A Handbook of thermal bridging details incorporating TDeck EPS blocks

Book 6 — Thermal bridging solutions for ground floor

Prepared for *Moulded Foams*

by the *BBA* and *RDL*

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Purpose of the handbook

This handbook was prepared for Moulded Foams and it provides one thermal bridging junction detail for a new dwelling, incorporating Tdeck EPS blocks. The details are for a masonry external wall with a full fill cavity wall insulation, and a ground floor constructed using Tdeck blocks with a thermal conductivity of 0.031 $W \cdot m^{-2} \cdot K^{-1}$ as defined in BBA Certificate 06/4369, Product Sheet 1. The drawing provided is for a typical detail and shows all the elements essential in achieving the calculated ψ-values. All other site requirements and all relevant building regulations must be taken into consideration when implementing the details.

The detail in this handbook includes drawings of the junction, ψ-values calculated by an experienced thermal modeller and a process checklist for use on site to facilitate the achievement of the calculated ψ-values.

List of Constructive Details

There are a total of 1 detail, labelled CD0058. To provide additional guidance for designers and specifiers the corresponding E numbers given in the latest SAP conventions document are also included.

The Handbook covers the use of the product Tdeck EPS block in suspended ground-floors.

Detail number	Detail title	SAP Ref
CD0058	FOAMGLAS PERINSUL HL External Masonry Cavity Wall. Full Fill Suspended Concrete Beam and EPS Block Floor	E5

How to use this handbook

The details have been prepared in line with the range of U values appropriate to achieve compliance within The Building Regulations 2010 (England and Wales) (as amended), Part L. Therefore all of the building elements have an upper U value limit of 0.30 $W \cdot m^{-2} \cdot K^{-1}$ for a wall and 0.25 $W \cdot m^{-2} \cdot K^{-1}$ for a floor, in line with the limiting fabric parameters given in Approved Document L1A.

The ψ-values are provided for different bands of U values. For each band the ψ-value is calculated for the worst case after considering the effect of thickness and conductivity of insulation independently. This ψ-value can therefore be taken for the complete range of U values quoted.

The wall finish drawn is plasterboard on dabs. This was chosen for consistency and also as it is a common construction method. It is not, however, essential to use this internal finish solution to achieve the stated ψ-value. The same applies for the use of rendered block or brick for the outer leaf. Additionally the mortar joints are indicative and may not necessarily coincide with those shown in the diagrams. The Tdeck EPS blocks should be used in accordance with the provisions given in BBA Certificate 06/4369, Product Sheet 1.

As a general rule, unless a specific solution for a wall or floor finish is either indicated in the *Notes* section or is explicitly mentioned in the annotations, it should be considered optional. The main driver in selecting the materials for each detail would be to achieve the U value bands as provided in each detail.

Some minimum guidance on how to achieve air tightness is also provided. As a general rule, acceptable barrier options are the use of plastercoat, blockwork inner leaf/parging coat applied to the internal face of the inner leaf with plasterboard cover, or plasterboard on dabs. Where plasterboard on dabs is used, a continuous ribbon of adhesive should also be applied around all openings, along the top and bottom of the wall and at internal and external corners. In general, all penetrations through the air barrier should be sealed with a flexible sealant. This type of guidance can also be found in the current Accredited Construction Details, available at the DCLG portal.

A series of tips on interpreting the information in each Constructive Detail, is given below, starting from the first to the last page.

Front page — Illustration

The drawing

The front page drawing is in full colour, and the annotations identify the critical parameters that must be observed in order for this junction to achieve the calculated ψ-values. The annotations are also consistent with the wording used in the *Notes* section, to make it easier to read and understand the important elements.

The Notes

This section relates to the steps in the build process of the junction that are essential for the construction of the detail with regards to achieving the stated ψ-values. Any other guidance by all relevant Building Regulations must be followed and this detail focuses only on the thermal performance and provides basic guidance with regards to air tightness.

Main body — ψ-values

The drawing

The second drawing provides additional information to that given on the front page. It highlights in colour the product for which these details have been produced, in this case, the Tdeck EPS blocks. It also indicates the position of the air barrier that must be maintained and provides the necessary information to enable the U value calculation, based on the examples provided.

ψ-values

A table of ψ-values (psi-values) and temperature factors is provided for each detail. The banding of U values provides the specifier with the flexibility to use different U values for the main elements, but ensures that the calculated ψ-value is still valid within that range. The ψ-values were calculated and checked by an experienced individual, as required by Approved Document L1A.

The temperature factor is a property of the construction and is used to assess the risk of surface condensation or mould growth. In all cases the calculated values are higher than the critical temperature factor for dwellings (0.75) as given in BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings*, which limits the risk of surface condensation or mould growth.

All ψ-values have been calculated in accordance with BRE Report 497 : 2007 *Conventions for calculating linear thermal transmittance and temperature factors* and other relevant standards quoted within that document.

U value examples

Some indicative guidance on the insulation thickness and thermal conductivity values required to achieve the U value example constructions in walls is also provided. There is no specification for the type of insulation used, but the necessary information is provided to enable the calculations to be repeated. The U values were calculated in accordance with BRE Report (BR 443 : 2006) *Conventions for U-value calculations* and other relevant British Standards.

A fully detailed wall U value calculation using the stated thickness and thermal conductivity values may produce lower wall U values than that indicated in the details, as only the minimum amount of information is provided, such as thickness and conductivity of insulation. Other combinations of thicknesses and conductivities can be used to achieve the wall U values, and as long as these are within the bands provided, the corresponding ψ-value will still be valid. This provides the user with considerable flexibility compared to more traditional representations of ψ-values, while maintaining the accuracy and technical rigour of the calculation.

Last page — checklist

Guidance checklist

This part of the detail relates to the quality assurance aspect, which used in combination with the guidance given on the first page, would provide reassurance to the builder that this detail will perform as expected. The *Notes* box is intended for the inspector or the site supervisor to record any additional information or changes that may have occurred to the final built detail. It can be used as a log of the work done for each detail and as a process for checking by the site supervisor, to ensure the detail was constructed as detailed and so that the calculated ψ-values can be achieved

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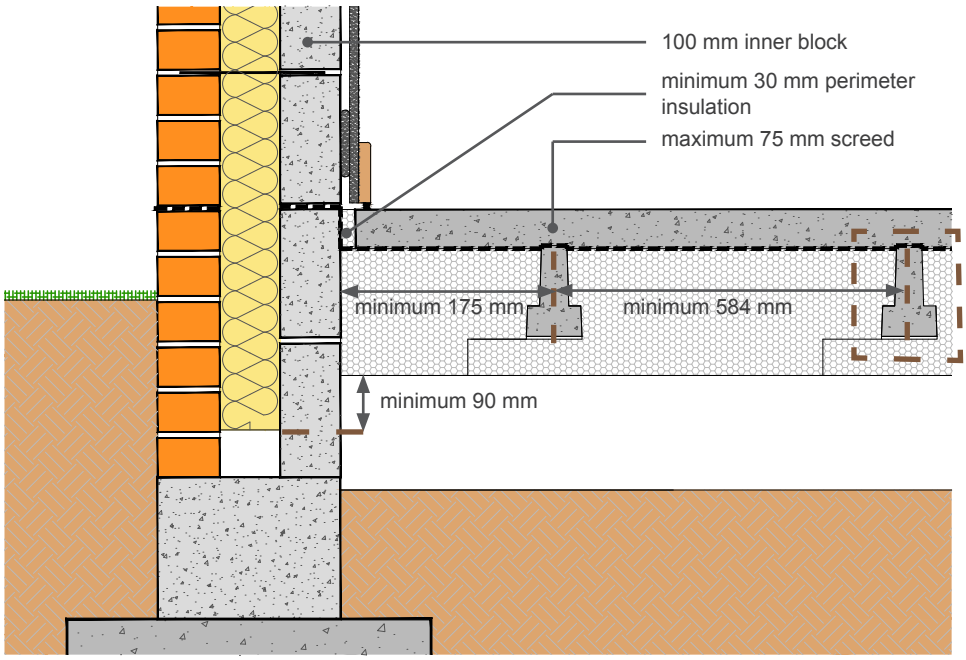
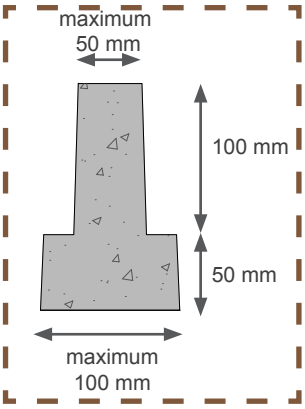
External Masonry Cavity Wall. Full Fill

Suspended Concrete Beam and EPS Block Floor

CD0058





This indicative guidance illustrates good practice for design and construction with respect to achieving thermal performance and air barrier continuity only. It must be implemented taking due regard of site conditions and all other requirements imposed by Building Regulations.

Notes

- Tdeck EPS flooring panel system with a thermal conductivity value of 0.031 $W \cdot m^{-1} \cdot K^{-1}$
- 100 mm wall inner block above and below dpc with a maximum thermal conductivity of 0.19 $W \cdot m^{-1} \cdot K^{-1}$
- perimeter insulation strip with a minimum 30 mm width and a maximum thermal conductivity of 0.031 $W \cdot m^{-1} \cdot K^{-1}$ and installed up to floor finish
- maximum screed thickness 75 mm
- wall insulation to continue at least 90 mm from bottom of floor insulation
- 175 mm minimum distance between the first beam and the wall inner leaf
- minimum 584 mm beam full centres
- beam dimensions as per drawing above
- ensure that the full fill wall insulation is installed correctly between the inner and outer leaf of the cavity wall with no gaps and that is fit for purpose with regards to water absorption and wall exposure
- ensure that the floor insulation tightly abuts blockwork wall
- ensure there is a seal between the wall and the floor air barrier, and that there are no gaps between skirting board and the floor (other improved air barrier continuity solutions can be used).

External Masonry Cavity Wall. Full Fill

Suspended Concrete Beam and EPS Block Floor

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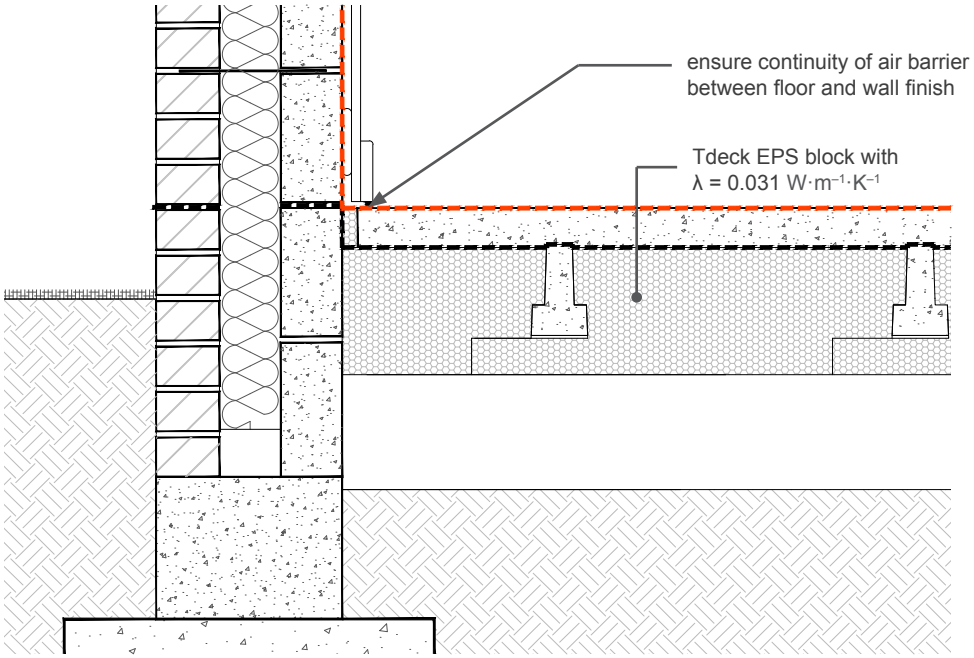

This indicative guidance illustrates good practice for design and construction with respect to achieving thermal performance and air barrier continuity only. It must be implemented taking due regard of site conditions and all other requirements imposed by Building Regulations.

Calculated ψ-values for this detail

Tdeck EPS panel overall thickness between 190 mm and 300 mm

Wall U values ($W \cdot m^{-2} \cdot K^{-1}$)	Beams parallel to junction				Beams perpendicular to junction[1]	
	Starter or end blocks width ≥ half of full centres		Starter or end blocks width < half of full centres			
	ψ-value ($W \cdot m^{-1} \cdot K^{-1}$)	Temperature factor	ψ-value ($W \cdot m^{-1} \cdot K^{-1}$)	Temperature factor	ψ-value ($W \cdot m^{-1} \cdot K^{-1}$)	Temperature factor
0.26≤ U ≤0.30	0.063	0.93	0.114	0.92	0.089	0.90
0.21≤ U ≤0.25	0.060	0.94	0.111	0.92	0.083	0.91
U ≤0.20	0.059	0.94	0.109	0.93	0.077	0.91

Tdeck EPS panel overall thickness between 301 mm and 400 mm

Wall U values	Beams parallel to junction				Beams perpendicular to junction[1]	
	Starter or end blocks width ≥ half of full centres		Starter or end blocks width < half of full centres			
	ψ-value ($W \cdot m^{-1} \cdot K^{-1}$)	Temperature factor	ψ-value ($W \cdot m^{-1} \cdot K^{-1}$)	Temperature factor	ψ-value ($W \cdot m^{-1} \cdot K^{-1}$)	Temperature factor
0.26≤ U ≤0.30	0.064	0.93	0.084	0.93	0.091	0.91
0.21≤ U ≤0.25	0.061	0.94	0.082	0.94	0.083	0.91
U ≤0.20	0.058	0.95	0.078	0.94	0.077	0.92

(1) 75% (minimum) area comprising single beams at full centres (minimum 584 mm) and 25% area comprising any combination of single or double beams at full or half centres

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Suspended Concrete Beam and EPS Block Floor

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Examples of floor U values for Tdeck EPS Panels can be found in BBA Certificate 06/4369

Examples of constructions achieving the required wall U values are shown below and in all cases, the wall ties are stainless steel double triangle types (2.5 per m^2) with the use of 100 mm blocks with thermal conductivity of 0.19 $W \cdot m^{-1} \cdot K^{-1}$ or less.

Wall U values ≤ 0.30 $W \cdot m^{-2} \cdot K^{-1}$ can be achieved with:
— 100 mm ≤ insulation thickness ≤ 115 mm with $\lambda \leq 0.036$ $W \cdot m^{-1} \cdot K^{-1}$

Wall U values ≤ 0.25 $W \cdot m^{-2} \cdot K^{-1}$ can be achieved with:
— 120 mm ≤ insulation thickness ≤ 150 mm with $\lambda \leq 0.036$ $W \cdot m^{-1} \cdot K^{-1}$

Wall U values ≤ 0.20 $W \cdot m^{-2} \cdot K^{-1}$ can be achieved with:
— 155 mm minimum insulation thickness with $\lambda \leq 0.036$ $W \cdot m^{-1} \cdot K^{-1}$.

External Masonry Cavity Wall. Full Fill

Suspended Concrete Beam and EPS Block Floor

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Guidance Checklist

Date: ..... Site Manager/Supervisor: .....

Site name: ..... Plot No: .....

Ref.	Item	Yes/No	Inspected (initials & date)
1	Is the wall inner leaf 100 mm with $\lambda = 0.19$ W·m^{-1}·K^{-1} or less?	☐ ☐	.....
2	Is the perimeter insulation as specified?	☐ ☐	.....
	— Minimum 30 mm width and $\lambda = 0.031$ W·m^{-1}·K^{-1} or less	☐ ☐	.....
	— Installed up to floor finish	☐ ☐	.....
3	Is the full fill insulation continued at least 90 mm below the underside of the floor insulation?	☐ ☐	.....
5	Is the distance between the first beam and the wall inner leaf 175 mm or greater?	☐ ☐	.....
6	Are beam full centres 584 mm or greater?	☐ ☐	.....
7	Are the beam dimensions as per drawing?	☐ ☐	.....
8	Is the floor insulation firmly against the blockwork wall leaving no gaps?	☐ ☐	.....
9	Is the wall full fill insulation installed correctly with no gaps?	☐ ☐	.....
10	Is the wall full fill insulation appropriate for moisture and wall exposure?	☐ ☐	.....
11	Is the continuity of the air barrier between the floor and the wall achieved? If not, please provide details.	☐ ☐	.....

Notes (include details of any corrective action)

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