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CI/SfB	(23)+(27) Ff4

Thermal Compliance

build with ease

H+H

Aircrete /aerkri:t/ noun., adj.

1. autoclaved, aerated concrete (AAC) **2.** (cel)lular (con)crete (CELCON). One of the lightest forms of concrete with structural, thermal, sound, fire and freeze/thaw properties, extensively used in Europe where known as 'gasbeton'. Used in the UK since the 1950s; today known as 'aircrete'. Comprises pulverised fuel ash (PFA), sand, cement, aluminium powder, lime and water. Used as blocks in a range of thicknesses and face formats for internal and external walls above and below dpc and as infill in beam and block floors; used as a material for reinforced floor elements.

Introduction

H+H UK Limited is well known for the beneficial thermal performance of their products, which offer simple solutions that meet and surpass the most demanding building requirements. When using our products thermal performance is only one of the benefits that can be gained:

Versatile building material
Offering benefits too numerous to list, our products help offer simple solutions to all the relevant Building Regulations and are the product of choice for the construction of Foundations, Floors and Walls.

Technical Support
Providing first class technical support we can advise on how to meet specific U-value requirements using our products.

Customer service
Our sales team is organised around the needs of our customers, to provide a continuity of care by our knowledgeable and professional staff.

Innovation
Our Research and Development laboratories are UKAS accredited. We are constantly looking for new and improved methods of delivering product solutions to meet the needs of our ever-changing environment.

Quality products
As part of an international group dedicated to the manufacture of aircrete, our factories are BS EN ISO 9001, BS EN ISO 14001 and OHSAS 18001, ensuring they are IMS compliant registered under the single umbrella to PAS99:2006.

Sustainability
Aircrete is made using up to 80% recycled material, with 99% of raw materials being sourced within the UK. Constructions using our products obtain the highest ratings in the BRE Green Guide to Housing Specification.

In 2008 H+H became the first manufacturer in the industry to achieve certification to the Carbon Trust Standard, for demonstrating year-on-year reductions in the company's carbon footprint.

In 2009 H+H was the first company to achieve 'Very Good' in the BES 6001:2008 standard for the Responsible Sourcing of Construction products, enabling the provision of the maximum 3 credits under the Code for Sustainable Homes.

In 2011, H+H became one of the first manufacturers in the UK to be awarded BSEN 16001, the latest European standard to focus specifically on energy efficiency. H+H also gained the British Standards Institute Energy Reduction Validation (ERV) Kitemark scheme for demonstrating reductions in carbon emissions.

Delivery
With factories and distribution depots strategically placed around the UK our experienced staff are able to offer a responsive and helpful service.

Building Regulations Guidance

Part L 2010 - Conservation of Fuel and Power

The latest amended Approved Document became effective from 1 October 2010. It applies to works from this date, unless work has already started on site, or a formal application is submitted prior to this date, with the requirement that works start on site before 1 October 2011.
The new Part L 2010 requires delivery of a 25% improvement in thermal performance and energy efficiency over the 2006 regulations.

Approved Document L – England / Wales and supporting documents

Approved Document L

Laid out in four documents Approved Document L is split into dwellings (L1) and buildings other than dwellings (L2) both of these sections are then subdivided into new build (L1A and L2A) and work in existing buildings (L1B and L2B). Note; Rooms for Residential Purposes e.g. nursing homes or student accommodation are addressed in L2A and L2B respectively.

For flats or other residential buildings with common areas, if the common areas are heated then AD L2A has to be used for the common areas. Conservatories under 30m[2] attached to a dwelling remain exempt from Building Regulations.

Main changes in the 2010 Edition

1 Approved Document L1A came into force on 1 October 2010. The main changes to the legal requirements and the supporting guidance since the issue of the previous Approved Document L1A are as follows:

Changes in the legal requirements

2 The exemption from the energy efficiency provisions for extensions consisting of a conservatory or porch is amended to grant the exemption only where the existing walls, windows or doors are retained, or replaced if removed and where the heating system of the building is not extended into the conservatory or porch.

3 A new requirement is introduced for CO_2 emission rate calculations to be carried out and given to the Building Control Body, along with a list of specifications used in the calculations before the start of building work on the erection of a new building. This is in addition to the CO_2 emission rate calculation required to be submitted after completion of the work.

Changes in the technical guidance

4 The annual CO_2 emission rate of the completed dwelling is now calculated using SAP2009 and must not exceed the target set by reference to a notional dwelling with an additional overall improvement of 25% relative to 2006 standards.

5 The notional dwelling now includes a party wall heat loss of zero, meaning that the targeted improvement of 25% is in addition to treating party walls between connected dwellings against heat loss.

6 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.

7 Some of the reasonable limits for building fabric and services performance specifications are strengthened.

8 Revised guidance is provided for avoiding thermal bridging at construction joints including the option of adopting a quality-assured accredited construction details scheme approach.

9 New provisions and guidance are introduced to limit heat loss from a swimming pool basin where this is constructed as part of a new dwelling.

10 Guidance is given for presenting the evidence that demonstrates compliance with the energy efficiency requirements and highlighting key features that are critical in achieving the annual CO_2 emission rate target.

Approved Document L1A
Work in new dwellings

The Principle

AD L1A gives guidance for new dwellings. In general, for dwellings there are five criteria to show compliance once the target has been set. These are:

Criterion 1 The predicted rate of carbon dioxide emissions Dwellings Emission Rate (DER) is not greater than the Target Emissions Rate (TER).

Criterion 2 The performance of the building fabric and the fixed building services is no worse than given design limits set out in the Approved document, for example maximum fabric U-values.

Criterion 3 The dwelling has the appropriate passive control measures to limit the effect of solar gains on indoor temperatures in summer, the aim being to reduce or eliminate the need for air conditioning.

Criterion 4 The performance of the dwelling, as built, is consistent with the DER. Extra credits are given in the TER/DER where buildings provide robust evidence of quality assured procedures in design and construction.

Criterion 5 The necessary provisions for energy efficient operation of the dwelling are put in place.

The key to meeting the Regulations is by comparing the target and design carbon dioxide emissions of the building. The Target Emission Rate (TER), expressed as a quantity of CO_2 per m^2 of floor area per year, is calculated for the new dwelling using SAP2009. No other method is allowed.

Two sets of DER will be needed:

Design–Draft It is now a requirement to submit TER and DER for the building and a list of specifications used in the calculations to the Building Control Body before works start on site.

Design–Final The second DER calculation is at completion stage using 'as built data' and the actual air permeability figures. An Energy Performance Certificate (EPC) is also required for all new dwellings.

Calculating the CO_2 emissions from the actual dwelling There are certain limits on design flexibility such as; maximum average U-value (see diagram 1) to ensure that each construction element plays a significant part in meeting the requirements. In addition to these maximum average U-values an upper limit on air permeability of 10 $m^3/hr/m^2$ is given as 'reasonable'. The only exception to this is for small sites where the builder has opted not to test.

Diagram 1 (from Table 2 AD L1A)
Limiting U-value standards (W/m^2K)

Element	U-value (W/m^2K)
Wall	0.30
Floor	0.25
Roof	0.20
Windows, roof lights, glazed doors	2.0
Party Walls	0.20

To comply with the regulations, the DER must be no worse than the TER calculated. The final DER calculation must be based on the building as constructed, incorporating:

a. any changes to the list of specifications that have been made during construction; and

b. the assessed air permeability. The assessed air permeability has to be determined as follows:

i. where the dwelling has been pressure tested, the assessed air permeability is the measured air permeability;

ii. where the dwelling has not been tested, the assessed air permeability is the average test result obtained from other dwellings of the same dwelling type on the development increased by a margin of +2.0 $m^3/(h.m^2)$ at 50 Pa. The outcome of this change is that the design air permeability should be at most 8.0 $m^3/(h.m^2)$ at 50 Pa, so that untested dwellings should achieve an assessed air permeability less than the limiting value of 10 $m^3/(h.m^2)$ at 50 Pa.

iii. on small developments, where the builder has opted to avoid testing, the assessed air permeability has to be taken as a value of 15 $m^3/(h.m^2)$ at 50 Pa.

Approved Document L1A continued
Thermal bridges

The building fabric has to be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements and at the edges of elements such as those around window and door openings.

The Approved Document specifies that where calculated, linear thermal transmittances and temperature factors should be calculated following the guidance set out in BR 497. Additionally, the builder has to demonstrate that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standards of consistency.

There are a number of ways of demonstrating that reasonable provision has been made. These are:

a. **To adopt a quality-assured accredited construction details approach in accordance with a scheme approved by the Secretary of State.**
   If such a scheme is utilised then the calculated linear thermal transmittance can be used directly in the DER calculation;

   For new buildings, such scheme(s) accredit and quality assure the calculation of the linear thermal transmittance, accredit details in terms of buildability and have an associated quality assurance regime that inspects a sample of sites to confirm that the details are being implemented correctly. This would be similar in nature to the scheme in place for acoustic requirements by ‘Robust Details Limited’.

b. **To use details that have not been subject to independent assessment of the construction method.**
   However, in this case, the linear thermal transmittance should still have been calculated by a person with suitable expertise and experience following the guidance set out in BR 497 and a process flow sequence should be provided to the Building Control Body indicating the way in which the detail should be constructed The calculated value increased by 0.02W/mK or 25% whichever is greater can then be used in the DER calculation. However, until a scheme (as in ‘a’ above) is in place, the increase to the calculated value does not apply.

c. **To use unaccredited details, with no specific quantification of the thermal bridge values.**
   In such cases a conservative default y-value of 0.15 must be used in the DER calculation. This, however, will almost certainly add significant cost to the design, since carbon emission savings will have to be made elsewhere.

The alternative approaches (a and b above) are not mutually exclusive. For example, a builder could use the accredited construction details scheme approach for the majority of the junctions, but use a bespoke detail for the window head. In this case, the 0.02W/mK or 25%, whichever is greater margin, would apply only to the thermal transmittance of the window head detail.

Air permeability and pressure testing

The AD sets out the requirements.
On each development, an air pressure test should be carried out on three units of each dwelling type or 50 per cent of all instances that dwelling type, whichever is the less. A block of flats is treated as a separate development irrespective of the number of blocks on the site. The dwelling(s) to be tested are taken from the first completed batch of units of each dwelling type.

Most larger developments will include many dwelling types - and multiple units of each type have to be tested to confirm the robustness of the designs and the construction procedures. The Building Control Body will normally select the dwellings to be tested.

Compliance with the requirements is demonstrated if:

a. the measured air permeability is not worse than the limit value of $10m^3/(h.m^2)$ at 50 Pa; and

b. the DER calculated using the measured air permeability is not worse than the TER.

This means that if a design adopted a low (i.e. better) design air permeability in order to achieve a performance better than the TER, it would fail to comply with Part L if the pressure test achieved the limit value and the TER was achieved.

As an alternative approach to specific pressure testing on development sites where no more than two dwellings are to be erected, it is allowed to either;

demonstrate that during the preceding 12 month period, a dwelling of the same dwelling type constructed by the same builder had been pressure tested and had achieved the design air permeability, or avoid the need for any pressure testing by using a value of 15 $m^3/(h.m^2)$ at 50 Pa for the air permeability.

The effect of using this cautious value of 15 would then have to be compensated for by improved standards elsewhere in the dwelling design.

Approved Document L1A continued

H+H Solutions

Whilst there is much flexibility available to the designer, for wall constructions it is likely that the range of wall U-values will be from 0.20 to 0.25W/m^{2}K, depending upon air permeability values, boiler efficiency, fuel type and type of dwelling.

H+H UK can offer simple, cost-effective wall constructions to meet these values, see Typical House Types for examples, that can easily be accommodated with cavities of 100mm or less (see the back of this document for examples).

Floor constructions are likely to be in the range of 0.15 to 0.20W/m^{2}K, with Beam and H+H Block solutions being suitable However compensatory measures may be used to allow higher U-values.

Typical House Types

The following examples are based on actual house types and indicate the design parameters that can typically be used to obtain compliance with Part L1A.

End of Terrace House

For an end terrace 3 bedroom dwelling with ground floor area of approximately 45m^2.

Building Fabric Insulation

Element	U-value (W/m²K)
Ground floor	0.15
Walls	0.25
Roof	0.16
Windows/Doors	1.4 / 1.2
Separating wall	0.0

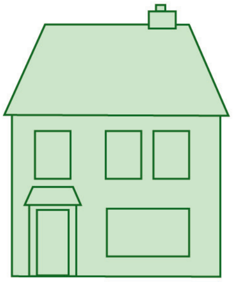
Space/Water Heating

Element	
Boiler	90.0% SEDBUK, gas fired instantaneous combi
Controls	Time and temperature zone control, Interlock+ delayed start thermostat
Secondary	Electric room heaters heating (Default)

Other

Element	
Air Permeability	7m³/(h.m²) @ 50pa
Lighting	75% Low Energy
Equivalent 'y' value	Calculated using H+H linear thermal bridge details
TMP	Calculated using actual material values

Detached House



For a detached 4 bedroom dwelling with ground floor area of approximately 60m^2 the following specification can be achieved.

Building Fabric Insulation

Element	U-value (W/m²K)
Ground floor	0.15
Walls	0.25
Roof	0.16
Windows/Doors	1.4 / 1.2
Separating wall	0.0

Space/Water Heating

Element	
Boiler	90.0% SEDBUK, gas fired instantaneous combi
Controls	Time and temperature zone control, Interlock+ delayed start thermostat
Secondary	Electric room heaters heating (Default)

Other

Element	
Air Permeability	7m³/(h.m²) @ 50pa
Lighting	75% Low Energy
Equivalent 'y' value	Calculated using H+H linear thermal bridge details
TMP	Calculated using actual material values

Mid Terraced House

Mid terraces are generally slightly more difficult to achieve compliance. In this example we have used a 3 bedroom dwelling with ground floor area of approximately 45m².

Building Fabric Insulation

Element	U-value (W/m²K)
Ground floor	0.14*
Walls	0.25
Roof	0.16
Windows/Doors	1.4 / 1.2
Separating wall	0.0

Space/Water Heating

Element	
Boiler	90.0% SEDBUK, gas fired instantaneous combi
Controls	Time and temperature zone control, Interlock+ delayed start thermostat
Secondary	Electric room heaters heating (Default)

Other

Element	
Air Permeability	7m³/(h.m²) @ 50pa
Lighting	100% Low Energy
Equivalent 'y' value	Calculated using H+Hy value linear thermal bridge details
TMP	Calculated using actual material values

* Usually results in the same insulation thickness as an end terrace with a U-value of 0.15W/m2K.

There is much scope for increasing and decreasing U-values and trading off with other elements. In the case where a renewable energy source is used (e.g. PV or Solar panels), it is likely that the U-values can be relaxed to the limiting values in the Approved Document L 1A.

Achieving Compliance

There are a large number of factors to be taken into consideration when trying to achieve the TER. For most dwellings the range of workable elemental U-values is as follows:

Element	Performance	
Roof	0.13 to 0.16W/m²K	250-300mm insulation
Walls	0.20 to 0.25W/m²K	100-150 cavity
Windows/doors	1.2 to 1.50W/m²K	D/G, Low E, Argon fill
Floor	0.15 to 0.20W/m²K	75mm insulation on beam/block
Boiler	90 to 92% SEDBUK	Currently Available
Airtightness	5 to 7m³/(h.m²)	Currently Achievable
Party Wall	0.0W/m²K	Filled and sealed

Approved Document L1A continued
H+H Solutions

Linear Thermal Bridging

Additional heat losses due to thermal bridging are considered within the SAP calculations and are obtained by multiplying the linear thermal transmittance (psi-value) of a junction by the total length. As a means of easy comparison, these additional heat losses are often translated into a 'whole house figure', called a y-value (by dividing the additional heat loss by the total exposed area).

Under previous versions of SAP, default values for 'y' could have been used to save additional calculations, however, for the 2010 regulations SAP2009 requires that each dwelling should have thermal bridge heat losses calculated individually (unless a very onerous y=0.15 is adopted).

Aircrete has long been known for its beneficial thermal properties, these thermal benefits have recently been further enhanced by research into linear thermal bridging. The use of H+H UK's Foundation Blocks, the Beam and Block flooring System and H+H's range of aircrete blocks in the walls can offer significant thermal benefits due to the reduction in the heat loss at the junction of the wall, floor and foundation. Typically, y-values of 0.02-0.06 (subject to house type and layouts) can be realised using standard aircrete junction details without the need for further enhancement.

Party Wall By pass

The issue of thermal loss via the separating party walls is new as a regulatory requirement. Contrary to previous assumptions, a limited amount of site testing work has shown that cavity party walls may not be calculated at zero heat loss. This is because airflow in an empty cavity provides a heat loss mechanism, with the heat assumed to enter the cavity and then flow upwards and outwards to be lost to the surrounding air.

Thus a significant change for Part L 2010 is the notional dwelling used for the TER, which assumes a party wall U-value of Zero. Therefore, if there is a party wall this has to be designed as having a zero heat loss and then the 25% for the 2010 improvement in Carbon emission is applied.

Some guidance is given in the AD for U-values of party walls and the table below
is repeated from the AD

Therefore, in reality cavity party walls will require some insulation.
There is a useful definition of 'full fill' from the Building Control Alliance **http://www.buildingcontrolalliance.org/downloads**
Click on 'Definition of fully filled Cavity Seperating Wall (203)'

H+H Party Wall Solutions

The solutions being offered to obtain the zero U-value party wall using Aircrete are regularly being updated by Robust Details Limited (RDL) as approved constructions. In the revision to the RDs, Isover RD Party Wall Rolls can be added to the existing aircrete construction RDs for constructions using either conventional or thin layer mortar. However, the inclusion of a specific blown fibre material in the cavity does not have any detrimental effect on the wall's acoustic performance, and this will offer an alternative solution. As far as sealing the wall is concerned, cavity socks can be used to close the party wall and external wall junction and there are proprietary systems that can be used at the head and base of the wall.

As a result, the construction of 2 leaves of H+H 100mm Standard or Hi-Strength aircrete with a minimum 75mm filled cavity will achieve compliance with both the Part E and Part L. If thin-joint construction is being used, an additional option is to omit the wall ties if structural design permits, which will enhance the acoustic performance further.

Party Wall	U-value assigned (W/m^2K)
Solid	0.00
An unfilled cavity with no effective edge sealing	0.50
An unfilled cavity with effective sealing around all exposed edges and in line with insulation layers in abutting elements	0.20
A fully filled cavity with effective sealing around all exposed edges and in line with insulation layers in abutting elements	0.00

Approved document L1B
Work in existing dwellings and extensions

Extensions

For extensions, the ADL1B can be met by limiting the total area of windows, roof windows and doors in extensions so that it does not exceed the sum of:

25% of the floor area of the extension, plus the total area of any windows or doors which, as a result of the extension works, no longer exist or are no longer exposed.

The U-values should meet the standards set out in the table:

Table 1 (From ADL 1B Table 2)
Standards from new thermal elements

Element	Standard (W/m²K)
Wall	0.28
Pitched roof – insulation at ceiling level	0.16
Pitched roof – insulation at rafter level	0.18
Pitched roof or roof with integral insulation	0.18
Floors	0.22*
Swimming Pool Basin	0.25

*a lesser provision may be appropriate, depending upon floor conditions and can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

The approach set out above is seen to be somewhat prescriptive. An alternative approach is provided to allow some elements of the design to be relaxed through compensating measures elsewhere. One method is to show that the area-weighted U-value of all the elements in the extension is no greater than an extension of the same size and shape that complies with the standards in table 1, the opening area standards.

For even greater flexibility, it is possible to use SAP to show that the calculated CO_2 emission rate from the dwelling with its proposed extension is no greater than for the dwelling, plus notional extension built to the standards for thermal elements in table 1. If as part of the standard set out, upgrades are proposed to the existing dwelling, such upgrades should be no worse than those set out in column (b) of table 2.

Renovation of thermal elements

The AD considers requirements for all renovation of a thermal element, which could be through the provision of a new layer, including cladding or rendering of the external surface or internal dry-lining or the replacement of an existing layer, such as stripping down a wall to expose the brick or blockwork. Where such renovation takes place, the element performance should be improved to achieve or better the U-value in column (b) of table 2, within certain provisions. There are reasons for not doing this, for example if the payback period is longer than 15 years.

For retained thermal elements, there are requirements:

a. Where an existing element is part of a building subject to material change of use

b. Where an existing element is to become part of the thermal envelope where previously it was not, e.g., part of a garage conversion.

It is required to upgrade those elements whose U-value is worse than the threshold value in column (a) of table below to achieve a U-value given in column (b).

Table 2
Upgrading retained thermal elements

Element	(a) Threshold U-value W/m²K	(b) Improved U-value W/m²K
Wall – cavity insulation	0.70	0.55
Wall – external or internal insulation	0.70	0.30
Floor	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation between rafters	0.35	0.18
Flat roof or roof with integral insulation	0.35	0.18

There are some relaxations given in the AD in cases where the values given in column (b) are difficult to achieve.

Approved document L2A

Work in new buildings other than dwellings and large extensions

The only route to showing compliance to Part L is through the new Simplified Building Energy Model (SBEM).

There are as with AD L1A five criteria to demonstrate compliance.

1. Meeting a CO_2 emission rate
2. Meeting design limits for fabric and services. These are essentially longstop values, since using these would not give you a compliant building.
3. Check that the building has passive control measures to limit solar gains.
4. Check building as built is as designed – air tightness and services
5. Provision of necessary information for building owner/occupier.

The Target CO_2 Emission Rate (TER) is the minimum energy the performance requirement for a new building and must be calculated using Simplified Building Energy Model (SBEM) or other approved software tools. An up to date list of approved software can be found at www.communities.gov.uk.

The TER is established by using approved software to calculate the CO_2 emission rate from a notional building of the same size and shape as the actual building, but with specified properties. These specified properties shall be as set out in the 2010 version of the National Calculation Methodology (NCM) Modeling Guide, in the section headed 'Detailed definition of Notional Building for buildings other than dwellings.

The specification delivers an overall 25% reduction in CO_2 emissions across the new-build mix for the non-dwellings sector (the so-called 'aggregate approach').

As per ADL1A, there are limits on the fabric standards. These are shown in the table.

Limiting fabric parameters

Roof	0.25W/m^{2}K
Wall	0.35W/m^{2}K
Floor	0.25W/m^{2}K
Windows, roof windows. Roof lights curtain walling and pedestrian doors	2.2W/m^{2}K
Vehicle access and similar large doors	1.5W/m^{2}K
High-usage entrance doors	3.5W/m^{2}K
Roof ventilators (inc. smoke vents)	3.5W/m^{2}K
Air permeability	10.0m^3/hm^2 at 50 Pa

Linear thermal bridging is treated in the same way as for dwellings.

The designer has to show that the Building Emission Rate (BER) is better than the previously calculated TER. The BER has to be calculated using the same software as used to get the original TER. This should not be difficult since entering the building data into SBEM will give the notional building emissions and also the proposed building emissions (the BER).

The final BER should take as-built details and the test data from air tightness, ductwork and fan commissioning. Most buildings have to be air tested, but there are a number of exceptions given.

All building services must be commissioned so that at completion systems and controls are in working order.

Approved document L2B
Work in existing buildings other than dwellings

For existing buildings other than dwellings, the guidance is generally based upon an elemental approach, with additional guidance that provides greater flexibility. As with new build, there is a general raising of building standards for existing buildings with more focused guidance for thermal elements, replacement fittings and heating systems.

For large extensions, where the floor area is the extension is greater than $100m^2$ and 25% of the existing floor area, the work has to be regarded as a ‘new build’. It will therefore have to meet Part L2A.

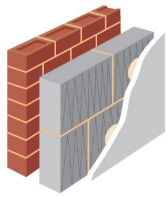
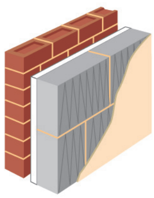
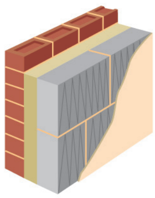
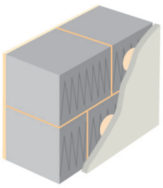
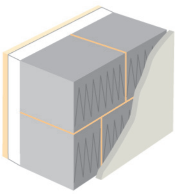
For most existing buildings, the standard for new and replacement windows is no longer expressed as U-value, but as a Window Energy Rating. The AD contains a table setting the standards for maximum window, door and roof lights, for different building types.

As per ADL1B, an optional approach to elements is available using an area-weighted U-value method. The standards for U-values for new thermal elements are the same for extensions to dwellings as given in L1B.

A similar approach to extensions to dwellings for renovation of thermal elements also applies to non-dwellings. As a result, the table given in L2B for upgrading retained thermal elements is the same a L7B.

H+H Solutions

This is just small sample of the available solutions using H+H products. Specific wall construction U-values, as well as beam and block floor U-values can be obtained from our Technical Department.

	$0.30W/m^2K$	$0.28W/m^2K$	$0.25W/m^2K$
	**Clear Cavity** Brick outer leaf Clear cavity **100mm Standard Grade** 25mm TW50 between battens + 40mm Thermaline Super **$0.30W/m^2K$**	**Clear Cavity** Brick outer leaf Clear cavity **100mm Standard Grade** 60mm ThermaLine SUPER **$0.27W/m^2K$**	**Clear Cavity** Brick outer leaf Clear cavity **100mm Standard Grade** 70mm ThermaLine SUPER **$0.24W/m^2K$**
	**Partial Fill Cavity** Brick outer leaf Clear cavity 40mm Kingspan TW50 **100mm Standard Grade** Any finish* **$0.30W/m^2K$**	**Partial Fill Cavity** Brick outer leaf Clear cavity 45mm Kingspan TW50 **100mm Standard Grade** Any finish* **$0.28W/m^2K$**	**Partial Fill Cavity** Brick outer leaf Clear cavity 50mm Kingspan TW50 **100mm Standard Grade** Plasterboard on dabs **$0.25W/m^2K$**
	**Fully Filled Cavity** Brick outer leaf 75mm Dritherm 32 **100mm Standard Grade** Lightweight Plaster **$0.30W/m^2K$**	**Fully Filled Cavity** Brick outer leaf 100mm Dritherm 37 **100mm Standard Grade** Plasterboard on dabs **$0.28W/m^2K$**	**Fully Filled Cavity** Brick outer leaf 100mm Dritherm 32 **100mm Standard Grade** Plasterboard on dabs **$0.25W/m^2K$**
	**Solid wall - internal insulation** Render finish **215mm Solar Grade** 40mm ThermaLine Super **$0.30W/m^2K$**	**Solid wall - internal insulation** Render finish **215mm Solar Grade** 50mm ThermaLine Super **$0.26W/m^2K$**	**Solid wall - internal insulation** Render finish **215mm Solar Grade** 60mm ThermaLine Super **$0.23W/m^2K$**
	**Solid wall - external insulation** Render finish 55mm EPS# OR 30mm Kingspan K5 **215mm Solar Grade** Plasterboard on dabs **$0.30W/m^2K$**	**Solid wall - external insulation** Render finish 75mm EPS# OR 40mm Kingspan K5 **215mm Solar Grade** Any finish* **$0.28W/m^2K$**	**Solid wall - external insulation** Render finish 85mm EPS# OR 45mm Kingspan K5 **215mm Solar Grade** Any finish* **$0.25W/m^2K$**

Notes:
* Any internal finish assumes dense plaster as worst case. Lightweight plaster or Plasterboard on dabs may also be used
# EPS insulation assumed to be tongue and groove or lapped jointed

Above U-values are not exhaustive, please contact our Technical Department for other constructions or grades of block not shown

0.22W/m²K	0.20W/m²K	0.18W/m²K	0.15W/m²K
Clear Cavity Brick outer leaf Clear cavity **100mm Standard Grade** 80mm ThermaLine SUPER **0.21W/m²K**	**Clear Cavity** Brick outer leaf Clear cavity **100mm Standard Grade** 90mm ThermaLine SUPER **0.19W/m²K**	**Clear Cavity** Brick outer leaf Clear cavity **100mm Standard Grade** 25mm TW50 between battens +80mm ThermaLine SUPER **0.18W/m²K**	**Clear Cavity** Brick outer leaf Clear cavity **100mm Standard Grade** 40mm TW50 between battens +90mm ThermaLine SUPER **0.15W/m²K**
Partial Fill Cavity Brick outer leaf Clear cavity 65mm Kingspan TW50 **100mm Standard Grade** Plasterboard on dabs **0.22W/m²K**	**Partial Fill Cavity** Brick outer leaf Clear cavity 75mm Kingspan TW50 **100mm Standard Grade** Plasterboard on dabs **0.20W/m²K**	**Partial Fill Cavity** Brick outer leaf Clear cavity 100mm Kingspan TW50 **100mm Standard Grade** Any finish* **0.18W/m²K**	**Partial Fill Cavity** Brick outer leaf Clear cavity 125mm Kingspan K8 **100mm Standard Grade** Lightweight plaster **0.15W/m²K**
Fully Filled Cavity Brick outer leaf 150mm Dritherm 37 **100mm Standard Grade** Plasterboard on dabs **0.22W/m²K**	**Fully Filled Cavity** Brick outer leaf 150mm Dritherm 32 **100mm Standard Grade** Any finish* **0.20W/m²K**	**Fully Filled Cavity** Brick outer leaf 100mm Xtratherm CavityTherm **100mm Standard Grade** Plasterboard on dabs **0.18W/m²K**	**Fully Filled Cavity** Brick outer leaf 150mm Xtratherm CavityTherm **100mm Standard Grade** Any Finish **0.14W/m²K**
Solid wall - internal insulation Render finish **215mm Solar Grade** 70mm ThermaLine Super **0.20W/m²K**	**Solid wall - internal insulation** Render finish **215mm Solar Grade** 70mm ThermaLine Super **0.20W/m²K**	**Solid wall - internal insulation** Render finish **215mm Solar Grade** 80mm ThermaLine Super **0.18W/m²K**	**Solid wall - internal insulation** Render finish **215mm Solar Grade** 25mm TW50 between battens +90mm ThermaLine SUPER **0.15W/m²K**
Solid wall - external insulation Render finish 115mm EPS# OR 55mm Kingspan K5 **215mm Solar Grade** Any finish* **0.22W/m²K**	**Solid wall - external insulation** Render finish 130mm EPS# OR 65mm Kingspan K5 **215mm Solar Grade** Any finish* **0.20W/m²K**	**Solid wall - external insulation** Render finish 165mm EPS# OR 75mm Kingspan K5 **215mm Solar Grade** Any finish* **0.18W/m²K**	**Solid wall - external insulation** Render finish 215mm EPS# OR 95mm Kingspan K5 **215mm Solar Grade** Any finish* **0.15W/m²K**

For further information, to check our most up-to-date product range or to find your nearest stocking merchant, please visit our website **www.hhcelcon.co.uk** or contact the following departments:

Sales
For sales enquiries or to find your local stockist please contact
Tel: 01732 886444
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