Professor Nico Hendriks, MSc              ECBE Chairman         </div> <div>           Chris van der Meijden, MSc              BDA Group Technical Director         </div> </div>		
<b>Version</b> 01	<b>BDA Group</b> Avelingen West 33 P.O. Box 389 4200 AJ Gorinchem The Netherlands +31 (0)183 66 96 90	<b>Kiwa BDA Expert Centre Building Envelope (ECBE)</b>  <b>Kiwa Ltd.</b> Unit 5 Prime Park Way Prime Enterprise Park Derby, DE1 3QB United Kingdom +44 (0)7718 57 05 64	Page 1 of 14 pages

<p><b>1 Conditions of use</b></p>	<p><b>1 Application</b> The assessment of The Systems relates to the use of the systems in domestic, residential and commercial buildings with correctly installed masonry external walls, which have been designed and constructed in accordance to BS EN 1996-1-1:2005+A1 and the UK NA to BS EN 1996-1-1:2005+A1<sup>16,17</sup> and correctly detailed ground floor systems, designed and constructed in accordance with BS 8102<sup>19</sup> and BS 8215<sup>20</sup> and with the Agrément holder's requirements.</p> <p><b>2 Assessment</b> Kiwa BDA Expert Centre Building Envelope (ECBE) has assessed the thermal performance, design and installation of the product according to BS EN 15037-1<sup>2</sup>, BS EN 15037-4<sup>3</sup> and BS EN 1996-1-1:2005+A1 and the UK NA to BS EN 1996-1-1:2005+A1<sup>16,17</sup> in combination with the DoP<sup>28</sup> and visits. Also NHBC Standards, Chapter 5.2 Suspended ground floors<sup>38</sup> have been taken into account. Factory Production Control has been assessed by Kiwa N.V., Technical Assessment Body, in the UK represented by Kiwa Ltd.<sup>26</sup>.</p> <p><b>3 Installation</b> It is recommended that the quality of installation and workmanship is controlled by (a) competent person(s). Such person(s) shall be either a qualified employee of the Consulting Engineer or an employee of the installing contractor. The product shall be installed strictly in accordance with the requirements of the Agrément holder and the requirements of this Agrément.</p> <p><b>4 Geographical scope</b> The validity of this document is limited to England, Wales, Scotland and Northern Ireland, with due regard to section 11 Building Regulations.</p> <p><b>5 Validity</b> The purpose of this BDA Agrément<sup>®</sup> is to provide for well-founded confidence to apply The Systems in the described applications and according to approved specifications. According to the BDA Guideline - BDA Agrément<sup>®1</sup> the validity of this Agrément is therefore three years after the official date of issue, published on <a href="http://www.kiwa.co.uk/bda">www.kiwa.co.uk/bda</a>. After this the validity can be extended every three years after positive review. This Agrément is not valid in those cases where ECBE identifies that the design of a flooring system does not comply with article 8.2.</p>
<p><b>2 Sources</b></p>	<ol style="list-style-type: none"> <li>1 BDA Guideline - BDA Agrément<sup>®</sup>, 30<sup>st</sup> June 2015</li> <li>2 BS EN 15037-1:2008 Precast concrete products. Beam-and-block floor systems. Beams</li> <li>3 BS EN 15037-4:2010+A1:2013 Precast concrete products. Beam-and-block floor systems. Expanded polystyrene blocks</li> <li>4 BS EN 14889-2:2006 Fibres for concrete. Polymer fibres. Definitions, specifications and conformity</li> <li>5 BS EN 1990:2002+A1:2005 - Eurocode. Basis of structural design</li> <li>6 UK National Annex to BS EN 1990:2002<sup>5</sup></li> <li>7 BS EN 1991-1-1:2002 - Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings</li> <li>8 BS EN 1992-1-1:2004+A1:2014 Eurocode 2: Design of concrete structures. General rules and rules for buildings</li> <li>9 UK National Annex to BS EN 1991-1-1:2002<sup>7</sup></li> <li>10 BS EN 206:2013 Concrete. Specification, performance, production and conformity</li> <li>11 BS 8500-1:2006+A1:2012 Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier</li> <li>12 BS 8500-2:2015 Concrete. Complementary British Standard to BS EN 206. Specification for constituent materials and concrete</li> <li>13 Technical Report TR 65: 2014 Guidance on the use of macro-synthetic-fibre-reinforced concrete</li> <li>14 BS EN 13163:2012+A1:2015 Thermal insulation products for buildings. Factory made expanded polystyrene (EPS) products. Specification</li> <li>15 BDA Report 16-0895 (15-B-0535) calculations of stresses and strains in EPS overlay board, 2016-07-13</li> <li>16 BS EN 1996-1-1:2005+A1:2012 Eurocode 6. Design of masonry structures. General rules for reinforced and unreinforced masonry structures</li> <li>17 UK National Annex to BS EN 1996-1-1:2005+A1:2012<sup>16</sup></li> <li>18 BS 5250:2011 Code of practice for control of condensation in buildings</li> <li>19 BS 8102:1990 Code of practice for protection of buildings against water from the ground</li> <li>20 BS 8215:1991 Code of practice for design and installation of damp proof courses in masonry construction</li> <li>21 BS EN ISO 6946:2007 Building components and building elements. Thermal resistance and thermal transmittance. Calculation method</li> <li>22 BR443: Conventions for U-value calculations, 2006 edition, BRE Scotland</li> <li>23 BS EN ISO 10211:2007 Thermal bridges in building constructions. Calculation of heat flows and surface temperatures</li> </ol>
<p><b>Version</b> 01</p>	<p style="text-align: center;"><b>Expert Centre Building Envelope</b> Copyright<sup>©</sup> 2017 Kiwa BDA</p> <p style="text-align: right;">Page 2 of 14 pages</p>

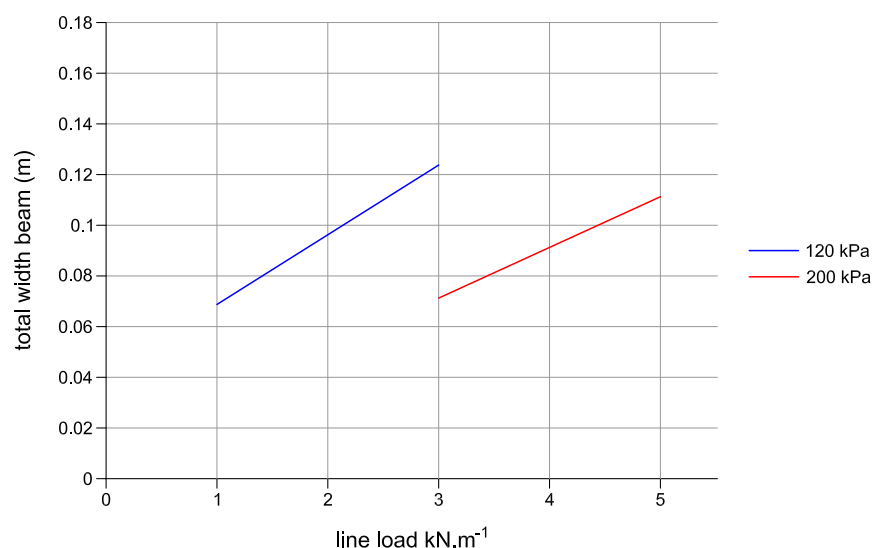
<p><b>2 Sources</b> (continued)</p>	<p>24 BS EN ISO 13370:2007 Thermal performance of buildings. Heat transfer via the ground. Calculation methods</p> <p>25 Thermal Bridging Guide - An introductory guide to thermal bridging in homes, Zero Carbon Hub, February 2016</p> <p>26 Kiwa Ltd Report 2048 Inspection of Factory and Factory Production Control, Springvale EPS Ltd, 20<sup>st</sup> - 21<sup>st</sup> January 2016</p> <p>27 DoP Springvale EPS Ltd, Platinum EPS120E Rev 1, 2016-10-13</p> <p>28 DoP Springvale EPS Ltd, EPS120 Rev 0, 2016-10-13</p> <p>29 DoP Springvale EPS Ltd, EPS120E Rev 0, 2016-06-01</p> <p>30 DoP Springvale EPS Ltd, EPS200 Rev 1, 2016-10-13</p> <p>31 DoP Springvale EPS Ltd, Platinum Beamshield Plus EPS Rev 2, 2016-10-13</p> <p>32 DoP Springvale EPS Ltd, Beamshield Plus EPS Rev 2, 2016-10-13</p> <p>33 Technical Data Sheet Springvale Beamshield Flooring Insulation Systems</p> <p>34 Guide to the installation of Beamshield Plus and Platinum Beamshield Plus Suspended Floor Insulation</p> <p>35 SAP 2012 Conventions, BRE Standard Assessment Procedure, 2015-10-20 (v 6.0)</p> <p>36 BR497:2010 Conventions for Calculating Linear thermal transmittance and Temperature Factors</p> <p>37 BS 4483:2005 Steel fabric for the reinforcement of concrete. Specification</p> <p>38 NHBC Standards:2017, Chapter 2.1 The Standards and Technical Requirements and Chapter 5.2 Suspended ground floors</p> <p><b>Remark:</b> in the text of this document reference is made to some of these sources by adding the relevant source number in superscript</p>
<p><b>3 Independently assessed system characteristics of components used for critical functions <sup>**</sup>)</b></p>	<p><sup>**</sup>) The critical functions which apply to this section and section 4 are structure, durability and thermal insulation, as mentioned in Chapter 2.1, Technical Requirement R3 (Materials requirement) of the NHBC Standards<sup>38</sup>.</p> <p><b>CE-marking of EPS top sheets and blocks</b></p> <p>The Agrément holder has taken the responsibility of CE marking the EPS components of the system in accordance with BS EN 15037-4<sup>3</sup>, BS EN 13163<sup>14</sup> and Regulation (EU) No 305/2011 - Article 7. An asterisk (*) indicates that the regarding data shown in this section is given in the manufacturer's Declarations of Performance (DoP)<sup>27,28,29,30,31,32</sup>.</p> <p><b>EPS top sheets</b></p> <ul style="list-style-type: none"> <li>Range of thicknesses (mm) : 50 - 600*</li> <li>Declared thermal conductivity <math>\lambda_D</math> (<math>W \cdot m^{-1} \cdot K^{-1}</math>) <ul style="list-style-type: none"> <li>EPS120 &amp; variable width board (white) : 0.035*</li> <li>EPS120E &amp; variable width board (white) : 0.035*</li> <li>platinum EPS120E &amp; variable width board : 0.030*</li> <li>EPS200 (white) : 0.033*</li> </ul> </li> <li>Mechanical properties <ul style="list-style-type: none"> <li>top sheets, for line loads up to 3 <math>kN \cdot m^{-1}</math> : <math>\geq</math> EPS 120</li> <li>top sheets, for line loads up to 5 <math>kN \cdot m^{-1}</math> : <math>\geq</math> EPS 200</li> <li>compressive strength at 1% <ul style="list-style-type: none"> <li>for EPS120 (kPa) : <math>\geq</math> 60</li> <li>for EPS200 (kPa) : <math>\geq</math> 90</li> </ul> </li> </ul> </li> <li>Reaction to fire, Euroclass <ul style="list-style-type: none"> <li>EPS120 &amp; variable width board (white) : F (NPD)*</li> <li>EPS120E &amp; variable width board (white) : E*</li> <li>platinum EPS120E &amp; variable width board : E*</li> <li>EPS200 (white) : F (NPD)*</li> </ul> </li> <li>Water vapour diffusion resistance factor <math>\mu</math> (-) <ul style="list-style-type: none"> <li>EPS120 : 30-70*</li> <li>EPS200 : 40-100*</li> </ul> </li> </ul> <p><b>EPS infill blocks</b></p> <ul style="list-style-type: none"> <li>Declared thermal conductivity <math>\lambda_D</math> (<math>W \cdot m^{-1} \cdot K^{-1}</math>) <ul style="list-style-type: none"> <li>Platinum Beamshield Plus EPS : 0.030*</li> <li>Beamshield Plus EPS : 0.038*</li> </ul> </li> <li>Mechanical properties <ul style="list-style-type: none"> <li>the infill blocks shall have adequate resistance to withstand loads applied during the construction phase and minimum cut-length and bearing width defined by the Agrément holder<sup>33</sup></li> <li>infill blocks : R1a*</li> </ul> </li> <li>Reaction to fire, Euroclass : F (NPD)*</li> </ul>
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**3 Independently assessed system characteristics of components used for critical functions \*\*)**  
(continued)

**Required beam width**

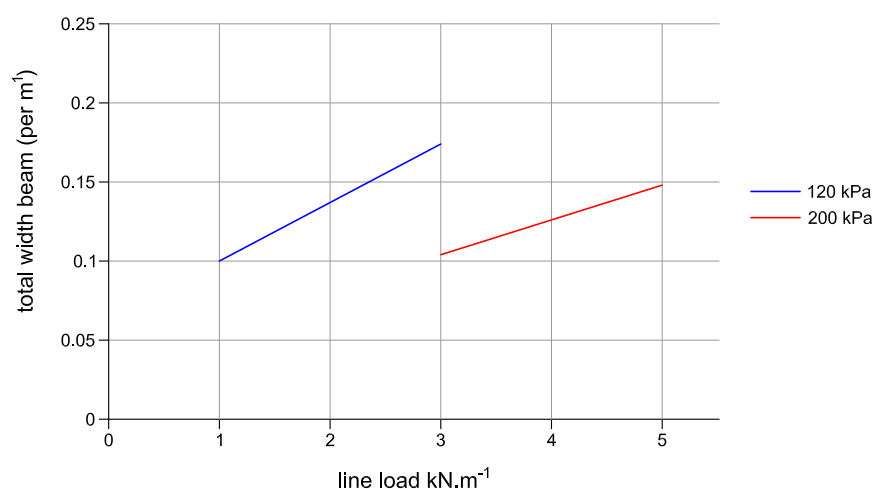
- Beams parallel under a partition wall
  - the required beam width for top sheets of EPS120 and EPS200 is given in Figure 1<sup>15</sup>;

Figure 1 - Graph of the required total beam width parallel under a partition wall



- the minimum required beam width (m) under a partition wall as a function of the EPS grade is given in BDA Report 15-B-0535<sup>15</sup>.
- Beams perpendicular under partition walls (per m<sup>1</sup>)
  - the required beam width for top sheets of EPS120 and EPS200 is given in Figure 2<sup>15</sup>;

Figure 2 - Graph of the required total beam width (per m<sup>1</sup>) perpendicular to partition walls



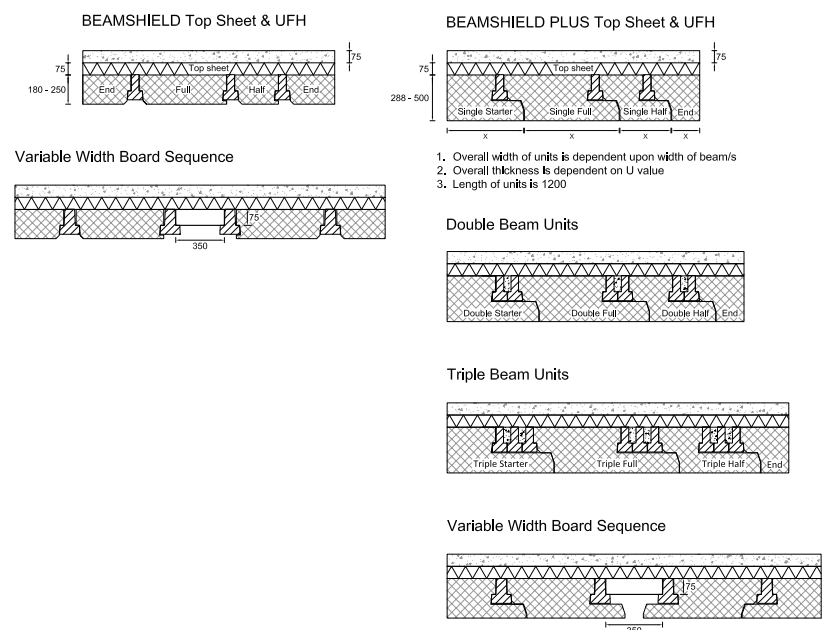
- the minimum required beam width (m • m<sup>-1</sup>) under a partition wall as a function of the EPS grade is given in BDA Report 15-B-0535<sup>15</sup>.

**Guidance for the specifiers of T-beam supported suspended floors**

- partition walls running parallel to beams shall be installed directly above, or within a maximum distance from supporting beams;
- partition walls perpendicular to beams shall be supported by a minimum number of beams according to the Agrément holders requirements;
- there are not to be joints in the topsheets running parallel to and above the PCC beam or beams within the width of the beam or beams for their full length, nor joints perpendicular to the PCC beam or beams within the width of the beam or beams within 375 mm of the centreline of a span perpendicular partition;
- the exact position of partition walls will vary according to beam width and configuration;
- the Agrément holders guidelines are supplementary to the structural requirements of the beams themselves and shall be taken into consideration by the specifier of the floor.

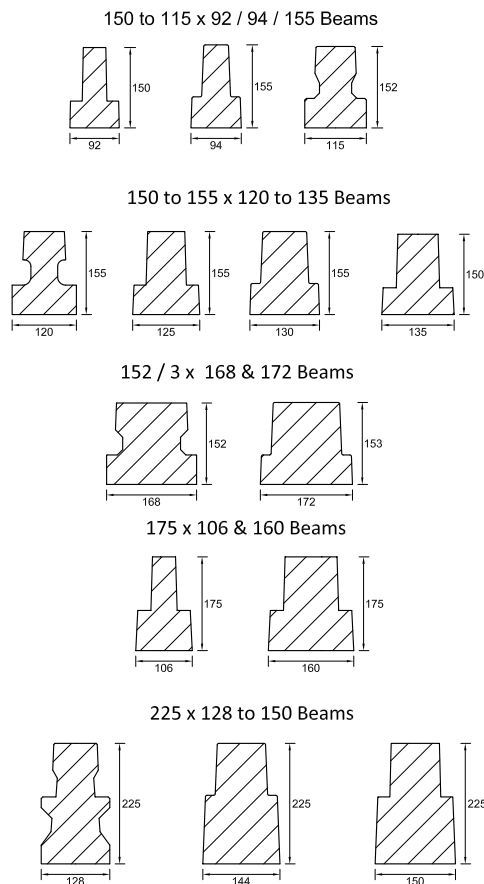
**Beamshield systems range**  
The full range of the Springvale Beamshield Top Sheet, UFH/Beamshield Plus Top Sheet, Plus UFH Flooring Insulation Systems is given in Figure 3.

Figure 3 - Range of The Systems



**Typical pre-cast concrete beams**  
Examples of typical pre-cast concrete beams for The Systems are given in Figure 4.

Figure 4 - Examples of typical pre-cast concrete beams



<b>4 Independently assessed ancillary items used for critical functions<sup>*)</sup></b>	<p>In conjunction with the EPS blocks several ancillary items are used according to the following specifications (See also section 9 'Examples of details').</p> <ul style="list-style-type: none"> <li>• <b>Platinum EPS and White EPS edge strips</b> <ul style="list-style-type: none"> <li>- for insulation of the perimeter of the structural concrete topping.</li> </ul> </li> <li>• <b>Pre-stressed concrete beams</b> <ul style="list-style-type: none"> <li>- as given in Figures 3 and 4, CE marked and designed according to BS EN 1992-1-1<sup>8</sup>, BS EN 206<sup>10</sup>, BS 8500-1<sup>11</sup> and BS 8500-2<sup>12</sup>. See also section 8.7.</li> </ul> </li> <li>• <b>Concrete topping</b> <ul style="list-style-type: none"> <li>- as specified in Tables 2 to 5 in section 8.7, dependent on the expected floor usage;</li> <li>- when reinforced with steel mesh the topping shall be designed according to BS EN 1990<sup>5</sup> and BS EN 1992-1-1<sup>8</sup> and their respective UK National Annexes<sup>6,9</sup>, with a maximum aggregate size of 10 mm. See also section 8.7;</li> <li>- when reinforced with polymer fibres, these must be CE marked according to BS EN 14889-2<sup>4</sup>, the topping shall be designed according to BS EN 1990<sup>5</sup> and BS EN 1992-1-1<sup>8</sup> and their respective UK National Annexes<sup>6,9</sup>, taking into account Technical Report TR 65<sup>13</sup>, with a minimum specification as defined in Table 2 of this Agrément.</li> </ul> </li> <li>• <b>Concrete closure blocks</b> <ul style="list-style-type: none"> <li>- the compressive strength shall be equal to or greater than the compressive strength of the blocks used to form the inner leaf of the wall.</li> </ul> </li> </ul>
<b>5 Factory Production Control (FPC)</b>	<p>Kiwa N.V., Technical Assessment Body, represented by Kiwa Ltd. has determined that Springvale EPS Ltd., with respect to The Systems fulfill all provisions concerning the specifications described in this Agrément. The FPC audit conducted on the 20<sup>th</sup> - 21<sup>st</sup> January 2016<sup>26</sup> demonstrated that Springvale have a satisfactory Quality Management System and are committed to operating an effective Quality System throughout their activities. Based on information provided during the audit / site inspection a positive recommendation is given to BDA as the 'new' system (existing Beamshield block + additional EPS layer) meets all aspects of the BDA Agrément<sup>®</sup> and relevant building regulations.</p>
<b>6 Quality Management System</b>	<p>Springvale operate an effective and well maintained Quality Management System (QMS). For the Index, Scope and Quality Policy Springvale are certified to ISO 9001:2008 (BSI, Agrément No. FM 13871, issued 14/07/2015) and have an EC Agrément of Factory Production Control (Agrément No. 0086-CPD-596316 issued by BSI on 13/06/2013).</p>
<b>7 Continuous surveillance</b>	<p>In order to demonstrate that the FPC is in conformity with the requirements of the technical specification described in this Agrément the continuous surveillance, assessment and approval of the FPC will be done in a frequency of not less than once per year by Kiwa Ltd.</p>
<b>8 Points of attention for the specifier</b>	<ol style="list-style-type: none"> <li><b>1 Delivery, transport and site handling</b> <ul style="list-style-type: none"> <li>- the EPS blocks are wrapped in polythene, but otherwise unprotected. Therefore, care shall be taken during transit and storage to avoid damage. Particular attention is required for blocks with extended toe widths; further measures are given in section 10.</li> </ul> </li> <li><b>2 Permitted constructions</b> <ul style="list-style-type: none"> <li>- only constructions designed according to the specifications as given in this Agrément and as shown in section 9 or similar are allowed under this Agrément; in each case the specifier will have to cooperate closely with the holder of this Agrément.</li> </ul> </li> <li><b>3 Building physics - general</b> <ul style="list-style-type: none"> <li>- the building physical behaviour of floors incorporating one of The Systems shall be verified as suitable by a specialist; the specialist can be either a qualified employee of the specifier or a qualified consultant; the qualified person will check the building physical behaviour of the designed floor construction and if need be, advise about improvement to achieve the final specification; it is recommended that he would cooperate closely with the holder of this Agrément.</li> </ul> </li> <li><b>4 Thermal performance aspects</b> <ul style="list-style-type: none"> <li>- for the purpose of U-value calculations and to determine if the requirements of the national Building Regulations are met, the thermal resistances of the constructions shall be calculated according to BS EN ISO 6946<sup>21</sup>, BR443<sup>22</sup>, and BS EN ISO 10211<sup>23</sup> as appropriate; also the recommendations in the Thermal Bridging Guide<sup>25</sup> should be observed;</li> <li>- the Agrément holder can provide a service to provide for 2D and 3D calculations for numerically modelled EPS block and beam configurations, complying to BS EN ISO 13370<sup>24</sup>, BS EN ISO 10211<sup>23</sup> and BR497<sup>36</sup>;</li> </ul> </li> </ol>
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**8 Points of attention for the specifier**  
(continued)

- the requirement for limiting the heat loss through the building fabric, including the effect of thermal bridging can be satisfied if the U-values of the building elements do not exceed the maximum values in the relevant Elemental Methods given in the national Building Regulations of England (Approved Document L), Wales (Approved Document L), Scotland (Technical Standards Regulations 9) and Northern Ireland (Technical Booklet F); further information on regulations is given in section 11 of this Agrément.

**5 Junction linear thermal transmittance ( $\psi$ ) values**

- the Agrément holder's service for numerical calculations also includes calculations for  $\psi$ -values such as given in section 9 including external walls (perpendicular and parallel), party walls, thresholds and temperature factors;
- these  $\psi$ -values depend on several parameters such as system types (Figure 3) beam dimensions (Figure 4), EPS block and beam configurations, external wall configurations and foundation configurations;
- default system  $\psi$ -values are given in Table 1, other values can be modelled according to BR497<sup>32</sup> 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 1 - Default  $\psi$ -values ( $W \cdot m^{-1} \cdot K^{-1}$ ), according to SAP 2012 Conventions<sup>35</sup>

Junction	$\psi$ -value
External wall	0.32
Party wall	0.16

**6 Condensation risk (see also figures 5 to 8, section 9)**

- external walls and ground floors incorporating the systems will adequately limit the risk of interstitial condensation when designed in accordance with BS 5250<sup>18</sup>; a condensation risk analysis shall be completed by the specifier at design stage;
- to help minimise the risk of interstitial condensation, the void space beneath the lowest point of the floor construction shall 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 shall be not less than  $1500 \text{ mm}^2 \cdot \text{m}^{-1}$  run of external wall or  $500 \text{ mm}^2 \cdot \text{m}^{-2}$  of floor area, whichever is the greater; where pipes are used to carry ventilating air, these shall be at least 100 mm in diameter;
- when designed and installed in accordance with this Agrément the systems will contribute to a convection-free envelope of high vapour resistance;
- to minimise the risk of interstitial condensation at junctions with external walls, specifiers shall ensure that wall insulation extends to at least 150 mm beyond the bottom of the beam;
- to minimise the risk of condensation at service penetrations, care should be taken to minimise gaps in the insulation layer, for example by filling with expanding foam insulation.

**7 Structural performance**

**7.1 General**

- the structural engineer must ensure that the concrete beams and structural topping are suitable for the intended use.

**7.2 EPS infill blocks and top sheets**

- the EPS infill blocks and top sheets provide a formwork to the structural concrete topping; only the top sheets make a further contribution to the long-term structural performance of the floor in the form of load spreading (see section 3), once the structural concrete topping has been placed and has obtained its full design strength;
- installation of Beamshield Plus units requires free movement of beams; this will also assist with fitting multiple beam units and thicker units;
- placing beams in contact with parallel walls shall be avoided as this creates a cold bridge;
- it is good practice to begin each bay with a starter unit; proceed installing the units in the direction of the toe and continue to the opposite wall; do not change direction as this could lead to gaps in the insulation envelope;
- the span of the concrete topping over the first or last beam shall be no greater than 300 mm; end units are cut from half or full Beamshield Plus units; ensure that this is done accurately and squarely so they closely about the inner leaf;
- where possible position the final cut unit against the inner leaf;
- to reduce the risk of accidental penetration of the EPS during the construction phase spacers for supporting mesh reinforcement should be located on spreader plates over the EPS top sheets.

**8 Points of attention for the specifier**  
(continued)

**7.3 Structural concrete topping**

- the concrete topping thickness and reinforcement specification must be determined in accordance with BS EN 1992-1-1<sup>8</sup> by a qualified structural engineer;
- the concrete topping shall be according to BS 8500-1<sup>11</sup>, BS 8500-2<sup>12</sup> and BS EN 206<sup>10</sup>, manufactured in plants covered by the QSRMC scheme (Quality Scheme for Ready Mixed Concrete) and laid by personnel with the appropriate skills and experience;
- the specifications in Table 2 are suitable for single-family self-contained dwelling blocks and communal areas in blocks of flats with the characteristic imposed loads defined in Table 4;
- the concrete specifications in Table 3 are suitable for commercial buildings with the characteristic imposed loads defined in Table 5.

*Table 2 - Concrete topping specifications for single-family self-contained dwelling blocks and communal areas in blocks of flats with the characteristic imposed loads given in Table 4*

Overall concrete thickness above the services (mm)	Grade	Maximum aggregate size <sup>a)</sup> (mm)	Type <sup>b)</sup>	Reinforcement Specifications <sup>33</sup>
75	C25/30	10	Standard	Macro-fibre Durus S400, dosage <sup>c)</sup> of 4 kg•m <sup>-3</sup> 45 mm long, 0.9 mm diameter, tensile strength 465 MPa, E-modulus 3350 MPa and 0.9 mm diameter (Class II in accordance with BS EN 14889-2 <sup>4</sup> )
75	C25/30	10	Standard	One layer of A142 mesh to BS 4483 <sup>37</sup> with a characteristic yield strength of (f <sub>yk</sub> ) 500 N•mm <sup>-2</sup> . Nominal cover to reinforcement steel shall be 35 mm
60	C28/35	10	Standard	One layer of A142 mesh to BS 4483 <sup>37</sup> with a characteristic yield strength of (f <sub>yk</sub> ) 500 N•mm <sup>-2</sup> . Nominal cover to reinforcement steel shall be 27 mm

a) The aggregate for the concrete shall comply with BS EN 12620

b) Specification and workability of the concrete should be selected as appropriate for the intended installation method, in accordance with BS 8500-1 and BS EN 206

c) The minimum residual flexural tensile strength of macro-polymer fibre concrete topping is 1.61 MPa at 0.5 mm CMOD and 1.73 MPa at 3.5 mm CMOD (crack mouth opening displacement prism test, BS EN 14889-2<sup>4</sup>)

*Table 3 - Concrete topping specifications for commercial buildings with the characteristic imposed loads given in Table 5*

Thickness (mm)	Grade	Maximum aggregate size (mm)	Type	Reinforcement
75	C25/30	10	self-levelling self-compacting concrete	steel mesh <sup>a)</sup>
75	C28/35	10	self-levelling self-compacting concrete	steel mesh <sup>a)</sup>

a) Structural mesh should be sized and designed according to BS EN 1990:2002, BS 1991-1-1:2002 and BS EN 1992-1-1:2004 and their UK National Annexes

*Table 4 - Imposed and partition loads for concrete topping reinforced with macro-polymer fibres and steel mesh A142 (kPa)*

Description	Characteristic value of loads for single-family dwellings	Characteristic value of loads for communal areas in blocks of flats
Imposed uniformly distributed load (kPa)	1.5	3.0
Imposed concentrated load (kN)	2.0	4.0
Line load partition, parallel and perpendicular to the beam (kN•m <sup>-1</sup> )	3.0	5.0
Allowance for moveable partition (kPa)	1.0	1.0



**8 Points of attention for the specifier**  
(continued)

*Table 5 - Imposed and partition loads for commercial buildings and concrete topping reinforced with steel mesh*

Description	Characteristic values of loads
Imposed UDL (kPa)	5.0
Imposed concentrated load (kN)	4.5
Line load partition parallel and perpendicular to the beam (kN•m <sup>-1</sup> )	5.0
Allowance for moveable partition (kPa)	1.0

**7.4 Pre-stressed concrete beams**

- examples of typical pre-stressed beams are given in section 3, Figure 4;
- the self-bearing pre-stressed concrete beams provide for the final strength of the floor system independently of any other constituent part of the floor system;
- the pre-stressed concrete beams must be designed in accordance with BS EN 1992-1-1 (Eurocode 2)<sup>8</sup> and its UK National Annex by a qualified and experienced individual to ensure that the beams are adequate to resist the applied loading;
- the proposed pre-stressed concrete beam must be CE marked, and manufactured and designed according to BS EN 15037-1<sup>2</sup>;
- the serviceability deflection limit of the proposed concrete beam must be in accordance with BS EN 1992-1-1<sup>8</sup>;
- the maximum effective span of the concrete beam (assumed to be a simply-supported and self-bearing beam) must be calculated using the equations from BS EN 1990<sup>5</sup>;
- where - e.g. under load-bearing walls - two or more concrete beams are placed side by side, the spaces between the beam webs should be in-filled with concrete with a minimum strength class of C25/30 to give blocking of action.

**8 Maintenance and consulting service**

- once installed strictly in accordance with the requirements of this Agrément and of the Agrément holder, the system components are within the floor structure, therefore do not require maintenance;
- the Agrément holder can provide a technical advisory service for U-value calculations and installation advice.

**9 Durability**

- once installed the EPS blocks are protected in service from agents liable to cause deterioration and will be effective as insulation for the life of the building in which they are installed;
- beneath a suspended ground floor over a ventilated void and soil the exposure condition is class XC1, in accordance with BS EN 1992-1-1<sup>8</sup>; the concrete beams will have adequate durability for this exposure condition;
- the concrete topping reinforced with steel mesh or macro-polymer fibres will have adequate durability for exposure class XC1.

Figure 5 - Beamshield Top Sheet Floor/Wall Junction

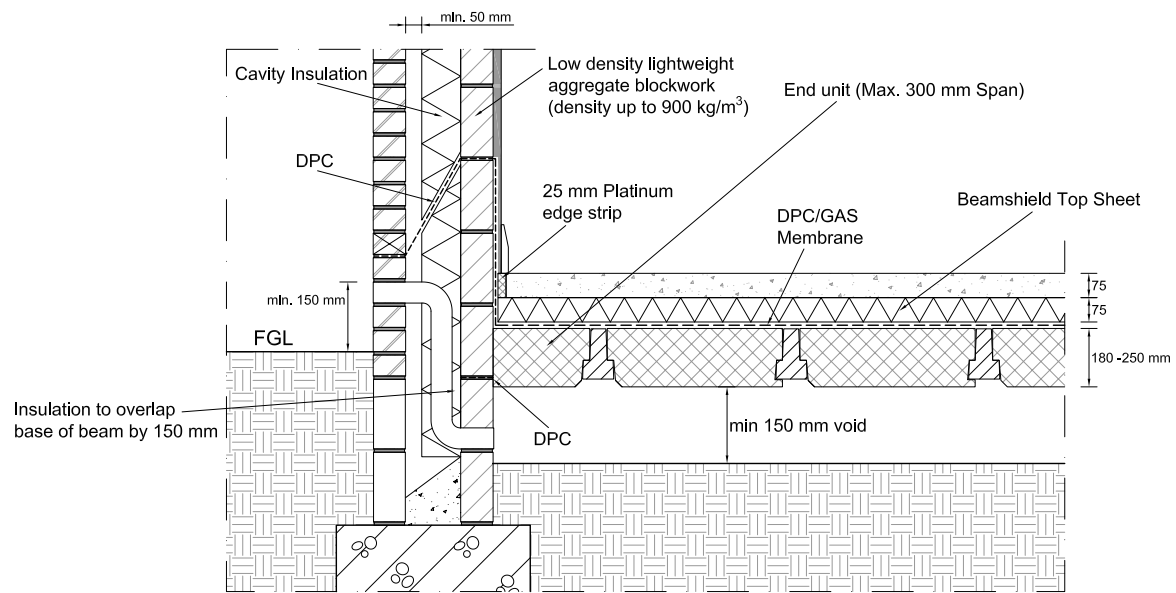


Figure 6 - Beamshield Plus Top Sheet Floor/Wall Junction

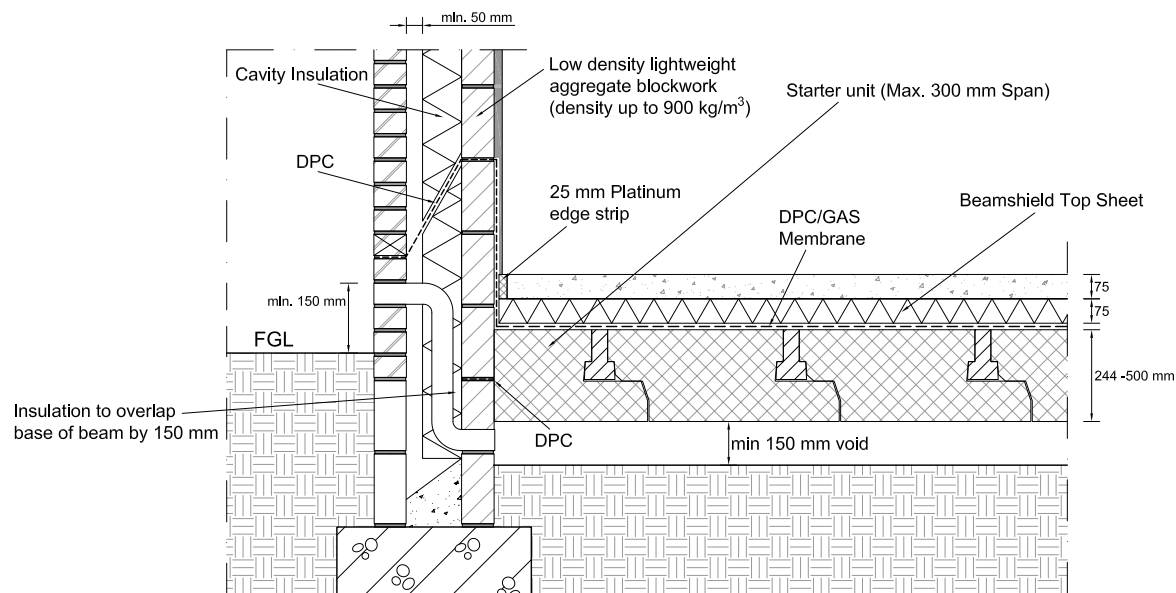


Figure 7 - Beamshield UFH Floor/Wall Junction

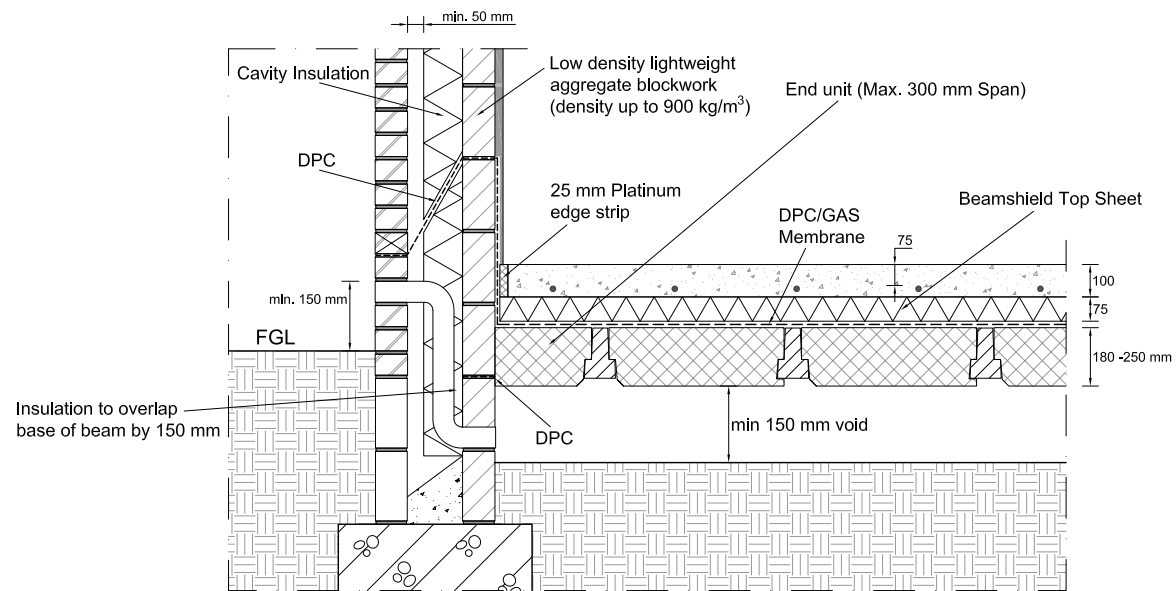
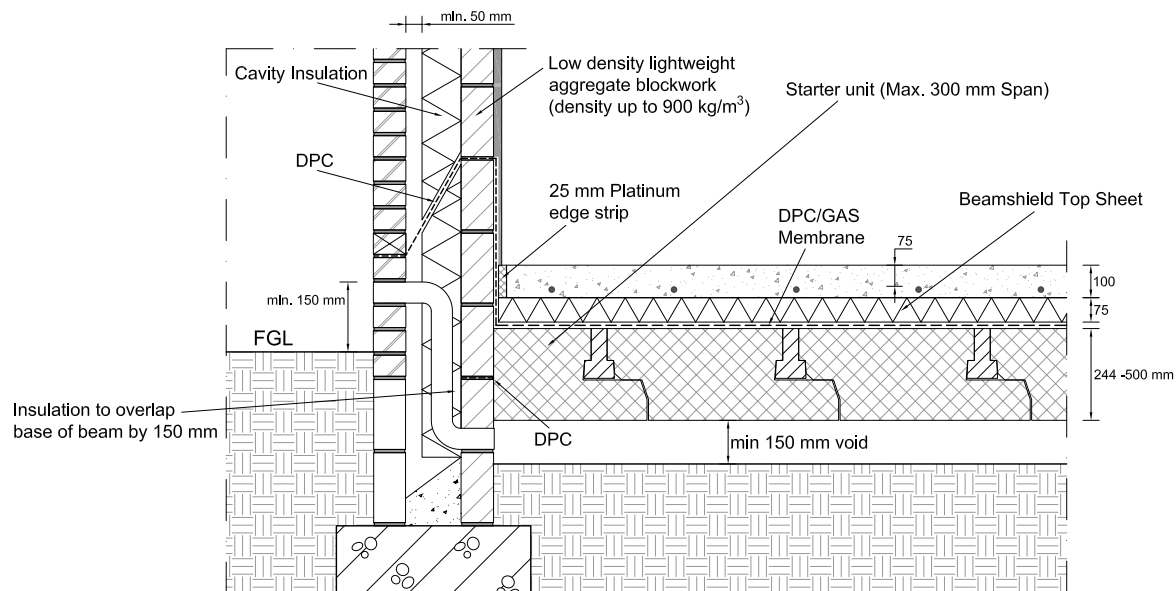


Figure 8 - Beamshield Plus UFH Floor/Wall Junction



<p><b>10 Installation procedure</b></p>	<p><b>1 General</b></p> <ul style="list-style-type: none"> <li>- installation of The Systems and ancillary items should be in accordance with the Agrément holder's requirements<sup>34</sup> and current good building practice;</li> <li>- details of the components of the systems are given in sections 3 and 4 of this Agrément;</li> <li>- during installation care must be taken to avoid damaging the components; should damage occur the concerning component shall be repaired or replaced according to the Agrément holder's requirements<sup>33</sup>; any damaged EPS blocks shall be replaced before pouring the concrete.</li> </ul> <p><b>2 Delivery and site handling</b></p> <ul style="list-style-type: none"> <li>- the EPS blocks and top sheets are delivered on site, wrapped in polythene and should include product component name, dimensions, the BDA identification mark, installation requirements, the number of this Agrément and the CE-label;</li> <li>- the EPS blocks and top sheets shall be stored in clean, dry conditions, stacked on a flat base, clear of the ground (to avoid contamination), protected against prolonged direct sunlight and secured to avoid wind damage; care must be taken to avoid contact with organic solvents;</li> <li>- the EPS blocks and top sheets shall be protected from being dropped or crushed by objects; care shall be exercised when storing large quantities on site;</li> <li>- the EPS blocks and top sheets shall not be exposed to open flame or other ignition sources and be stored away from flammable material such as paint and solvents;</li> <li>- to ensure maximum performance of the component when installed, on site precautions shall be taken to protect it from contaminants.</li> </ul> <p><b>3 Site preparation</b></p> <ul style="list-style-type: none"> <li>- the final minimum void depth shall be increased appropriately where clay soil of low medium- or high-volume change potential exists, to prevent problems associated with heave;</li> <li>- where there is good natural drainage or 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;</li> <li>- the ground beneath the floor should be free of topsoil and vegetation; oversite concrete or other surface seal is not required, but material added to bring the solum to an even surface must be hard and dry;</li> <li>- a continuous damp-proof course shall be laid along the support wall below the floor in accordance with BS 8102<sup>19</sup>.</li> </ul> <p><b>4 Installation - general</b></p> <ul style="list-style-type: none"> <li>- always ensure that a minimum <b>150 mm ventilated airspace</b> is provided beneath the Beamshield blocks; ventilators shall be positioned to allow air to pass beneath the blocks;</li> <li>- precast concrete beams shall be laid out in accordance with the relevant drawings;</li> <li>- there are not to be joints in the top sheets running parallel to and above the PCC beam or beams within the width of the beam or beams for their full length, nor joints perpendicular to the PCC beam or beams within the width of the beam or beams within 375 mm of the centreline of a span perpendicular partition.</li> </ul> <p><b>5 Beamshield Top Sheet, UFH/Beamshield Plus Top Sheet, Plus UFH</b></p> <p><b>5.1 General</b></p> <ul style="list-style-type: none"> <li>- where a block has to be cut down to length of 300 mm or less, it shall be located at the edge of the floor and extra care taken to avoid damage by foot traffic;</li> <li>- the <b>EPS blocks</b> are to be cut as appropriate to accommodate service penetrations, e.g. soil vent pipes, and the resulting gaps filled with expanding foam or other insulation to minimise local thermal bridging and air infiltration.</li> </ul> <p><b>5.2 Beamshield Top Sheet, UFH</b></p> <ul style="list-style-type: none"> <li>- all blocks shall be installed from above; it is good practice to use the appropriate block to measure the distances between beams; end blocks can be cut as required to start and end the sequence.</li> </ul> <p><b>5.3 Beamshield Plus Top Sheet, Plus UFH</b></p> <ul style="list-style-type: none"> <li>- <b>starter blocks</b> (see Figure 3) are to be attached to the first beam; the beams and blocks are then to be positioned tightly against the wall;</li> <li>- it is good practice to start each floor with a starter block and proceed in the direction of the toe to the opposite wall;</li> <li>- the correct EPS blocks shall be used with the single beams and multiple beams, to ensure that the vertical gap between an EPS block toe and the adjacent EPS block does not exceed 6 mm so that cold air does not by-pass the insulation and significantly reduce the thermal performance of the floor.</li> </ul> <p><b>5.4 Finishing (both systems)</b></p> <ul style="list-style-type: none"> <li>- profiled <b>EPS end blocks</b> (see Figure 3) can be supplied by the Agrément holder, or alternatively they can be cut on site from a full or half block; the end block shall not be more than 300 mm wide at the top;</li> <li>- a <b>gas barrier</b> membrane can be installed where required and laid over the floor in accordance with the Agrément holder's requirements<sup>34</sup>;</li> <li>- the <b>EPS top sheet</b> insulation is laid over the floor and cut with a handsaw to accommodate service holes and part sheet widths, where necessary; small offcuts can be used to seal around service penetrations.</li> </ul>	
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