LIGNACITE
Sustainable Masonry

ENERGY EFFICIENCY STANDARDS

5. GUIDE TO PART L OF THE BUILDING REGULATIONS

U-VALUE SOLUTIONS FOR WALLS AND FLOORS

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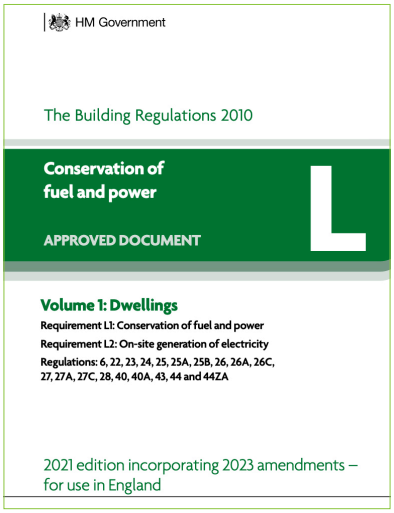
INDEX

Issue Date: September 2023

1. Key Changes to the Part L Standard

- The changes to Part L: Conservation of Fuel and Power represent a significant uplift in thermal standards and will require greater attention to insulation performance and heating systems than previously.
- Commencement of works will now relate to individual plots, rather than entire sites.
- A suitable analysis of high-efficiency alternative heating systems must be made for each new dwelling or building (Regulation 25A). Although this has been a requirement since 2013, in practice it has seldom been asked for by Building Control.
- The process for confirming continuity of insulation and thermal bridging details has been made more rigorous. On-site audits, including photographs, will now be required for each dwelling. Standard Assessment Procedures (SAP) assessors will need to have copies of all sign-off sheets and photographs before they are able to provide as-built reports and EPCs.
- Thermal bridging details can no longer be adopted based on the government's Accredited Construction Details as these have been withdrawn. Manufacturers details are likely to be increasingly adopted with bespoke calculations used for non-standard junctions.
- Air tightness testing will now need to be undertaken for every dwelling rather than a percentage of each dwelling type on a development.
- Developers will need to supply a Home User Guide for every plot upon completion. This must contain information on the installed services as well as an overheating assessment under Part O.
- To meet the latest Part L requirements, heating systems will need to be designed to operate at lower flow temperatures to facilitate the use of heat pumps. In practice, this means that radiators will need to be bigger than those used for a conventional boiler-fired heating system.
- Lighting efficiency is now to be included within Standard Assessment Procedures (SAP) calculations, with the number of lamps recorded.
- Predictably, the Part L changes have been facilitated to move away from gas and towards heat pump installation. Gas heating will be difficult to design in accordance with this latest version of the Building Regulations due to the Primary Energy Rate calculation. Gas systems will need to be supplemented by copious amounts of solar photovoltaics and/or other technologies to enable compliance.
- In addition to the Part L changes, a new Approved Document O on Overheating Mitigation has been published. This legislation needs to be considered alongside the heightened standards of Part L, as it sets maximum glazing percentages for schemes as well as the need for an overheating assessment, which may impact SAPs in terms of shading, glazing performance, mechanical ventilation and heat recovery.



2. Energy Efficiency Standards from 2021

Improvements to the energy efficiency of buildings were published in 2021 with guidance on compliance provided by the following Approved Documents:

Approved Document L – Volume 1: Dwellings
Approved Document L – Volume 2: Buildings other than dwellings

This Design Guide provides a commentary on the new changes and includes compliant wall and floor solutions using products from Lignacite Limited.

These changes to the Building Regulations are intended to help the UK deliver net zero. This includes a requirement for new homes to produce around 30% less CO_2 than current standards, and a 27% reduction in emissions from other new buildings. To deliver the improvements, new homes will be assessed against the following four performance metrics:

- Primary energy
- CO_2 emissions
- The fabric energy efficiency standard (FEES)
- Minimum standards for fabric and fixed building services

With increasing amounts of renewable energy generation, fuel factors are no longer required to offset 'dirty' electricity generation. This will adversely impact any property using oil, LPG or solid mineral fuel. This will prove to be a challenge to homes that are off-grid. More widely, it will help to drive the uptake of heat pumps that is a crucial part of the government's long-term strategy.

The new changes took effect from the 15th June 2022.

Dwellings

Key Changes

- A new requirement has been introduced to calculate the target primary energy rate. This is in addition to calculating the target emission rate and target fabric energy efficiency rate.
- Compliance will be based on the latest version of the Standard Assessment Procedure – SAP 10.
- This change builds upon the need for a strong 'fabric first' approach. This stops new homes being constructed relatively poorly but still passing by adding renewables, such as solar photovoltaics (solar panels). There is an increase in the 'backstops' (the minimum allowable performance for walls, floors, ceilings, windows and doors) to support this move.
- The emission factors for various fuels have been revised. In particular the emission factors for electricity are considerably improved compared to previous editions of Part L in recognition of the decarbonising of the national grid. In practical terms this will make electrical heating systems, such as air source heat pumps, a more attractive proposition in meeting Part L targets. Mains gas is still a heating option but will require additional measures to be taken to comply. The SAP 10 fuel emission factors are shown in Table 5.1.

Table 5.1 – Current and previous SAP fuel carbon emission factors

Fuel Type	Previous Values (kg CO_{2e} / kWh)	Current Values (kg CO_{2e} / kWh)
Mains Gas	0.216	0.21
Electricity	0.519	0.136
LPG	0.241	0.241
Heating Oil	0.298	0.298

- There is mandatory air tightness testing for every house and apartment. This removes the tricky and complex rules for sampling, including the +2.00 rule for untested plots. The new maximum target for air tightness is <8m^3/(h·m^2)@50Pa, which is a 2-point reduction from the current maximum of 10.

- Photographic evidence should be taken for each dwelling as a record during the construction of a property. All key junctions should be photographed along with key building services. Each image is required to be correctly referenced. The images should be made available to the energy assessor and the building control body.

- Improved fabric performance has been introduced for building extensions.

SUMMARY OF U-VALUES FOR WALLS AND FLOORS

3. Summary of U-Values for Floors and Walls

New Dwellings – U-Values

The U-Value of walls and floors will be largely governed by the need to meet the Part L targets for both the dwelling emission rate (TER) and the Fabric Energy Efficiency Rate (TFEE). Compared to the previous version of Part L, fabric standards have been significantly increased.

A good basis for design is to consider the 'notional dwelling' specification, which new designs are compared against using the SAP calculation procedure.

Table 5.2 – Notional specification for external elements

External walls including semi-exposed walls	U = 0.18 W/m^{2}K
Party walls	U = 0
Floors	U = 0.13 W/m^{2}K
Roofs	U = 0.11 W/m^{2}K

For walls, a U-Value of 0.18 W/m^{2}K is used, which is increasingly seen as the target to meet. There may be some limited flexibility within the SAP calculation to vary this, but experience to date suggests that the U-Value range is likely to be 0.18-0.20 W/m^{2}K. U-Values higher than this are likely to place a greater burden on the rest of the thermal elements to compensate for a lesser wall performance.

For exposed floors, the notional dwelling specifies a U-Value of 0.13 W/m^{2}K. In practice, there is limited scope to vary this to meet the Part L targets, so U-Values in the range of 0.11-0.13 W/m^{2}K are likely to be needed.

Extension to Dwellings – U-Values

The elemental standard for walls, floors, etc., as above specified in Approved Document L, are summarised in Table 5.3.

Table 5.3 – Limiting U-Values for new fabric elements in extensions to dwellings

Element type	Maximum U-Value W/m^{2}K
Roof	0.15
Wall	0.18
Floor	0.18

For external walls, a U-Value of 0.18 W/m^{2}K is required. There may be some flexibility to vary this using one of the approaches given in Approved Document L, paragraphs 10.7 and 10.9, but these approaches require calculations to prove that a lesser U-Value is required. In practice, other thermal elements would need an improved U-Value to compensate for reduced wall performance.

Non-Domestic Buildings – U-Values

The elemental standards for new walls, floors, etc. specified in Approved Document L are summarised in Table 5.4. The wall U-Value is specified to be 0.26 W/m^{2}K.

Table 5.4 – Limiting U-Values for new or replacement elements in new and existing buildings

Element type	Maximum U-Value W/m^{2}K
Roof (flat roof)	0.18
Roof (pitched roof)	0.16
Wall	0.26
Floor	0.18

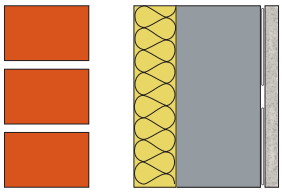
4. Achieving U-Values with the Lignacite Product Range

Meeting Part L thermal standards demands a high level of fabric performance. Presented over the next few pages is an extensive number of wall and floor solutions featuring Lignacite's products in combination with the latest and most thermally efficient insulation products available. Solutions are presented for cavity walls with partial and full fill cavity insulation. In general, these solutions will satisfy U-Values of circa 0.18 W/m^{2}K. Solutions are also provided for Lignacite products used in beam and block floors.

For constructions that are not featured here, please contact our Technical Services team. They will be happy to assist.

Calculations are provided in good faith and are based upon the data provided by an insulation producer at the time. However, such data is liable to change without prior notice from the producer. We therefore suggest that confirmation calculations are carried out at the design stage based upon the very latest data.

Table 5.5 – Partial fill cavity fill solutions



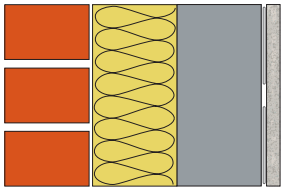
Facing brick
50mm Retained cavity
Partial cavity fill
100mm Lignacite block (as described)
Plasterboard or plaster finish

Cavity Width	Insulation Type	Internal Finish	U-Values (W/m^{2}K)		
			100mm Ash GP	100mm Fibo 850	100mm Lignacrete
125mm	75mm Partial fill λ= 0.022* 50mm Low E Cavity	12.5mm Plasterboard on dabs	0.21	0.20	0.22
		13mm Lightweight plaster	0.22	0.21	0.22
	75mm Kingspan K108 50mm Low E Cavity	12.5mm Plasterboard on dabs	0.19	0.18	0.19
		13mm Lightweight plaster	0.19	0.19	0.20
150mm	100mm Partial fill λ= 0.022* 50mm Low E Cavity	12.5mm Plasterboard on dabs	0.17	0.17	0.17
		13mm Lightweight plaster	0.17	0.17	0.18
	100mm Kingspan K108 50mm Low E Cavity	12.5mm Plasterboard on dabs	0.15	0.15	0.15
		13mm Lightweight plaster	0.15	0.15	0.16

* Includes Celotex CW4000, Ecotherm Eco-Cavity, Unilin Thin-R, etc.

ACHIEVING U-VALUES WITH THE LIGNACITE PRODUCT RANGE

Table 5.6 – Fully filled cavity fill solutions



Facing brick
Full cavity fill
100mm Lignacite block (as described)
Plasterboard or plaster finish

Cavity Width	Insulation Type	Internal Finish	U-Values W/m²K		
			100mm Ash GP	100mm Fibo 850	100mm Lignacrete
100mm	100mm DriTherm 32/100mm Isover CWS 32	12.5mm Plasterboard on dabs	0.26	0.25	0.27
		13mm Lightweight plaster	0.27	0.26	0.28
	95mm CavityTherm 5mm Air Space	12.5mm Plasterboard on dabs	0.19	0.18	0.19
		13mm Lightweight plaster	0.19	0.19	0.20
	90mm Celotex Thermaclass 21 10mm Air Space	12.5mm Plasterboard on dabs	0.19	0.19	0.20
		13mm Lightweight plaster	0.19	0.20	0.20
	90mm Kingspan K106 10mm Air Space	12.5mm Plasterboard on dabs	0.18	0.18	0.18
		13mm Lightweight plaster	0.18	0.18	0.19
125mm	125mm Dritherm 32/125mm Isover CWS 32	12.5mm Plasterboard on dabs	0.22	0.21	0.22
		13mm Lightweight plaster	0.22	0.22	0.23
	120mm CavityTherm 5mm Air Space	12.5mm Plasterboard on dabs	0.15	0.15	0.16
		13mm Lightweight plaster	0.16	0.15	0.16
	115mm Celotex Thermaclass 21 10mm Air Space	12.5mm Plasterboard on dabs	0.15	0.16	0.16
		13mm Lightweight plaster	0.16	0.16	0.16
	115mm Kingspan K106 10mm Air Space	12.5mm Plasterboard on dabs	0.14	0.15	0.15
		13mm Lightweight plaster	0.15	0.15	0.15
150mm	150mm Dritherm 32/125mm Isover CWS 32	12.5mm Plasterboard on dabs	0.19	0.18	0.19
		13mm Lightweight plaster	0.19	0.19	0.20
	145mm CavityTherm 5mm Air Space	12.5mm Plasterboard on dabs	0.14	0.13	0.14
		13mm Lightweight plaster	0.13	0.13	0.14
	140mm Celotex Thermaclass 21 10mm Air Space	12.5mm Plasterboard on dabs	0.13	0.13	0.14
		13mm Lightweight plaster	0.14	0.13	0.14
	140mm Kingspan K106 10mm Air Space	12.5mm Plasterboard on dabs	0.12	0.12	0.13
		13mm Lightweight plaster	0.12	0.12	0.13

Notes to tables:

1. The U-Values shown are based on the use of the proprietary insulation products described. Alternative products can be used, provided they can achieve an equivalent thermal resistance (m²K/W) and, where applicable, enhanced low emissivity cavities.

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 12.5mm² for structural cavities up to 175mm wide.

ACHIEVING U-VALUES WITH THE LIGNACITE PRODUCT RANGE

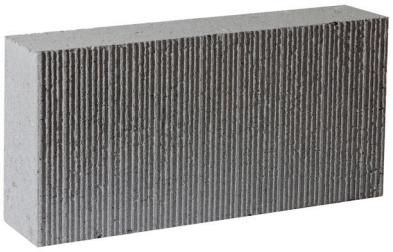
Beam and block floors are straightforward to insulate and can achieve very good levels of thermal performance. The U-Value is dependent on the floor build-up as well as the perimeter/area (P/A) of the ground floor. Most domestic floors will have P/A ratios in the range of 0.4 to 0.6. Table 5.7 provides U-Values for this P/A range, which are based on the following construction:

- Infill blocks: 100mm Lignacite Ash GP 7.3N/mm²
- PIR insulation (**λ**= 0.022W/m²K)
- 75mm screed

Table 5.7 – U-Values for beam and block floors

Floor U-Value W/m²K					
Insulation	Floor P/A Ratio				
	0.4	0.45	0.5	0.55	0.6
100mm PIR	0.16	0.16	0.17	0.17	0.17
120mm PIR	0.14	0.14	0.14	0.15	0.15
130mm PIR	0.13	0.13	0.14	0.14	0.14
140mm PIR	0.13	0.13	0.13	0.13	0.13
150mm PIR	0.12	0.12	0.12	0.12	0.12
175mm PIR	0.11	0.11	0.11	0.11	0.11

Notes: PIR products include Celotex, Ecotherm, Recticel etc.



The U-Values shown are based on using 100mm Lignacite Ash GP infill blocks.

5. Appendix

Dwellings

Demonstrating compliance

Compliance is based on a number of metrics and is focussed on the design of the dwellings as well as confirming the 'as-built' performance.

Table 5.8 – Compliance for new dwellings

Compliance metrics	What is required	Comments
1.	The rate of CO_2 emissions from the dwelling (the dwelling emission rate, DER) must not exceed the target emission rate (TER) when calculated in accordance with SAP 10.	
2.	The Dwelling's Fabric Energy Efficiency rate (FEES) must not exceed the Target Fabric Energy Efficiency (TFEE) rate when calculated in accordance with SAP 10.	Its purpose is to ensure that a design has good levels of fabric insulation and is not over reliant on renewable energy sources as the main route to compliance with a relatively poorly insulated fabric.
3.	The dwelling's Primary Energy Rate must not be greater that the target Primary Energy Rate when calculated in accordance with SAP 10.	The target primary energy rate, in kWh_{PE}/m^2year is influenced by the fabric and the heating fuel. Note: If primary energy was the sole compliance metric, this would have negative effects on the achievement of the UK's Carbon Budgets, as a low primary energy solution is often not a low carbon one.

Calculating the target energy rate, target emission rate and target fabric energy efficiency rate

A new dwelling must be built to a minimum standard of energy efficiency. This is done by comparing calculations of the performance of the 'actual dwelling' against calculations of the performance of a theoretical dwelling called the 'notional dwelling'.

The notional dwelling is the same size and shape as the actual dwelling and has standardised properties for fabric and services. A summary of the notional dwelling specification is given in Table 5.9.

Table 5.9 – Summary of reference values for notional dwelling

Element or system	Values
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area
External walls including semi-exposed walls	0.18 W/m^2K
Party walls	0.0 W/m^2K
Floor	0.13 W/m^2K
Roof	0.11 W/m^2K
Opaque doors (less than 30% glazed area)	1.0 W/m^2K
Semi-glazed door (30-60% glazed area)	1.0 W/m^2K
Rooflights	1.7 W/m^2K
Ventilation system	Natural ventilation with intermittent extract fans. (No air conditioning)
Air permeability	5.0$m^3/h.m^2$ at 50 Pa
Main heating	Boiler and radiators Central heating pump in heated space Design flow temperature = 55°C Boiler 89.5% efficiency
Hot water	Heated by boiler Separate time and control for space and water heating
Waste water heat recovery (WWHR)	All showers connected to WWHR, including showers over baths.
Hot water cylinder	If cylinder, declared loss factor = 0.85 x (0.2 + 0.051$V^{2/3}$) kWh/day where V is the volume of the cylinder in litres
Lighting	Fixed lighting capacity (lm) = 185 x total floor area Efficacy of all fixed lighting = 80 lm/W
Photovoltaic (PV) system	Houses: kWp = 40% of ground floor area, including unheated spaces/6.5 Flats: kWp = 40% of dwelling floor area/ 6.5 x number of storeys in block System facing south-east or south-west

- Limits standards in new dwellings

The fabric elements in new dwellings should meet the limiting standards shown in Table 5.10. Each specified value represents the area-weighted average for all elements of that type. In practice, to achieve the TER and TFEE rate, a significantly better fabric performance than that set out in the Table below is likely to be required.

Table 5.10 – Limiting fabric parameters

Element	Performance
Roof – all types	0.16 W/m^{2}K
Wall	0.26 W/m^{2}K
Floor	0.18 W/m^{2}K
Party wall	0.20 W/m^{2}K
Swimming pool basin	0.25 W/m^{2}K
Windows	1.6
Rooflight	2.2
Door (including glazed doors)	1.6
Air permeability	8.0m^3/(h.m^2) at 50 Pa 1.57m^3/h.m^2) at 4 Pa

- Party walls and other thermal bypasses

To limit heat loss through party walls, it is recommended that cavity walls are fully insulated. There are a number of Robust Detail specifications which permit the use of full cavity fill without detriment to the acoustic performance of the wall. If in doubt, please contact our Technical Services for advice. Alternatively, solid walls can be specified between dwellings using Lignacrete blocks and their use avoids a thermal bypass condition.

Table 5.11– U-Values for party walls

Party Wall construction	U-Value W/m^{2}K
Solid (e.g. 215mm Lignacrete wall)	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 around all exposed edges and in line with insulation layers in abutting elements, eg using a suitable Robust Detail specification	0.0

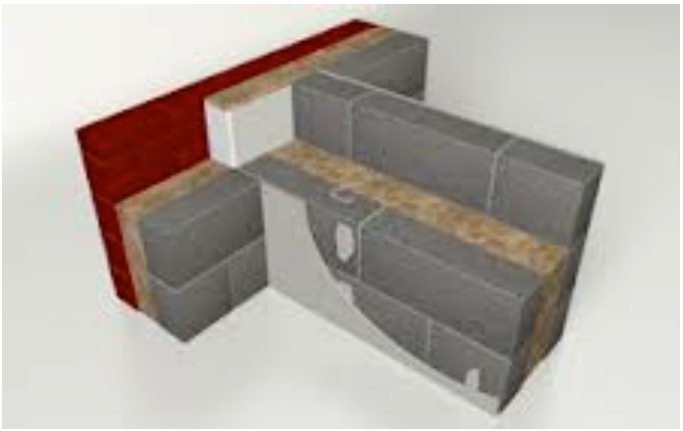


Figure 5.1 – Fully filled cavities provide zero heat loss for party walls

- Part L compliant specification for a dwelling – based on use of an air source heat pump

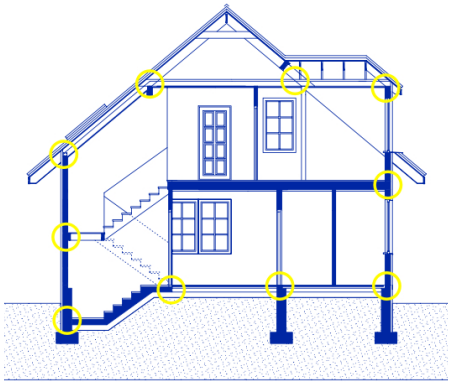
The following example is what a Part L compliant specification may look like for a dwelling using an air source heat pump to provide the heating and hot water.

Table 5.12 – Typical Part L Compliant specification using an air source heat pump

Element or System	Reference value for target setting
Opening areas (windows, roof light and doors)	Same as for actual dwelling not exceeding a total area of openings of 25% of total floor area
External walls including semi-exposed walls	U = 0.18 W/m²K
Party walls	U = 0.0 W/m²K
Floor	U = 0.13 W/m²K
Roof	U = 0.11 W/m²K
Opaque doors (less than 30% glazed area)	U = 1.0 W/m²K
Semi-glazed doors (30-60% glazed area)	U = 1.0 W/m²K
Windows and glazed doors with greater than 60% glazed area	U = 1.2 W/m²K Frame factor = 0.7
Roof windows	U = 1.2 W/m²K
Rooflights	U = 1.7 W/m²K
Ventilation system	Natural ventilation with intermittent extract fans.
Air permeability	5.0m³/(h.m²) at 50 Pa
Main heating fuel (space and water)	**Mains electricity**
Heating system	**Air source heat pump** and radiators Design flow temperature = 45°C
Hot water	Separate time and control for space and water heating
Heat pump	Space heating efficiency = 250% Water heating efficiency = 250%
Heating system controls	**Weather compensation** Either: – Single storey dwelling in which the living area is greater than 70% of total floor area: programmer and room thermostat – Any other dwelling: time and temperature zone control, thermostatic radiator valves
Waste water heat recovery (WWHR)	None
Hot water cylinder	If cylinder, declared loss factor = 0.85 x (0.2 + 0.051$V^{2/3}$) kWh/day where V is the volume of the cylinder in litres
Lighting	Fixed lighting capacity (lm) = 185 x total floor area Efficacy of all fixed lighting = 80 lm/W
Photovoltaic (PV) system	**None**

NOTES: Changes from the notional dwelling specification (Table 5.12) are shown in bold

- Thermal bridging



A major factor in the performance of the building fabric is not simply the amount of insulation you install, but how it interconnects with other components and the other insulated elements within the design.

Building junctions where building elements meet, such as at wall junctions, corners, lintels, cills etc, are usually less well insulated than the main element. This edition of Part L strengthens the measures to limit thermal bridging as well as the need to provide evidence of compliance at completions.

To limit thermal bridging the following apply.

a. Drawings should be provided for junctions.
b. Before elements are concealed, a check should be made to confirm that the designed details have been constructed. Notably, photographs of the details should be taken in line with Appendix B to Approved Document L. This is a new and exacting requirement and applies to each dwelling.
c. Careful consideration should be given to product substitutions to ensure the assumptions in the SAP Design calculations are not invalidated.
d. Wall-to-floor junctions should be detailed to achieve continuity of insulation.

Designers can elect to assess thermal bridging in the following ways:

- Use junction details from a reputable non-government database containing independently assessed thermal junction details. For example, see Recognised Construction Details™ – https://www.recognisedconstructiondetails.co.uk
- Use junction details calculated by a competent person based on the guidance in BRE Report 497 Conventions for calculating linear thermal transmittance and temperature factors.
- Use the values in the Standard Assessment Procedure, Table K1. A mixture of known and default values may be used.
- Use a default Y-Value of 0.20 W/m²K.

Thermal Bridging

It will be apparent that for most designs, it will be necessary to adopt details that can provide the best possible reduction in heat loss, in practice achieving a y-value of around 0.05 W/m²K or better. To do otherwise, it will be necessary to compensate for the higher heat losses by improvements to the U-Values of the building fabric.

APPENDIX

Non-domestic buildings

The scope of Approved Document L, Volume 2: Buildings other than dwellings, includes the following:

a. Calculating the target primary energy rate and target emission rate
b. Consideration of high-efficiency alternative systems
c. Limiting heat gains and losses
d. Minimum building services efficiencies and controls and system specific-guidance
e. Pressure testing
f. Air permeability and pressure testing
g. Commissioning
h. Providing information

Refer to the Approved Document regarding new elements in existing buildings, including extensions, and work to fabric elements in existing buildings.

Calculating the target primary energy rate and target emission rate

New buildings must be built to a minimum standard of energy efficiency. This is done by comparing calculations of the performance of the 'actual building' against calculations of the performance of a theoretical dwelling called the 'notional building'.

The notional dwelling is the same size and shape as the actual dwelling and has standardised properties for fabric and services. The full specifications of the notional building are given in the National Calculation Methodology Modelling Guide, which can be accessed from www.uk-ncm.org.uk.

The energy performance of the notional building is described using the following metrics.

- The target primary energy rate, in kWh_{PE}/m^2 per year
- The target emission rate, in $kgCO_2/m^2$ per year

Generally, compliance will be assessed using the Simplified Building Energy Model (SBEM).

Achieving the target primary energy rate and target emission rate

Providing the building satisfies the minimum standards for fabric elements (see Table 5.6), the design can achieve the target primary energy rate and target emission rate by using any combination of the following.

a. Fabric energy efficiency
b. Efficient building services
c. Low and zero carbon technologies used in an appropriate mix

Consideration of high-efficiency alternative systems

Before building work commences, an analysis must be provided that considers the technical, environmental and economic feasibility of using high-efficiency alternative systems in the construction. Examples include:

- Decentralised energy supply systems based on energy from renewable sources
- Cogeneration
- District or block heating or cooling
- Heat pumps

The analysis should be documented and available for inspection.

- Limiting heat gains and losses

Unwanted heat losses from the building apply to the following:

- The building fabric
- Airtightness
- The pipework and services

The fabric elements in new buildings should meet the limiting standards shown in Table 5.13. Each specified value represents the area-weighted average for all elements of that type. In practice, to achieve the TER, a better fabric performance than that set out in the Table is likely to be required.

Table 5.13 – Limiting U-Values and air permeability in new buildings

Element	Maximum U-Value W/m²K
Roof – flat roof	0.18 W/m²K
Roof – pitched roof	0.16 W/m²K
Wall	0.16 W/m²K
Floor	0.18 W/m²K
Swimming pool basin	0.25 W/m²K
Windows in building similar to dwellings	1.6 or Window Energy Band B
All other windows, roof windows, curtain walling	1.6
Roof lights	2.2
Pedestrian doors	1.6
Vehicle-access and similar large doors	1.3
High-usage entrance doors	3.0
Roof ventilators	3.0
Air permeability	8.0m³/ (h.m²) at 50 Pa

- Minimum building services efficiencies and controls

Extensive guidance is provided regarding minimum building services efficiencies and controls. The Approved Document should be consulted for full details.

- Pressure testing

Buildings will be required to undergo testing for air permeability. The minimum standard is shown in Table 5.6. There are exemptions for buildings with not less than 500m² total useful floor area. However, to avoid a test the air permeability used to calculate the building primary energy rate and building emission rate should be taken as 15.0m³/(h.m²) at 50 Pa. All air pressure testing should be performed following the guidance in the approved airtightness testing methodology, CIBSE's TM23.

- Commissioning

Fixed building services must be commissioned to ensure that they use no more fuel and power than is reasonable. The Approved Document should be consulted for full details.

- Providing information

Operating and maintenance instructions should be provided to the owner of the building in a building log book. For new buildings, the information provided should contain the following:

a. Information so that the building can be operated in an energy-efficient manner, including information about:

i. the building
ii. the fixed building services and on-site electricity generation
iii. the maintenance requirements of the fixed building services and on-site electricity generation

b. A copy of the completed commissioning records.