

# Thermal Insulation

## Introduction

New measures to improve the energy efficiency of buildings have been introduced by the Government.

- The intention is to meet the requirements of The Energy Performance of Buildings Directive (EPBD) which aims to further combat climate change and requires buildings to be both better insulated and to make use of more efficient heating systems.
- The changes to Approved Documents (conservation of fuel and power) of the Building Regulations for England and Wales came into force on 6th April 2006.
- The revised Approved Document will also make air leakage pressure testing of buildings mandatory, thereby improving compliance with the regulations.
- The use of Robust Details for airtightness of dwellings may provide an alternative to routine testing, although at present the required details have not yet been developed.

Guidance is given below on compliance to satisfy the requirements of Building Regulation L1 (England and Wales) 2006, with respect to Hanson's aggregate blocks.

Different requirements apply in Scotland. Please refer to technical standard J of the Building Standards (Scotland) Regulations.

## Approved Documents

The new Part L Approved Documents are in 4 sections as follows:

### Part L1 Housing

1. Approved Document L1A New dwellings
2. Approved Document L1B Existing Dwellings

### Part L2 Non Dwellings

3. Approved Document L2A New buildings other than dwellings
4. Approved Document L2B Existing buildings other than dwellings

A number of other publications are listed in the Approved Documents and are relevant to assess compliance.

### Part L1A

The guidance in Approved Document L1A is limited to new dwellings with a total floor area not greater than 450m<sup>2</sup>. For dwellings exceeding this size,

compliance can be assessed using a calculation procedure known as the Simplified Building Energy Model (SBEM). Conservatories with a floor area greater than 30m<sup>2</sup> must comply with Approved Document L1.

### Part L1A requirements - dwellings

The 2006 amendments to Part L1 seek to achieve about a 20% reduction in carbon emissions when compared to dwellings built to the 2002 standards of thermal insulation. Compliance can only be demonstrated using a revised Standard Assessment Procedure (SAP 2005) calculation method.

### SAP 2005 & Emission rates

The use of SAP 2005 will result in the reporting of CO<sub>2</sub> emissions from:

1. Space and water heating, (CH) and
2. The use of internal fixed lighting (CL).

The Target CO<sub>2</sub> Emission Rate (TER) will need to be determined. This is calculated using approved software based on SAP 2005 and is, in turn, based upon a notional building which assumes a 20% improvement on the 2002 regulation design values. The following formula is used to determine the TER:

$$\text{TER} = (\text{CH} \times \text{fuel factor} + \text{CL}) \times (1 - \text{improvement factor}).$$

The fuel factor is a tabulated value from Approved Document L1 and is dependent on the fuel type. The Dwelling CO<sub>2</sub> Emission Rate (DER) is calculated based on the energy features of the proposed dwelling. It needs to be carried out twice.

- |        |  |
|--------|--|
| First  | based on the 'as designed' construction for submission to Building Control.  |
| Second | On completion taking into account the actual construction and services, as well as the actual air permeability found from site tests. Neither should be worse than the TER for the dwelling to comply. |

### Compliance criteria

Once the TER has been calculated, compliance is met by following five criteria.

#### Stage 1

Check (by calculation) that the predicted rate of carbon dioxide emissions from the dwelling (DER) is not greater than the Target CO<sub>2</sub> Emission Rate (TER).

## Stage 2

The dwelling fabric and the fixed services should have performance values no worse than the specified design limits.

## Stage 3

The dwelling should include appropriate passive control measures to limit the effect of solar gains on indoor temperatures.

## Stage 4

The performance of the dwelling, as built, is consistent with the DER. This requires a check to ensure that any changes in performance and specification of materials between design and construction do not affect the TER. A final calculation of the DER is required to confirm compliance.

## Stage 5

Information concerning the energy efficient operation of the dwelling should be provided to the occupier. This will include operating and maintenance instructions produced in such a way that householders can understand.

This information is expected to be included as part of the 'Home Information Pack'.

## Limits on design flexibility

For design purposes, the limiting U-Values shown in Table 7 should not be exceeded. In practice, the envelope standards would need to be better than the limiting values.

Table 7: Design limit U-Values

Element	(a) Area - weighted dwelling average	(b) Worst individual sub-element
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows, roof windows, roof lights & doors	2.2	3.3

## Limiting the effects of solar gains in summer

Designers need to check that the dwelling is not prone to summertime overheating. High mass structures perform well in this area by being able to store heat during the daytime and releasing heat as the dwelling cools down overnight. Maximum advantage will result from the use of aggregate blocks in external and internal walls as well as ground and intermediate beam and block flooring. Lighter forms of construction do not possess the potential for high thermal mass.

Other steps could include an appropriate combination of window size and orientation, solar protection through shading, ventilation etc. Reference should be made to 'CE 129 Reducing Overheating - A Designer's Guide'; for more information.

## Quality of construction

It is important to note that insulation should be continuous over the whole dwelling envelope and that the air permeability is within a reasonable limit.

To ensure that the performance of the dwelling as built is consistent with the DER, a check is required to ensure that any changes in performance and specification of materials between design and construction do not affect the TER. A final calculation of the DER is required to confirm compliance. If the dwelling does not comply, then appropriate remedies will be required. A checklist is provided in Approved Document L1A to aid identification of non-conformities.

For details of how to comply with the requirements of Parts L1B, L2A and L2B, please consult the relevant Approved Documents. Details of the changes relating to Part L were reproduced from the technical data sheets compiled by the Concrete Block Association.

## Aggregate block solutions

Although the performance values of the building envelope will depend on factors such as air permeability values, fuel type and heating efficiency, it is likely that wall U-Values of 0.27- 0.35W/m<sup>2</sup>K will be required. Examples of aggregate block solutions to meet this level of performance are detailed on pages 42-47.

The U-Values given in this brochure are correct at the time of going to press and are based on manufacturers' details available at that time. Details of insulation products featured in the construction solutions can be obtained from the companies listed below:

Knauf Insulation Tel. 01744 766 666  
[www.knaufinsulation.co.uk](http://www.knaufinsulation.co.uk)

British Gypsum-Isover Tel. 0115 945 1143  
[www.isowool.com](http://www.isowool.com)

Rockwool Ltd Tel. 01656 862 621  
[www.rockwool.co.uk](http://www.rockwool.co.uk)

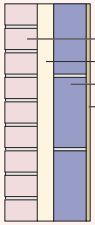
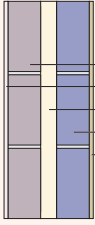
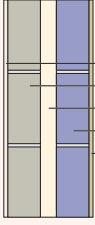
Kingspan Insulation Group Tel. 0870 733 8333  
[www.insulation.kingspan.com](http://www.insulation.kingspan.com)

Xtratherm UK Ltd Tel. 0871 222 1033 [www.xtratherm.com](http://www.xtratherm.com)  
Celotex Ltd Tel. 01473 822 093  
[www.celotex.co.uk](http://www.celotex.co.uk)

# Thermal insulation

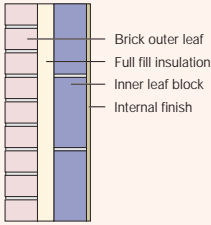
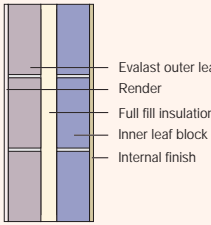
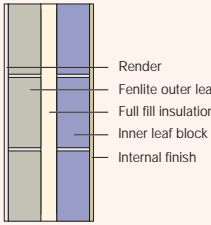
## Full fill construction

Table 8: minimum thickness of insulation to achieve a 0.27 W/m<sup>2</sup>.K U-Value (actual U-Value in brackets). 100mm inner leaf block width.

0.27	Insulation conductivity W/m.K	Evalast	Fenlite	Fenlite 1500	Evalite Standard	Superlite	Ultralite	Internal finish
 <p>Brick outer leaf Full fill insulation Inner leaf block Internal finish</p>	0.032	n/a	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	Dense plaster
	0.034	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	0.036	125 (0.27)	125 (0.26)	125 (0.27)	125 (0.26)	125 (0.26)	125 (0.26)	
	0.040	145 (0.27)	140 (0.27)	140 (0.27)	140 (0.27)	135 (0.27)	135 (0.26)	
	0.032	n/a	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.26)	Lightweight plaster
	0.034	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	0.036	125 (0.27)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)
	0.040	125 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	135 (0.26)
	0.032	100 (0.27)	100 (0.26)	100 (0.26)	100 (0.26)	100 (0.26)	100 (0.26)	Plasterboard on dabs
	0.034	n/a	n/a	n/a	n/a	100 (0.27)	100 (0.27)	
	0.036	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.25)	125 (0.25)	
	0.040	140 (0.27)	130 (0.27)	135 (0.27)	135 (0.27)	130 (0.27)	130 (0.27)	
 <p>Evalast outer leaf Render Full fill insulation Inner leaf block Internal finish</p>	0.032	n/a	100 (0.27)	n/a	100 (0.27)	100 (0.27)	100 (0.27)	Dense plaster
	0.034	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	0.036	125 (0.27)	125 (0.27)	125 (0.27)	125 (0.27)	125 (0.26)	125 (0.26)	
	0.040	145 (0.27)	140 (0.27)	140 (0.27)	140 (0.27)	140 (0.27)	135 (0.27)	
	0.032	n/a	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.26)	Lightweight plaster
	0.034	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	0.036	125 (0.27)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)
	0.040	140 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	135 (0.26)
	0.032	100 (0.27)	100 (0.26)	100 (0.26)	100 (0.26)	100 (0.26)	100 (0.26)	Plasterboard on dabs
	0.034	n/a	n/a	n/a	n/a	n/a	100 (0.27)	
	0.036	125 (0.27)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	
	0.040	140 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	130 (0.27)	130 (0.27)	
 <p>Render Fenlite outer leaf Full fill insulation Inner leaf block Internal finish</p>	0.032	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.26)	100 (0.26)	Dense plaster
	0.034	n/a	n/a	n/a	n/a	n/a	100 (0.27)	
	0.036	125 (0.27)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.25)	125 (0.25)
	0.040	140 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	135 (0.27)	130 (0.27)	130 (0.27)
	0.032	100 (0.27)	100 (0.27)	100 (0.26)	100 (0.26)	100 (0.26)	100 (0.26)	Lightweight plaster
	0.034	n/a	n/a	n/a	n/a	n/a	100 (0.27)	100 (0.27)
	0.036	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.26)	125 (0.25)	125 (0.25)	125 (0.25)
	0.040	135 (0.27)	130 (0.27)	130 (0.27)	130 (0.27)	130 (0.27)	130 (0.27)	130 (0.26)
	0.032	100 (0.26)	100 (0.26)	100 (0.26)	100 (0.26)	100 (0.25)	100 (0.25)	Plasterboard on dabs
	0.034	n/a	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.26)	
	0.036	125 (0.26)	125 (0.25)	125 (0.25)	125 (0.25)	125 (0.25)	100 (0.27)	
	0.040	135 (0.27)	130 (0.27)	130 (0.27)	130 (0.27)	130 (0.27)	125 (0.27)	

## Full fill construction

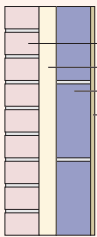
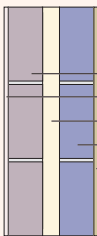
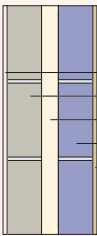
Table 9: minimum thickness of insulation to achieve a 0.30 W/m<sup>2</sup>K U-Value (actual U-Value in brackets). 100mm inner leaf block width.

0.30	Insulation conductivity W/m.K	Evalast	Fenlite	Fenlite 1500	Evalite Standard	Superlite	Ultralite	Internal finish
	0.032	100 (0.28)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	85 (0.30)	Dense plaster
	0.034	100 (0.30)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.28)	
	0.036	125 (0.27)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.29)	
	0.040	125 (0.30)	120 (0.30)	120 (0.30)	120 (0.30)	120 (0.30)	115 (0.30)	
	0.032	100 (0.28)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	85 (0.30)	Lightweight plaster
	0.034	100 (0.29)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.28)	
	0.036	125 (0.27)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.29)	
	0.040	125 (0.30)	120 (0.30)	120 (0.30)	120 (0.30)	120 (0.30)	115 (0.30)	
	0.032	100 (0.27)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	Plasterboard on dabs
	0.034	100 (0.29)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.27)	85 (0.30)	
	0.036	100 (0.30)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.29)	90 (0.30)	
	0.040	120 (0.30)	115 (0.30)	115 (0.30)	115 (0.30)	115 (0.30)	110 (0.30)	
	0.032	100 (0.28)	100 (0.27)	100 (0.28)	100 (0.27)	100 (0.27)	100 (0.27)	Dense plaster
	0.034	100 (0.30)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.28)	
	0.036	125 (0.27)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.29)	
	0.040	130 (0.30)	120 (0.30)	125 (0.30)	125 (0.30)	120 (0.30)	120 (0.30)	
	0.032	100 (0.28)	100 (0.27)	100 (0.27)	100 (0.27)	100 (0.27)	85 (0.30)	Lightweight plaster
	0.034	100 (0.30)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.28)	100 (0.28)	
	0.036	125 (0.27)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.30)	100 (0.29)	
	0.040	125 (0.30)	120 (0.30)	120 (0.30)	120 (0.30)	120 (0.30)	115 (0.30)	
	0.032	100 (0.27)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	Plasterboard on dabs
	0.034	100 (0.29)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.27)	
	0.036	100 (0.30)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.28)	
	0.040	120 (0.30)	115 (0.30)	115 (0.30)	115 (0.30)	115 (0.30)	115 (0.30)	
	0.032	100 (0.27)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.29)	Dense plaster
	0.034	100 (0.29)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.27)	
	0.036	100 (0.30)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.28)	
	0.040	125 (0.30)	115 (0.30)	120 (0.30)	120 (0.30)	115 (0.30)	115 (0.30)	
	0.032	100 (0.27)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	Lightweight plaster
	0.034	100 (0.29)	100 (0.28)	100 (0.28)	100 (0.28)	100 (0.27)	85 (0.30)	
	0.036	100 (0.30)	100 (0.29)	100 (0.29)	100 (0.29)	100 (0.29)	90 (0.30)	
	0.040	120 (0.30)	115 (0.30)	115 (0.30)	115 (0.30)	115 (0.30)	110 (0.30)	
	0.032	100 (0.27)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	85 (0.30)	Plasterboard on dabs
	0.034	100 (0.28)	85 (0.30)	100 (0.27)	100 (0.27)	85 (0.30)	85 (0.30)	
	0.036	100 (0.29)	90 (0.30)	100 (0.28)	100 (0.28)	90 (0.30)	90 (0.30)	
	0.040	115 (0.30)	110 (0.30)	110 (0.30)	110 (0.30)	110 (0.30)	110 (0.30)	

# Thermal insulation

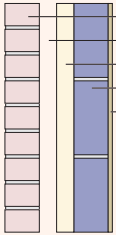
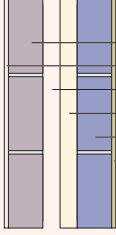
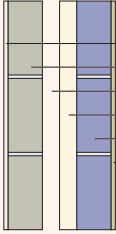
## Full fill construction

Table 10: minimum thickness of insulation to achieve a 0.35 W/m<sup>2</sup>K U-Value (actual U-Value in brackets). 100mm inner leaf block width.

0.35	Insulation conductivity W/m.K	Evalast	Fenlite	Fenlite 1500	Evalite Standard	Superlite	Ultralite	Internal finish
 <ul style="list-style-type: none"> <li>Brick outer leaf</li> <li>Full fill insulation</li> <li>Inner leaf block</li> <li>Internal finish</li> </ul>	0.032	85 (0.33)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.34)	75 (0.34)	Dense plaster
	0.034	85 (0.34)	85 (0.33)	85 (0.33)	85 (0.33)	85 (0.33)	75 (0.35)	
	0.036	90 (0.34)	85 (0.34)	85 (0.35)	85 (0.35)	85 (0.34)	80 (0.35)	
	0.040	100 (0.34)	95 (0.34)	95 (0.34)	95 (0.34)	95 (0.34)	95 (0.35)	
	0.032	85 (0.33)	75 (0.34)	75 (0.34)	75 (0.34)	75 (0.34)	75 (0.33)	Lightweight plaster
	0.034	85 (0.34)	85 (0.32)	85 (0.33)	85 (0.32)	75 (0.35)	75 (0.35)	
	0.036	90 (0.34)	85 (0.34)	85 (0.34)	85 (0.34)	80 (0.35)	80 (0.34)	
	0.040	95 (0.35)	90 (0.35)	90 (0.35)	90 (0.35)	90 (0.35)	90 (0.34)	
	0.032	75 (0.35)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.32)	Plasterboard on dabs
	0.034	85 (0.33)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.34)	75 (0.33)	
	0.036	85 (0.34)	80 (0.34)	80 (0.35)	80 (0.35)	80 (0.34)	75 (0.35)	
	0.040	95 (0.34)	90 (0.34)	90 (0.34)	90 (0.34)	85 (0.35)	85 (0.34)	
 <ul style="list-style-type: none"> <li>Evalast outer leaf</li> <li>Render</li> <li>Full fill insulation</li> <li>Inner leaf block</li> <li>Internal finish</li> </ul>	0.032	85 (0.33)	75 (0.35)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.34)	Dense plaster
	0.034	85 (0.35)	85 (0.33)	85 (0.33)	85 (0.33)	85 (0.33)	75 (0.35)	
	0.036	90 (0.35)	85 (0.35)	85 (0.35)	85 (0.35)	85 (0.34)	85 (0.35)	
	0.040	100 (0.35)	95 (0.35)	95 (0.35)	95 (0.35)	95 (0.34)	90 (0.35)	
	0.032	85 (0.32)	75 (0.34)	75 (0.35)	75 (0.34)	75 (0.34)	75 (0.33)	Lightweight plaster
	0.034	85 (0.34)	85 (0.33)	85 (0.33)	85 (0.33)	85 (0.32)	75 (0.35)	
	0.036	90 (0.34)	85 (0.34)	85 (0.34)	85 (0.34)	85 (0.34)	80 (0.35)	
	0.040	100 (0.34)	95 (0.34)	95 (0.34)	95 (0.34)	90 (0.35)	95 (0.34)	
	0.032	75 (0.35)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.32)	Plasterboard on dabs
	0.034	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.34)	
	0.036	85 (0.35)	80 (0.35)	80 (0.35)	80 (0.35)	80 (0.34)	75 (0.35)	
	0.040	95 (0.35)	90 (0.34)	90 (0.35)	90 (0.34)	90 (0.34)	85 (0.35)	
 <ul style="list-style-type: none"> <li>Render</li> <li>Fenlite outer leaf</li> <li>Full fill insulation</li> <li>Inner leaf block</li> <li>Internal finish</li> </ul>	0.032	75 (0.35)	75 (0.33)	75 (0.34)	75 (0.34)	75 (0.33)	75 (0.32)	Dense plaster
	0.034	85 (0.33)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.34)	
	0.036	85 (0.35)	80 (0.35)	80 (0.35)	80 (0.35)	80 (0.35)	80 (0.34)	
	0.040	95 (0.35)	90 (0.35)	90 (0.35)	90 (0.35)	90 (0.34)	85 (0.35)	
	0.032	75 (0.34)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.33)	65 (0.35)	Lightweight plaster
	0.034	85 (0.33)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.34)	75 (0.33)	
	0.036	85 (0.34)	80 (0.34)	80 (0.34)	80 (0.34)	80 (0.34)	75 (0.35)	
	0.040	95 (0.34)	85 (0.35)	90 (0.34)	90 (0.34)	85 (0.35)	85 (0.34)	
	0.032	75 (0.33)	65 (0.35)	75 (0.32)	75 (0.32)	65 (0.35)	65 (0.34)	Plasterboard on dabs
	0.034	75 (0.35)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.33)	75 (0.32)	
	0.036	95 (0.35)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.35)	75 (0.34)	
	0.040	90 (0.34)	85 (0.34)	85 (0.34)	85 (0.34)	85 (0.34)	80 (0.35)	

## Partial fill construction

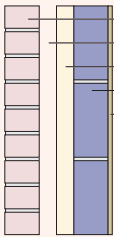
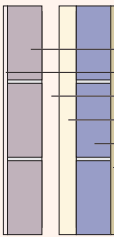
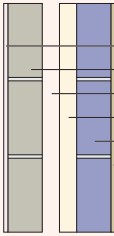
Table 11: minimum thickness of insulation to achieve a 0.27 W/m<sup>2</sup>.K U-Value (actual U-Value in brackets). 100mm inner leaf block width.

0.27	Insulation conductivity W/m.K	Evalast	Fenlite	Fenlite 1500	Evalite Standard	Superlite	Ultralite	Internal finish
	Foil faced	65 (0.27)	65 (0.26)	65 (0.27)	65 (0.27)	65 (0.26)	60 (0.27)	Dense plaster
	Cavity insulation (k=0.023W/m.K)	65 (0.27)	65 (0.26)	65 (0.26)	65 (0.26)	60 (0.27)	60 (0.27)	Lightweight plaster
	Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	65 (0.26)	60 (0.27)	60 (0.27)	60 (0.27)	60 (0.27)	60 (0.26)	Plasterboard on dabs
	Foil faced	65 (0.27)	65 (0.27)	65 (0.27)	65 (0.27)	65 (0.26)	60 (0.27)	Dense plaster
	Cavity insulation (k=0.023W/m.K)	65 (0.27)	65 (0.26)	65 (0.26)	65 (0.26)	65 (0.26)	60 (0.27)	Lightweight plaster
	Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	65 (0.27)	60 (0.27)	60 (0.27)	60 (0.27)	60 (0.27)	60 (0.26)	Plasterboard on dabs
	Foil faced	65 (0.27)	60 (0.27)	60 (0.27)	60 (0.27)	60 (0.27)	60 (0.27)	Dense plaster
	Cavity insulation (k=0.023W/m.K)	65 (0.26)	60 (0.27)	60 (0.27)	60 (0.27)	60 (0.27)	65 (0.26)	Lightweight plaster
	Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	60 (0.27)	60 (0.26)	60 (0.26)	60 (0.26)	60 (0.26)	55 (0.26)	Plasterboard on dabs

# Thermal insulation

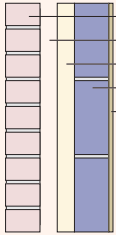
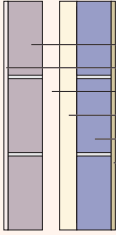
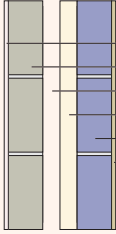
## Partial fill construction

Table 12: minimum thickness of insulation to achieve a 0.30 W/m<sup>2</sup>K U-Value (actual U-Value in brackets). 100mm inner leaf block width.

0.30	Insulation conductivity W/m.K	Evalast	Fenlite	Fenlite 1500	Evalite Standard	Superlite	Ultralite	Internal finish
	Foil faced Cavity insulation (k=0.023W/m.K) Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	60 (0.29)	50 (0.30)	50 (0.30)	50 (0.30)	50 (0.30)	50 (0.29)	Dense plaster
		55 (0.30)	50 (0.29)	50 (0.29)	50 (0.29)	50 (0.29)	45 (0.30)	Lightweight plaster
		50 (0.30)	45 (0.30)	50 (0.29)	50 (0.29)	45 (0.30)	45 (0.30)	Plasterboard on dabs
	Foil faced Cavity insulation (k=0.023W/m.K) Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	60 (0.29)	50 (0.30)	50 (0.30)	50 (0.30)	50 (0.30)	50 (0.29)	Dense plaster
		55 (0.30)	50 (0.30)	50 (0.30)	50 (0.30)	50 (0.29)	50 (0.29)	Lightweight plaster
		50 (0.30)	50 (0.29)	50 (0.29)	50 (0.29)	45 (0.30)	45 (0.30)	Plasterboard on dabs
	Foil faced Cavity insulation (k=0.023W/m.K) Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	50 (0.30)	50 (0.29)	50 (0.29)	50 (0.29)	50 (0.29)	45 (0.30)	Dense plaster
		50 (0.30)	45 (0.30)	45 (0.30)	45 (0.30)	45 (0.30)	45 (0.29)	Lightweight plaster
		50 (0.29)	45 (0.30)	45 (0.30)	45 (0.30)	45 (0.29)	45 (0.29)	Plasterboard on dabs

## Partial fill construction

Table 13: minimum thickness of insulation to achieve a 0.35 W/m<sup>2</sup>.K U-Value (actual U-Value in brackets). 100mm inner leaf block width.

0.35	Insulation conductivity W/m.K	Evalast	Fenlite	Fenlite 1500	Evalite Standard	Superlite	Ultralite	Internal finish
 <p>Brick outer leaf 50mm clear cavity Partial fill insulation Inner leaf block Internal finish</p>	Foil faced Cavity insulation (k=0.023W/m.K) Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	45 (0.33)	40 (0.34)	40 (0.34)	40 (0.34)	40 (0.34)	40 (0.33)	Dense plaster
		40 (0.35)	40 (0.34)	40 (0.34)	40 (0.34)	40 (0.33)	35 (0.35)	Lightweight plaster
		40 (0.34)	35 (0.35)	35 (0.35)	35 (0.35)	35 (0.35)	35 (0.34)	Plasterboard on dabs
 <p>Everlast outer leaf Render 50mm clear cavity Partial fill insulation Inner leaf block Internal finish</p>	Foil faced Cavity insulation (k=0.023W/m.K) Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	45 (0.33)	40 (0.34)	40 (0.35)	40 (0.34)	40 (0.34)	40 (0.33)	Dense plaster
		45 (0.33)	40 (0.34)	40 (0.34)	40 (0.34)	40 (0.34)	35 (0.35)	Lightweight plaster
		40 (0.34)	35 (0.35)	40 (0.33)	35 (0.35)	35 (0.35)	35 (0.34)	Plasterboard on dabs
 <p>Render Fenlite outer leaf 50mm clear cavity Partial fill insulation Inner leaf block Internal finish</p>	Foil faced Cavity insulation (k=0.023W/m.K) Cavity (low emissivity) = 0.644m <sup>2</sup> K/W	40 (0.35)	40 (0.33)	40 (0.33)	40 (0.33)	35 (0.35)	35 (0.34)	Dense plaster
		40 (0.34)	35 (0.35)	35 (0.35)	35 (0.35)	35 (0.35)	35 (0.34)	Lightweight plaster
		35 (0.35)	35 (0.34)	35 (0.34)	35 (0.34)	35 (0.34)	30 (0.35)	Plasterboard on dabs