Part L

Energy Efficiency Standards from October 2010

Guidance for Designers and Users

Introduction

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

- The changes are aimed at achieving a 25% improvement in energy efficiency over buildings designed to meet the 2006 standards.
- The changes to Part L1A (new dwellings) and Part L2A (new buildings other than dwellings) take effect from the 1st October 2010. These changes form part of a planned programme of energy efficiency improvements with the objective of achieving a zero carbon target for all new buildings within the next ten years.
- Achieving the required energy targets will require the implementation of progressive improvements in the performance of the building fabric and building services, together with increased use of low or zero carbon technologies, such as solar hot water and photovoltaic cells.

This Guide summarises the key changes and provides a number of wall solutions using Lignacite's products which can help to meet the required energy targets.

Lignacite concrete block solutions

Although the precise performance levels will have to be determined by the appropriate energy calculation methods, it is anticipated that the U-values of external walls will have to be pitched at 0.30W/m^2K or better. The Lignacite block solutions presented are designed to meet a practical range of performance levels.

Approved Documents

The new Approved Documents are contained in four parts, as follows.

Part L1 Dwellings	Approved Document L1A New dwellings Approved Document L1B Existing dwellings
Part L2 Non Dwellings	Approved Document L2A New buildings other than dwellings Approved Document L2B Existing buildings other than dwellings

A number of other publications are listed in the Approved Documents to assist with compliance or to provide more general information.

Key technical changes

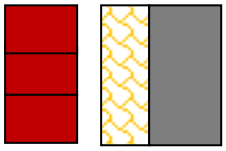
	New dwellings	New building other than dwellings
1.	The dwelling emission rate is now calculated using SAP 2009, and must not exceed the target set by reference to a notional dwelling with a 25% improvement relative to the 2006 standards.	The notional building used to determine the TER is the same size and shape as the actual building, constructed to a concurrent specification and no improvement factor. Developers are still given the option to vary the specification, provided the same overall level of $C0_2$ emissions is met or bettered.
2.	The notional dwelling now includes a part wall loss of zero. This means that conventional party walls will need to be better insulated, or a solid wall solution introduced e.g. Lignacrete blockwork.	Revised guidance is provided on shell and core developments and first fit-out work.
3.	Secondary heating is counted as part of the annual CO_2 emission rate of the completed dwelling only when actually provided for and credit is allowed wherever low-energy lighting is installed	A revised procedure is provided for demonstrating that reasonable provision has been made to limit the effects of solar gain in summer.
4.	Some of the reasonable limits for building fabric and services performance specifications are improved.	Revised guidance is provided for avoiding thermal bridging at construction junctions including the option of adopting a quality assured accredited construction details scheme approach.
5.	Revised guidance is provided for avoiding thermal bridging at construction junctions including the option of adopting a quality assured accredited construction details scheme approach.	

Wall U-values

Some typical U-value constructions using various block types from the Lignacite range are shown in Tables 1 – 7. These constructions offer a range of performance levels to suit the energy efficiency requirements of all building types. Solutions are presented for cavity walls with partial fill and full fill cavity insulation.
In addition, solutions are shown for cavity and solid walls with externally applied insulation. This method of insulating masonry walls is particularly suited to locations where a rendered finish is traditional. A number of Lignacite's products are ideal in providing a strong background on which to apply proprietary render and insulation systems.

For the U-values of constructions not featured, please contact Lignacite Ltd for advice.

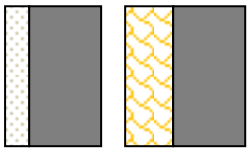
Table 1 Lignacite's blocks and partial cavity fill



Insulation	U-values (W/m^{2}K)				
	Internal finish	100mm Inner leaf			
		Lignacrete	Lignacite	Ashlite	Fibo
50mm Celotex CW4050	None e.g. Paint Grade block	0.31	0.30	-	-
	13mm Lightweight plaster	0.30	0.29	0.29	0.27
	12.5mm Plasterboard on dabs	0.29	0.29	0.28	0.26
	Typical wall width	302mm			
60mm Celotex CW4060	None e.g. Paint Grade block	0.29	0.28	-	-
	13mm Lightweight plaster	0.28	0.28	0.27	0.26
	12.5mm Plasterboard on dabs	0.28	0.27	0.26	0.25
	Typical wall width	312mm			
65mm Celotex CW4065	None e.g. Paint Grade block	0.27	0.27	-	-
	13mm Lightweight plaster	0.27	0.26	0.25	0.24
	12.5mm Plasterboard on dabs	0.26	0.26	0.26	0.24
	Typical wall width	317mm			
70mm Celotex CW40070	None e.g. Paint Grade block	0.26	0.25	-	-
	13mm Lightweight plaster	0.25	0.25	0.25	0.23
	12.5mm Plasterboard on dabs	0.25	0.25	0.24	0.23
	Typical wall width	322mm			

80mm Celotex CW4080	None e.g. Paint Grade block	0.24	0.23	-	-
	13mm Lightweight plaster	0.23	0.23	0.22	0.21
	12.5mm Plasterboard on dabs	0.23	0.22	0.22	0.21
	Typical wall width	332mm			
90mm Celotex CW4090	None e.g. Paint Grade block	0.22	0.21	-	-
	13mm Lightweight plaster	0.21	0.21	0.21	0.20
	12.5mm Plasterboard on dabs	0.21	0.21	0.20	0.20
	Typical wall width	342mm			
100mm Celotex CW40100	None e.g. Paint Grade block	0.21	0.20	-	-
	13mm Lightweight plaster	0.20	0.20	0.19	0.19
	12.5mm Plasterboard on dabs	0.20	0.19	0.19	0.18
	Typical wall width	352mm			

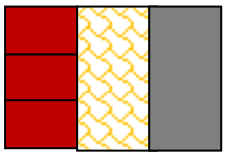
Table 2 Lignacite's blocks and partial cavity fill. Outer leaf 16mm render on 100mm Lignacrete dense block



Insulation	U-values(W/m^2K)				
	Internal finish	100mm Inner leaf			
		Lignacrete	Lignacite	Ashlite	Fibo
50mm Celotex CW4050	None e.g. Paint Grade block	0.31	0.31	-	-
	13mm Lightweight plaster	0.30	0.30	0.29	0.27
	12.5mm Plasterboard on dabs	0.29	0.29	0.28	0.27
	Typical wall width	316mm			
60mm Celotex CW4060	None e.g. Paint Grade block	0.29	0.29	-	-
	13mm Lightweight plaster	0.28	0.28	0.27	0.26
	12.5mm Plasterboard on dabs	0.28	0.27	0.27	0.25
	Typical wall width	326mm			
65mm Celotex CW4065	None e.g. Paint Grade block	0.27	0.27		
	13mm Lightweight plaster	0.27	0.27	0.26	0.25
	12.5mm Plasterboard on dabs	0.26	0.26	0,25	0,24
	Typical wall width			331mm	
70mm Celotex CW4070	None e.g. Paint Grade block	0.26	0.26	-	-
	13mm Lightweight plaster	0.26	0.25	0.25	0.24
	12.5mm Plasterboard on dabs	0.25	0.25	0.24	0.25
	Typical wall width	336mm			
80mm Celotex CW4080	None e.g. Paint Grade block	0.24	0.24	-	-
	13mm Lightweight plaster	0.23	0.23	0.23	0.22
	12.5mm Plasterboard on dabs	0.23	0.23	0.22	0.21
	Typical wall width	346m			

90mm Celotex CW4090	None e.g. Paint Grade block	0.22	0.22	-	--
	13mm Lightweight plaster	0.21	0.21	0.21	0.20
	12.5mm Plasterboard on dabs	0.21	0.21	0.21	0.20
	Typical wall width	356mm			
100mm Celotex CW40100	None e.g. Paint Grade block	0.20	0.20	-	-
	13mm Lightweight plaster	0.20	0.20	0.19	0.19
	12.5mm Plasterboard on dabs	0.20	0.19	0.19	0.18
	Typical wall width	366mm			

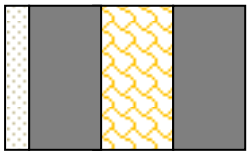
Table 3 Lignacite's blocks and full cavity fill



Insulation	U-values(W/m^2K)				
	Internal finish	100mm Inner leaf			
		Lignacrete	Lignacite	Ashlite	Fibo
85mm Crown Dritherm 32 Cavity Slab 32	None e.g. Paint Grade block	0.35	0.34	-	-
	13mm Lightweight plaster	0.34	0.33	0.32	0.30
	12.5mm Plasterboard on dabs	0.33	0.32	0.31	0.29
	Typical wall width	287mm			
100mm Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.30	0.29	-	-
	13mm Lightweight plaster	0.29	0.29	0.28	0.26
	12.5mm Plasterboard on dabs	0.29	0.28	0.27	0.26
	Typical wall width	302mm			
130m Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.25	0.24	-	-
	13mm Lightweight plaster	0.24	0.24	0.24	0.22
	12.5mm Plasterboard on dabs	0.24	0.24	0.23	0.22
	Typical wall width	332mm			
150m Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.22	0.22	-	-
	13mm Lightweight plaster	0.22	0.21	0.21	0.20
	12.5mm Plasterboard on dabs	0.21	0.21	0.21	0.20
	Typical wall width	352mm			

170mm Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.21	0.20	-	-
	13mm Lightweight plaster	0.20	0.20	0.20	0.19
	12.5mm Plasterboard on dabs	0.20	0.20	0.19	0.19
	Typical wall width	372mm			

Table 4 Lignacite's blocks and full cavity fill. Outer leaf 16mm render on 100mm Lignacrete dense block.



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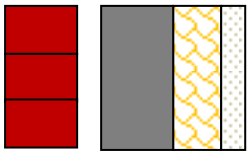
Insulation	U-values(W/m^{2}K)				
	Internal finish	100mm Inner leaf			
		Lignacrete	Lignacite	Ashlite	Fibo
85mm Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.35	0.34	-	-
	13mm Lightweight plaster	0.34	0.34	0.32	0.30
	12.5mm Plasterboard on dabs	0.33	0.33	0.31	0.29
	Typical wall width	301mm			
100mm Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.30	0.30	-	-
	13mm Lightweight plaster	0.30	0.29	0.28	0.27
	12.5mm Plasterboard on dabs	0.29	0.28	0.28	0.26
	Typical wall width	316mm			
130m Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.25	0.25	-	-
	13mm Lightweight plaster	0.25	0.24	0.24	0.23
	12.5mm Plasterboard on dabs	0.24	0.24	0.23	0.22
	Typical wall width	346mm			
150m Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.22	0.22	-	-
	13mm Lightweight plaster	0.22	0.22	0.21	0.20
	12.5mm Plasterboard on dabs	0.21	0.21	0.21	0.20

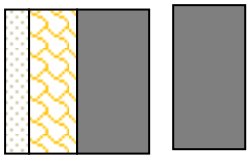
	Typical wall width	366m			
170mm Crown Dritherm 32 Cavity Slab	None e.g. Paint Grade block	0.21	0.21	-	-
	13mm Lightweight plaster	0.20	0.20	0.20	0.19
	12.5mm Plasterboard on dabs	0.20	0.20	0.20	0.19
	Typical wall width	386mm			

Table 5 Lignacite's blocks, 50mm clear cavity and internally applied thermal plasterboard laminate



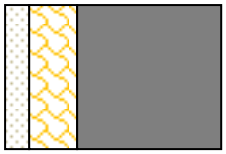
Thermal plasterboard laminate	U-values(W/m^2K)			
	100mm Inner leaf			
60mm Gyproc Thermaline Super ($R=2.56m^2$ K/W)	Lignacrete	Lignacite	Ashlite	Fibo
	0.31	0.31	0.30	0.30
Typical wall width	327mm			
70mm Gyproc Thermaline Super ($R=3.06m^2$ K/W)	0.27	0.27	0.26	0.26
Typical wall width	337mm			
80mm Gyproc Thermaline Super ($R=3.56m^2$ K/W)	0.24	0.24	0.23	0.24
Typical wall width	347mm			
90mm Gyproc Thermaline Super ($R=4.06m^2$ K/W)	0.21	0.21	0.21	0.22
Typical wall width	357mm			

Table 6 Lignacite's blocks and a proprietary render and external insulation system



Proprietary external wall insulated render system	U-values(W/m^{2}K)				
	Internal finish	100mm Inner leaf			
		Lignacrete	Lignacite	Ashlite	Fibo
10mm Render plus 100mm insulation (λ= 0.033)	None e.g. Paint Grade block	0.31	0.30	-	-
	13mm Lightweight plaster	0.30	0.30	0.29	0.27
	12.5mm Plasterboard on dabs	0.29	0.29	0.28	0.27
	Typical wall width	360mm			
10mm Render plus 125mm insulation (λ= 0.033)	None e.g. Paint Grade block	0.26	0.26	-	
	13mm Lightweight plaster	0.26	0.26	0.25	0.24
	12.5mm Plasterboard on dabs	0.25	0.25	0.25	0.24
	Typical wall width	385mm			
10mm Render plus 150mm insulation (λ= 0.033)	None e.g. Paint Grade block	0.23	0.23	-	-
	13mm Lightweight plaster	0.22	0.22	0.22	0.21
	12.5mm Plasterboard on dabs	0.22	0.22	0.22	0.21
	Typical wall width	410mm			

Table 7 Lignacite' blocks and a proprietary render and external insulation system



Proprietary external wall insulated render system	U-values(W/m^2K)				
	Internal finish	215mm single leaf wall			
		Lignacrete	Lignacite	Ashlite	Fibo
10mm Render plus 100mm insulation (λ= 0.033)	None e.g. Paint Grade block	0.31	0.30	-	-
	13mm Lightweight plaster	0.30	0.29	0.28	0.25
	12.5mm Plasterboard on dabs	0.30	0.29	0.27	0.24
	Typical wall width	325mm			
10mm Render plus 125mm insulation (λ= 0.033)	None e.g. Paint Grade block	0.27	0.26	-	-
	13mm Lightweight plaster	0.26	0.25	0.24	0.22
	12.5mm Plasterboard on dabs	0.26	0.25	0.24	0.22
	Typical wall width	350mm			
10mm Render plus 150mm insulation (λ= 0.033)	None e.g. Paint Grade block	0.23	0.22	-	-
	13mm Lightweight plaster	0.22	0.22	0.21	0.19
	12.5mm Plasterboard on dabs	0.22	0.21	0.21	0.19
	Typical wall width	375mm			

*To overcome manual handling concerns,, consideration should be given to the use of 100mm blocks laid flat, or two leaves of 100mm blocks laid back to back and suitably tied together.

Notes to tables:

1. The U-values shown are based on the use of various proprietary insulation products. Alternative products can be used, provided they can achieve an equivalent thermal resistance (m^2K/W).

2. The U-values shown have been calculated using Lignacite's concrete blocks with a face size of 440 x 215mm and with mortar joints assumed to be 10mm wide. Wall ties are assumed to be stainless steel with a cross-sectional area of no more than 12.5mm^2 for structural cavities up to 175mm wide. Above 175mm, the cross-sectional area of wall ties is assumed to be 25mm^2

3. The typical wall widths shown are for illustrative purposes only. They do not include the thickness of any internal finishes except for wall solutions with thermal insulation laminates. Thermal laminates are assumed to have minimum 15mm airspace between the laminate and the blockwork.

The wall widths shown for Lignacite's blocks in conjunction with partial cavity fill assume that a residual clear cavity of 50mm will be maintained. In some cases it may be possible to reduce the cavity width to a minimum of 25mm. The insulation manufacturer should be consulted for guidance.

4. The U-values shown for externally applied render and insulation are indicative of the performance that can be achieved when using such systems. The manufacturer should be consulted for specification details. Manufacturers of external wall insulation systems include Saint Gobain Weber Limited www.netweber.co.uk and Sto Limited www.sto.co.uk

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 constructions solutions can be obtained as follows:

Insulation product	**Manufacturer**	**Contact details**
Celotex	Celotex Ltd.	www.celotex.co.uk
Crown Dritherm	Knauf Insulation Ltd	www.knaufinsulation.co.uk
Gyproc Thermaline Super	British Gypsum	www.british-gypsum.com

Demonstrating Compliance

Compliance to satisfy Part L can be demonstrated by following five criteria as shown. The appropriate Approved Document provides guidance and procedures for satisfying each of the criteria.

	Dwellings	**Buildings other than dwellings**
Criterion 1	The calculated rate of CO_2 emissions from the dwelling (the Dwelling Emission Rate, **DER)** must not be greater than the Target Emission Rate (**TER**).	The calculated CO_2 emission rate for the building (the Building Emission Rate, **BER)** must not be greater than the Target CO_2 emission rate (**TER).**
Criterion 2	The performance of the building fabric and the fixed building services should achieve reasonable overall standards of energy efficiency following procedures given in the Approved Document. (See *'Limits on Design Flexibility'*)	The performance of the building fabric and the heating, hot water and fixed lighting systems should achieve reasonable overall standards of energy efficiency.
Criterion 3	The dwelling should have appropriate passive control measures to limit the effect of solar gains on indoor temperatures in	Demonstrate that the building has appropriate passive control measures to limit solar gains.

	summer, irrespective of whether or not the dwelling has mechanical cooling	
Criterion 4	The performance of the dwelling, as built, should be consistent with the **DER.**	The performance of the building, as built, should be consistent with the **BER**
Criterion 5	The necessary provisions for energy efficient operation of the dwelling should be put in place.	The necessary provisions for enabling energy-efficient operation of the building should be put in place.

Limits on Design Flexibility

For design purposes the limiting U-values shown should not be exceeded. The values stated are area-weighted average values for all elements of that type. In practice the envelope standards would need to be considerably better than the limiting values

Limiting Fabric Parameters		
Element	**Dwellings**	**Buildings other than dwellings**
Roof	0.20 W/m^{2}K	0.25 W/m^{2}K
Wall	0.30 W/m^{2}K	0.35 W/m^{2}K
Floor	0.25 W/m^{2}K	0.25 W/m^{2}K
Party wall	0.20 W/m^{2}K	-
Windows, roof windows, glazed roof lights, curtain walling and pedestrian doors	2.00 W/m^{2}K	2.2 W/m^{2}K
Vehicle access and similar large doors	-	1.5 W/m^{2}K
High-usage entrance doors	-	3.5 W/m^{2}K
Roof ventilators (inc. Smoke vents)	-	3.5 W/m^{2}K
Air permeability	10.00m^3/h.m^2 at 50 Pa	10.00m^3/h.m^2 at 50 Pa

Limiting the Effects of Solar Gains in Summer

Designers will need to check that the building is not at significant risk from the effects of solar gain during the summer months. In the case on non-dwellings the intention is to limit solar gains to minimise or negate the need for air-conditioning systems.

For dwellings SAP 2009 Appendix P contains a procedure to assist designers in checking whether solar gains are excessive. The check should be undertaken regardless of whether or not the building has mechanical cooling.

For non-dwellings, buildings should be assessed in accordance with CIBSE TM37 and, for educational buildings, in BB 101. For the purposes of satisfying Part L2A, a check should be made that the solar gains resulting from the proposed specifications are no greater than the various reference glazing systems (see Clause 4.44 of Approved Document L2A for details).

A strategy to limit the effects of solar gain can be achieved by an effective combination of window size and orientation, solar protection through shading and other solar control measures, ventilation (day and night) and high thermal capacity. Lignacite's range of block products used to internal walls all have the potential to impart the structure with a significant amount of thermal capacity. This important benefit is maximised if walls are built using blocks that are plastered or left fair, e.g. products from the Facing Masonry range.

Quality of Construction

The most important points to note are that;

a) the insulation is reasonably continuous over the whole building envelope; and

b) the air permeability is within reasonable limits.

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 BER or TER. A final calculation of the DER or BER is required to confirm compliance. If it is found that the building does not comply, then appropriate remedial work will be required to be undertaken. Suggestions for reporting changes or non-conformity are given in Appendix A of Approved Document L1A and L2A.

Air Permeability

The appropriate number of air permeability tests should be undertaken to demonstrate that the design air permeability has been achieved. Details are provided in the Approved

Document of the test method and criteria for selecting a testing organisation. For buildings designed using accredited construction details, a less onerous testing regime is required. Criteria are also given in the event of failing an air pressure test.

On small scale developments – no more than two dwellings – relaxation of air pressure can be given if:

a. during the preceding 12 month period , a dwelling of the same dwelling type constructed by the same builder has been pressure tested and has achieved the design air permeability; or
b. . To avoid the need for any pressure testing, an air permeability of $15m^3/h.m^2$ at 50 Pa is used when calculating the DTR. However, using this approach is likely to result in unrealistic performance values for many building elements.

For non-dwellings an exemption to air pressure testing can be made for buildings less than $500m^2$ floor area, provided the permeability used in the BER calculation is taken as $15m^3/h.m^2$ at 50 Pa.

Party Walls in Dwellings

Up until this change in energy standards, party walls between dwellings were assumed to be zero heat loss walls. As standards elsewhere in the building fabric have improved considerably over time, it is now considered that the air flow in cavity party walls is a significant path for heat loss.

It is recommended that the heat loss is reduced by restricting air movement in the cavity by:

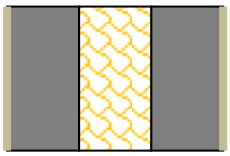
1) Fully filling the cavity

And/or

2)Providing effective sealing around the perimeter

A reasonable provision would be to adopt the guidance on U-values shown . It should be noted that fully filled cavity solutions must also be able to comply with the requirements of Part E1 (Sound insulation) of the Building Regulations. This can be demonstrated by pre-completion testing or use of an approved Robust Detail specification that incorporates full cavity fill.

U-Values for Party Walls	
Party Wall Construction	**U-Value (W/m^2K)**
Solid, e.g., Lignacrete	0.0
Unfilled cavity with no effective edge sealing	0.5
Unfilled cavity with effective sealing around all exposed edges and in line with insulation layers in abutting elements	0.2
A fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements	0.0



Cavity walls built using Liganacite, Ashlite and Lignacrete

Solid wall built using Lignacrete

TYPICAL METHODS OF REDUCDING HEAT LOSSS IN PARTY WALLS