APRIL 2014

Approved Document L 2013 Edition (England)

A guide to the changes

ROCKWOOL®

CREATE AND PROTECT®

This document provides a quick and easy reference guide of typical constructions and U-values using ROCKWOOL insulation products. The solutions offered will assist the end user to meet or exceed the building fabric performance levels required by the Part L 2013 documents (England).

This guide shows only a selection of our insulation products.
For further information on our wider product range, please visit www.rockwool.co.uk

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Section 1: Introduction to Approved Document L 2013

SUMMARY OF THE KEY CHANGES

The new Approved Document L 2013 came into force on 6th April 2014 and for the first time covers England only. Wales will introduce their own version of Approved Document L on 31st July 2014, based on the same methodology but with different targets. Scottish Building Regulations will follow in 2015.

The government has reiterated its commitment to making all new homes 'Zero Carbon' by 2016 and European legislation now also requires 'nearly zero energy' buildings from 2019.

However the government has also stated that in order to strike a balance between Zero Carbon and economic growth, the carbon reduction measures introduced in the 2013 ADL is smaller than was generally anticipated in the industry.

The new 2013 ADL will require New Dwellings to deliver a further 6% reduction in CO_2 emissions above 2010 standards and New build Non-Domestic an average 9% aggregate reduction above the 2010 standards.

As with previous documents the new 2013 ADL is broken down into 4 sections:

ADL1A	New Buildings:-	Dwellings
ADL2A	New Buildings:-	Buildings other than dwellings
ADL1B	Existing buildings:-	Dwellings
ADL2B	Existing buildings:-	Buildings other than dwellings

New build dwellings ADL1A

- New Build Dwellings will be required to deliver a further 6% reduction in carbon emissions above the 2010 standards.
- More Emphasis on building fabric performance, with the introduction of a Fabric Energy Efficiency target (FEES) level less 15%. This new target sits alongside TER/DER compliance
- Compliance has been made easier for detached dwellings so as to bring in line with other dwelling types (so that the same specification could be used across a development),
- For the first time a definitive means of compliance for an **elemental recipe** has been introduced, or as the Approved Documents call it 'Model Designs'. If the actual building is constructed entirely to this specification it will pass the TER requirement. (Details of the Notional Building Specifications can be found in 'Section 5: Model designs' of ADL1A and, Appendix R SAP 2012)
- No changes have been made in limiting fabric U-values ("Back Stops")
- New Building Services Compliance Guides have been introduced for domestic buildings.

New build non–domestic L2A

- New build Non –Domestic will be required to deliver an average 9% aggregate reduction in carbon emissions across the build mix, compared to 2010 standards.
- A wider range of notional buildings have been defined for top-lit, side-lit (heated only) and side-lit (heated and air conditioned) buildings.
- The notional building air permeability parameters have been further defined by the gross internal area of the building. The larger the building, the easier it is to achieve a good level of air tightness.
- For the first time a definitive means of compliance for an **elemental recipe** has been introduced, called 'Model Designs'. If the actual building is constructed entirely to this specification it will pass the TER requirement.(Details of the Notional Building Specifications can be found in 'Section 5: Model designs' of ADL2A)
- No changes have been made in limiting fabric U-values ("Back Stops")
- New Building Services Compliance Guides have been introduced for Non –Domestic buildings.

Existing buildings L1B and L2B

- Part L 2013 has not dealt with improvements to Existing buildings which have basically remained unchanged from the Part L 2010 (other than minor wording changes/clarifications).
- No changes have been made to the fabric U-values for extensions or to the performance of replacement windows or boilers
- Consequential improvements have not been implemented.

Transitional arrangements

The transitional provisions for 2013 are the same as the 2010 transitional arrangements. The provisions of ADL 2013 would not apply to the following:

- Where building work has commenced on site before 6th April 2014
- When a Building Notice or Full Plans submission of initial notice has been given to a local authority or building control body before 6th April 2014, so long as work commences on site before 6th April 2015.

This may be seen as a lenient approach, however, there is a difficulty in balancing between improving energy efficiency of new dwellings and kick starting the house building industry. This approach will also allow 'build-out' of existing projects, which avoids unnecessary revisions to specification and budgets part way through a development.

For larger housing developments, the transitional provisions will apply to the whole Building Regulation application, which means that only one plot on a site would need to commence to validate all of the plots on the application under the current Part L requirements.

The following are considered by Government to be classed as a valid commencement of work:

- Excavation for strip or trench foundations or for pad footings
- Digging out and preparation of ground for raft foundations
- Vibrofloatation (stone columns) piling, boring for piles or pile driving
- Drainage work specific to the building(s) concerned.

Government does not consider the following to be classed as valid commencement.

- Removal of vegetation, top soil, or treatment of contaminated land
- Demolition of previous buildings on site
- Dynamic compaction
- General site servicing works (temporary roads for example).

What does this mean to the developer?

Should a developer wish to build the site to the ADL 2010 regulations then they must have registered the site with Building Control before 6th April 2014. Secondly, work must start on site before 6th April 2015. If you don't think you're going to be able to start work before this date, make sure you've got some flexibility in your budget to accommodate improvements to the building fabric and services to ensure compliance.

Responsibility for compliance

Currently a great deal of responsibility is placed upon the developers to ensure compliance is met, however this often results in under compliance with the Building Regulations.

For Building Control to properly enforce the changes, a more robust system of building assessment and performance checking is now being implemented.

It is important to remember that the person (e.g. designer, builder, installer) carrying out building work has a responsibility to ensure that the work complies with Building Regulation requirements.

The building owner also has a responsibility for ensuring compliance and could be served with an enforcement notice in cases of non-compliance.

U-value competency

ROCKWOOL was one of the first organisations to be approved under a voluntary U-value and Condensation Risk Competency Scheme introduced by the British Board of Agrément (BBA) in association with the Thermal Insulation Manufacturers and Suppliers Association (TIMSA).

U-value or condensation risk calculations provided by approved ROCKWOOL employees are backed up by the BBA Competent Persons Logo, which signals to a customer that the data provided is credible.

Registration under the Scheme provides reassurance to a specifier or user that the services or the data being provided by a scheme member has been subject to a rigorous independent assessment process. They can therefore be assured that this output is representative and reliable.

The use of correct U-values is fundamental to compliance with Building Regulations, determining heating and cooling costs for the building occupier and assessing environmental performance. ROCKWOOL and the BBA encourage organisations that require U-value and Condensation risk calculations to obtain this information from suitably qualified companies.

NEW DWELLINGS: APPROVED DOCUMENT L1A

From 6th April 2014 all new build dwellings in England that have not previously been subject to either a Building Notice, Full Plan application or initial notice will be required to deliver a further 6% reduction in in carbon emissions above the 2010 standards.

A significant change to the methodology for demonstrating compliance has been introduced, which combines the current carbon emission measure ($kgCO_2/m^2$/year) calculated for the building, with a new requirement to consider the fabric energy efficiency (kWh/m^2/year) of the building.

The new fabric energy efficiency requirement (FEES) assesses the performance of built-in aspects such as fabric performance and air tightness.

This means the thermal performance of the building fabric now has its own standards and cannot be compensated for with a services strategy or renewable technologies.

The new document has also sought to simplify the compliance route by introducing a new 'notional building' which adopts an, **elemental recipe**' approach, which will be particularly helpful for the self-build market. It provides a straightforward, non-prescriptive means for house builders to meet as a compliant building specification, whilst maintaining a reasonable degree of design flexibility.

Overview of the changes to AD L1A 2013

Changes to design standards

The revised Part L1A approach to demonstrating compliance brings with it new terms and concepts that will become an integral part of energy efficiency design in the future.

The new requirements herald a major change in the way the National Calculation Methodology works for new dwellings, with the introduction of additional targets. These are the Dwelling Fabric Energy Efficiency Standards (DFEES) and the Target Fabric Energy Efficiency Standards (TFEES).

TER: The Target Emission Rate (TER) is calculated by using a dwelling of the same size and shape, but is now based on the elemental standards of Appendix R in SAP 2012. Building to the values in Appendix R will result in compliance with the TER. The TER calculation also requires the lengths and psi values of each thermal bridge; as a consequence the only y value that can be specified when calculating a DER is 0.15 W/m^2K. The aim is to encourage builders to consider thermal bridging earlier on in the process.

FEE: Fabric Energy Efficiency, is a measure of building envelope performance, which will be met by good design of the building fabric. It is measured in kWh/m^2/year. This means the thermal performance of the building fabric now has its own standards and cannot be compensated for with services strategy or renewable features.

FEES: Fabric Energy Efficiency Standard is a minimum performance standard developed by the Zero Carbon Hub when defining the target for 2016 zero carbon homes. This approach considers the space heating and cooling demands of a dwelling which are affected by:

- Building fabric U-values
- Thermal bridging
- Air permeability
- Thermal mass
- Lighting and solar gains.

The Standard sets two levels of maximum FEE at $39kWh/m^2$/year for mid-terrace houses and apartments, and $46kWh/m^2$/year for end-terrace, semi-detached and detached.

TFEE: Target Fabric Energy Efficiency, is the maximum permitted space heating and cooling demands of a dwelling. The target is calculated by building type.

DFEE: Dwelling Fabric Energy Efficiency, is the calculated energy demand for the building under consideration. It must be less than TFEE to demonstrate compliance.

The Target Emission Rate (TER) and the Target Fabric Efficiency Rate (TFEE) for individual dwellings must be calculated using SAP 2012. When a SAP calculation for Part L 2013 is carried out both the traditional carbon target TER (Target Emission Rate) and the TFEE must be passed.

New notional building

There is now a definitive means of compliance for the notional building using an 'elemental recipe', which appears in 'Section 5: 'Model designs'. If you build exactly to this simplified recipe the dwelling will pass the SAP and comply with both the TER and the TFEE. The fabric U-value requirements of the new notional building are as follows: Walls 0.18 (W/m^2K); Floors 0.13 (W/m^2K): Roofs 0.13 (W/m^2K): Windows 0.14.

Basis for demonstrating compliance:
SAP 2012 will be used to assess compliance with Part LIA

- The methodology for demonstrating compliance combines the current carbon emission measure ($kgCO_2/m^2$/year) calculated for the dwelling, with a new requirement to consider the fabric energy efficiency (kWh/m^2/year) of the building envelope.
- The process of demonstrating compliance uses a calculated carbon emission rate for the building in question ($kgCO_2/m^2$/year) and compares this to a target carbon emission rate, also calculated specifically for that building. In Part L terminology, the Dwelling Emission Rate (DER) must be less than the Target Emission Rate (TER). This approach is familiar from Part L 2010.
- The document also makes it much clearer that an EPC (Energy Performance Certificate) does not demonstrate compliance but is an associated output from the process. What demonstrates compliance is documentation provided by the builder to Building Control showing that the dwelling meets the required targets along with details of how specifically this was achieved. These are needed before work starts (at least 1 day) and after work ends (within 5 days).

Limiting fabric parameters:
The Limiting U-values shown in the table below remain unchanged from Part L1A 2010. It should be noted that these are only backstop U- values and will need to be significantly improved upon in order to achieve the TER and TFEE rate.

Table 1 below sets out limiting standards for the building fabric element.

Table 1

Limiting fabric parameters	U-value
Walls	0.30
Roof	0.20
Floors	0.25
Party walls	0.20
Windows/roof lights/doors	2.00
Air tightness	10m^3/m^2/hr @ 50 Pa
Swimming pool basin	0.25

Heat losses and gains from circulation pipes:
The calculation of overheating in the dwelling now includes losses and gains from the space heating and domestic hot water circulation pipes. The insulating of these pipes now gains greater significance in order to prevent overheating risk in dwellings.

Thermal Bridging:
Thermal bridging is one of the major challenges for the DCLG as it seeks to close the gap between design performance and as-built performance on building sites. However the the option for quality assured construction detailing has been omitted from Part L 2013 which instead permits designers to use the DCLG 'Approved Construction Details'(ACD's) or those that are formally recognised by DCLG, (basically ACD's or EST's 'Enhanced Construction Details')

To meet the requirements reasonable provision would to be to:

- Adopt approved design details set out in DCLG Approved Construction Details or those that are formally recognised by DCLG (Dept.of Government and Local Government)
- Use construction joint details that have been calculated by a person with suitable expertise following the guidance set out in BRE Report BR 497 (Conventions for calculating thermal transmittance and temperature factors)
- Use the linear thermal transmittance values in the 'default column' of Table K1 SAP 2012 directly in the DER and DFEE rate calculations or
- Use conservative default y-value of 0.15W/m2K rather than linear transmittance values for each construction in the DER and DFFE rate calculation.

Air permeability:
For new build, generally a value between 5 - 7m^3/m^2/hr will need to be achieved.

A value of 15.0$m^3/(hm^2)$ can still be used in small developments but will tend to require improving further the performance of thermal envelope.

Regulation 25A:
It's also worth noting that Regulation 25A has now been written into Part L1A. This basically states that a developer should asses the viability of renewable and high efficiency alternative system before starting work on site. These technologies don't need to be installed under the Building Regs, but their suitability should be assessed. This report should also be available to Building Control if requested.

Theoretical building performance vs actual building performance

One of the key features of the Part L 2010 regulations was to close the gap between the calculated performance anticipated at design stage and what is actually achieved.

This is referred to by Government as the 'performance gap'. If we are to achieve true zero carbon by 2016 it is vital that this gap be closed.

However Government has decided not to take forward a regulatory quality assurance proposal at this time, and is supporting the wider Zero Carbon Hub led industry 'as built' work programme looking at future approaches to tackle these issues.

MODEL DESIGNS

Part L1A now provides a definitive means of compliance for the notional building, in the form of an **elemental recipe**, which appears in 'Section 5 Table 4 'Model designs' If you build exactly to this simplified recipe approach the dwelling will pass the SAP and comply with both the TER and the TFEE (albeit a SAP calculation will still be required for submission to LABC).

The elemental recipe provides a straightforward, non-prescriptive means for house builders to meet performance targets, whilst maintaining a reasonable degree of design flexibility.

Alternatively, a more relaxed fabric specification can be used in conjunction with renewable technology such as PV or WWHR, although this is likely to be a more expensive route to compliance. (see Tables 3 and 4, page 11)

The TER is based on a building of the same size and shape as the actual dwelling constructed to a concurrent specification. If the actual building is constructed entirely to this specification it will meet the TER and therefore pass Criterion 1.

Table 2 provides a summary of the concurrent notional building specifications for each category of building (further details can be found in ADL1A Section 5 Table 4 'Model designs' and SAP 2012 Appendix R).

It should be noted that the concurrent notional building specifications are not prescriptive and designers are free to explore alternative specifications to meeting the TER and TFFE rate (provided specification meets all other provisions within ADL1A and in particular the limiting fabric parameters listed in Table 1, page 9) .

One thing that really stands out in this Model Design is the importance of thermal bridging. The TER will effectively use a Y-value of 0.05 in the calculation. This means that if you are using the standard Accredited Construction Details, you will in effect be penalised, making compliance harder to achieve. This will encourage the use of better detailing and more efficient thermal bridging design.

Table 2: Elemental recipe

Element/system	Element value
Total opening areas (windows and doors)	Based on a maximum proportion 25% of total floor area
External walls	0.18 W/m^{2}K
Party walls	0.00 W/m^{2}K
Floor	0.13 W/m^{2}K
Roof	0.13 W/m^{2}K
Windows, roof lights and glazed doors	1.4 W/m^{2}K (whole window U-value) g-value = 0.63
Opaque doors	1.0 W/m^{2}K
Semi-glazed doors	1.2 W/m^{2}K
Air tightness	5.0m^3/hr/m^2 @ 50 Pa
Linear thermal transmittance	Standardised psi values – see SAP Appendix R except use of y= 0.05 W/m^{2}K if default value of y=0.15W/m^{2}K is used in the actual dwelling
Ventilation type	Natural (with extract fans)
Air conditioning	None
Heating System	Mains Gas/ (SEDBUK 2009 efficiency 89.5%)
Secondary heating	None
Low energy lighting	100%
Thermal mass parameter	Medium (TMP=250)

Linear Thermal bridging Calculated using the lengths of junctions in the actual dwelling and the psi values provided in SAP 2012 Appendix R (overall standard between ECDs and ACDs)

Examples of a 'relaxed' fabric approach

SAP 2012 will also allow you to flex the design to enable a more relaxed fabric specification to be used in conjunction with renewable technology (examples of which can be seen in the Tables 3 and 4, page 11).

Table 3 shows possible example routes of compliance for an end terrace/semi-detached with an internal floor area of 76m^2. These options shown include:

- Triple glazing which results in slightly relaxed fabric requirements for walls and floor U-values from the elemental recipe
- Waste Water Heat Recovery (WWHR) which resulted in more significant relaxations to the wall and roof U-values (although this is likely to be a more expensive route to compliance).

Table 3: End terrace/semi-detached for a 76m² (possible example routes to meet the TER and TFEE)

Building Element U-values (W/m²K)	Example 1 Elemental Recipe from Table 2	Example 2 Relaxed fabric + Triple glazed	Example 3 Relaxed fabric + Triple glazed	Example 4 Relaxed fabric + WWHR
External walls	0.18	0.22	0.21	0.26
Party Walls	0	0	0	0
Floor	0.13	0.16	0.14	0.19
Roof	0.13	0.13	0.13	0.13
Windows	1.4	0.9 (g = 0.57)	0.9 (g = 0.57)	1.4
Air tightness ($m^3/hr.m^2$)	5	5	6	5
Gas boiler	89.5% (SEDBUK)	89.5% (SEDBUK)	89.5% (SEDBUK)	89.5% (SEDBUK)
Services	-	-	-	WWHR
TER ($kgCO_2/m^2.yr$)	18.72	18.72	18.72	18.72
DER ($kgCO_2/m^2.yr$)	18.72	18.68	18.69	18.67
TFEE($kWh/m^2.yr$)	54.26	54.26	54.26	54.26
DFEE($kWh/m^2.yr$)	47.18	46.73	46.76	54.20

Note the values shown in Examples above are for guidance purposes only. A SAP calculation will still be required to be produced to show compliance.

TER: Target Emission Rate
DER: the Dwelling Emission Rate (calculated rate of Co2 emissions from the dwelling, must not be greater than the TER)
TFEE: the Target Fabric Energy Efficiency rate
DFEE: calculated Dwelling Fabric Energy Efficiency rate (must not be greater than the TFEE)
WWHR: Waste Water and Heat Recovery system

Table 4: shows possible example routes to meet the TER and TFEE for a **118m² Detached House.** Options include the addition of PVs or SHW (Solar hot water) which can result in relaxed U-Values for walls, roofs and floors, from the elemental recipe.

Building Element U-values (W/m²K)	Example 1 Elemental Recipe	Example 2 Relaxed fabric + PV	Example 3 Relaxed fabric + SHW
External walls	0.18	0.26	0.26
Party Walls	NA	NA	NA
Floor	0.13	0.20	0.20
Roof	0.13	0.18	0.18
Windows	1.4	1.4	1.4
Air tightness ($m^3/hr.m^2$)	5	5	5
Gas boiler	89.5% (SEDBUK)	89.5% (SEDBUK)	89.5% (SEDBUK)
Services	-	0.48kWp PV	SHW
TER ($kgCO_2/m^2.yr$)	18.72	17.44	17.44
DER ($kgCO_2/m^2.yr$)	18.72	17.44	17.30
TFEE($kWh/m^2.yr$)	54.26	59.20	59.20
DFEE($kWh/m^2.yr$)	47.18	59.19	59.19

Note the values shown in Examples 2 and 3 above are for guidance purposes only. A SAP calculation will still be required to be produced to show compliance.

TER: Target Emission Rate
DER: the Dwelling Emission Rate (calculated rate of Co2 emissions from the dwelling, must not be greater than the TER)
TFEE: the Target Fabric Energy Efficiency rate
DFEE: calculated Dwelling Fabric Energy Efficiency rate (must not be greater than the TFEE)
SHW: Solar Hot Water (+ gas boiler)

MAIN CHANGES TO SAP 2012:
NEW DWELLINGS APPROVED DOCUMENT L1A

1. **Thermal bridging** - a further 19 junctions have been added giving a new total of 42 junctions to consider; all reference to confidence factors has been removed

2. **Hot water** - the degree to which primary pipework has been insulated can now be varied

3. **Carbon emissions** – these now include transportation of fuel and are 3 year rather than 5 year averages; a 15 year average is also output

4. **Regional weather** – the costs and savings quoted on the EPC will become sensitive to geographical location; climate regions are now defined by postcode

5. **Solar thermal and PV outputs** - a revised way of calculating solar radiation; revised collector losses for solar thermal systems

6. **Boiler efficiency and controls** – manufacturers declaration no longer an option for individual boilers at the as built stage; revisions to the calculation procedure particularly for solid fuel

7. **Heat pumps** – default efficiencies substantially lower than in SAP 2009

8. **PV on blocks of flats connected to landlord supply** – individual flats will get carbon benefit but no SAP benefit or cost saving on the EPC

9. **Community heating** – two more control options; CO_2 emission offset for biomass community CHP to carry forward in all cases if FEE target is met

10. **Other calculation changes** – fuel prices and primary energy factors have been revised; slight changes to default U values for openings; WWHRS assumption changes

NON-DOMESTIC, NEW BUILD: APPROVED DOCUMENT L2A

From 6th April 2014 all new non-domestic buildings in England, that have not previously been subject to a Building Notice, a Full Plan application or initial notice will be required to deliver an average 9% aggregate reduction in carbon emissions across the building mix compared with 2010 standards.

The approach to demonstrating compliance remains consistent with the 2010 methodology whereby carbon dioxide emissions are calculated using a notional building, of the same size and shape as that being designed, constructed to a concurrent specification.

As with dwellings the new ADL2A document has also sought to simplify the compliance route by introducing a new 'notional building' which adopts an, **elemental recipe** approach if a building is designed and built entirely to it, it would meet the required Target Emission Rate

Overview of the changes to AD L2A 2013

As with ADL1A 2013 there are few changes to the ADL2A 2013 document;

Reduction of carbon

Changes have been made to the specification requirements across seven building types to deliver an average 9% aggregate reduction in carbon dioxide emissions when compared to the 2010 specifications. This target will vary depending on the type of building being assessed (see Table 5 below) The calculation has also been adjusted so it doesn't penalise small warehouses, which proved difficult to meet under Part L 2010.

DCLG documents illustrate how this overall improvement is made up and this is reproduced in Table 5 below:

Table 5 overall improvement in carbon dioxide emissions when compared to the 2010 specifications

Building type	CO_2 Improvement % on part L2A 2010
Distribution warehouse	4%
Deep plan office with AC	12%
Retail warehouse	8%
Shallow plan office	13%
Hotel	12%
School	9%
Small warehouse	3%
Aggregate across build mix	**9%**

A new target fabric energy efficiency (TFEE) standard has been introduced

This means the thermal performance of the building fabric now has its own standards and cannot be compensated for with services strategy or renewable technologies.

Notional building

The notional building has been modified to have more energy efficient building fabric and air permeability.

There are now notional buildings for top lit, side lit (heated only) and side lit (heated and air conditioned) buildings. These notional buildings now also have a greater variety of air permeability figures based on size of the building. The larger the building, the easier it is to achieve a good level of air tightness.

Model designs

There's also a Model Design recipe for ADL2A. It's slightly more complicated than the recipe for ADL1A, and given there are so many ways to heat, ventilate and light a non-domestic building, it's certainly not the only route to compliance. It does however, serve to give a good starting point for U-values. The rest is then down to the performance of building services, by far the biggest influence on the SBEM calculation.

Table 6, page 15 provides a summary of the concurrent notional building specifications for each category of building (more detail can be found in the NCM Modelling Guide 2013).

The TER is based on a building of the same size and shape as the actual building constructed to a concurrent specification If the actual building is constructed entirely to this specification it will meet the TER.

Table 6: Summary of concurrent Notional building specification recipe Non-Domestic L2A

Element and U-values W/m²K	Side lit or unlit (where HVAC spec is heating only)	Side lit or unlit (where HVAC spec includes cooling)	Toplit
External walls	0.26	0.26	0.26
Roof	0.18	0.18	0.18
Floor	0.22	0.22	0.22
Windows	1.6 (incl.10% FF)	1.6 (incl.10% FF)	N/A
G-value (%)	40%	40%	N/A
Roof lights	N/A	N/A	1.6
G-value (%)	N/A	N/A	55%
Air tightness	5.0m³/hr/m²	5.0m³/hr/m²	7.0m³/hr/m²
The above air tightness applies where gross internal floor area is 250m² or less			
Air tightness	3.0m³/hr/m²	3.0m³/hr/m²	7.0m³/hr/m²
The above air tightness applies where gross internal floor area is more than 250m² but less than 3500m²			
Air tightness	3.0m³/hr/m²	3.0m³/hr/m²	5.0m³/hr/m²
The above air tightness applies where gross internal floor area is more than 3500m² but less than 10000m²			
Air tightness	3.0m³/hr/m²	3.0m³/hr/m²	3.0m³/hr/m²

For further details of the concurrent Notional building specification refer to Table 5 ADL2A 2013 edition

It should be noted that the concurrent notional building specifications are not prescriptive and designers may explore alternative specification to meeting the TER in each case.

As can be seen from Table 6 above, compliance with the new ADL2A maintains the emphasis on having a well insulated building fabric which cannot be achieved by adopting the limiting fabric parameters identified in Table 7.

Limiting fabric parameters

The limiting fabric parameters are unchanged from ADL2A 2010.

It should be noted that these are only backstop U-values and will need to be significantly improved upon than shown in Table 7 below in order to achieve the TER rate.

Table 7

Limiting fabric parameters	U-values (W/m²K)
Walls	0.35
Roof	0.25
Floors	0.25
Party Walls	0.20
Windows/roof lights/doors	2.2
Vehicle access doors	1.5
High usage entrance doors	3.5
Air tightness	10m³/m²/hr @ 50 Pa

Building services

The Non-Domestic Building Service Compliance Guide has increased the efficiency standards for fixed services including cooling and electric lighting. However, the standard has been designed so that developers can achieve it through energy efficiency alone if they choose. Solar photovoltaic (PV) panels would only likely to be included where cost effective.

The performance of building services, has by far the biggest influence on the SBEM calculation. As with all things SBEM, the nature of the building down to the room usage really defines the performance, so unfortunately there are no hard and fast rules for compliance.

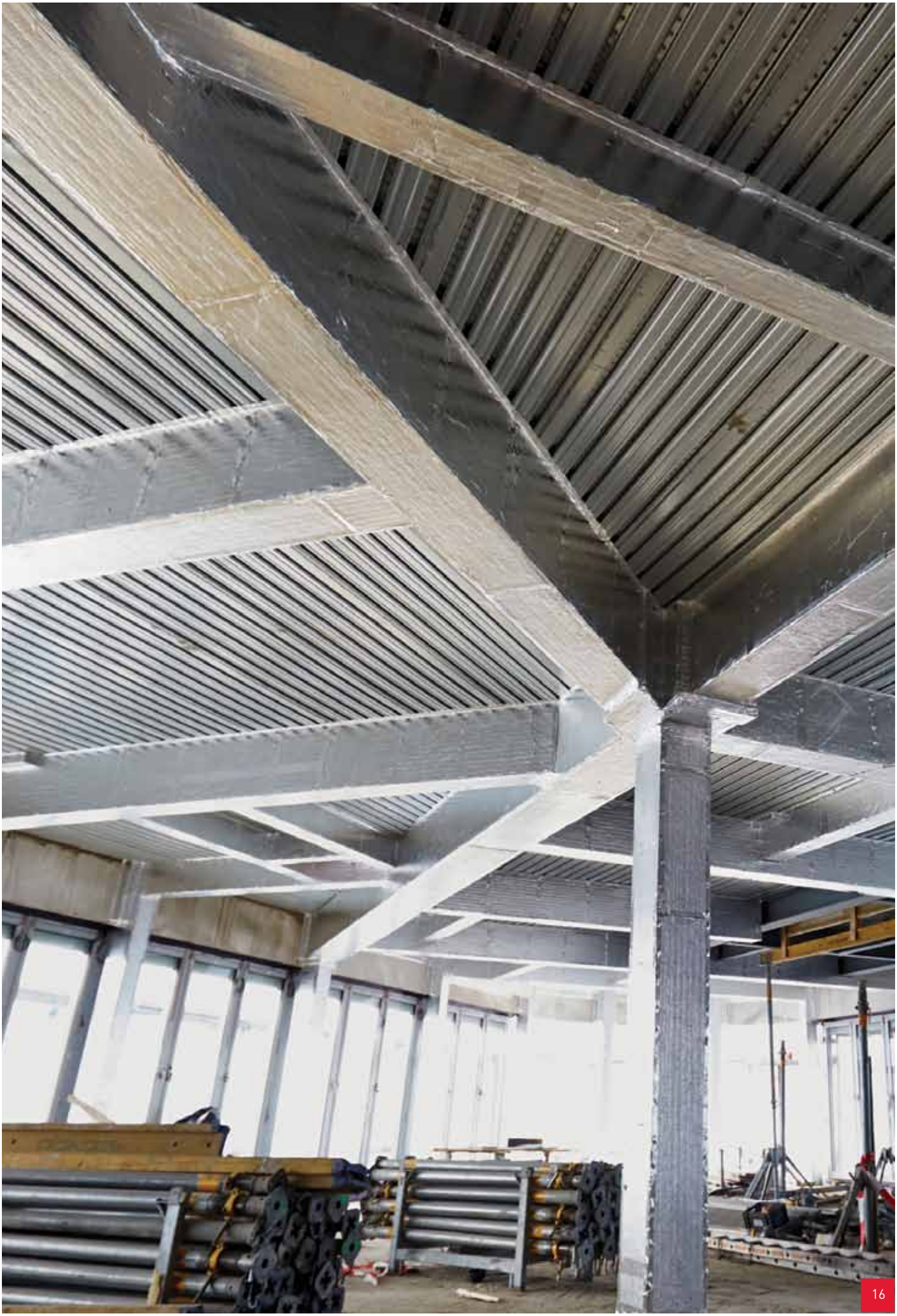
Thermal bridging

In line with the domestic requirements, the option to use quality assured accredited construction details has been removed in the absence of a suitable scheme.

Other buildings with special considerations

Special considerations will apply to certain classes of buildings which include:

- Non-exempt buildings with low energy demand (guidance for such building types is given in paragraphs 2.24 -2.27 of ADL2A)
- Modular and portable buildings with planned service life of more than 2 years (guidance for such building types is given in paragraphs 2.28 -2.32 of ADL2A)
- Shell and core developments (guidance for such building types is given in paragraphs 2.34 -2.36 of ADL2A)



MAIN CHANGES TO SBEM:
APPROVED DOCUMENT L 2013 (ENGLAND)

1. Revised treatment of metal clad constructions (metal sheds).

2. Improved treatment of shading devices, PV systems and non-transpired solar collectors.

3. New categories of Notional building:

- Side-lit, heated only
- Side-lit, heated and cooled
- Top-lit
- Un-lit

4. 'SBEM Q'. Process for getting recognition for a new technology in SBEM (similar to SAP Appendix Q)

5. Modified auxiliary energy

6. Updated NCM Modelling Guide

7. Green Deal tool also available

EXISTING DWELLINGS AND NON-DWELLINGS: APPROVED DOCUMENTS L1B AND L2B

The new 2013 Part L1B and L2B in England have not dealt with improvements to existing buildings, which have remained unchanged from the Part L 2010 standards.

The reason Government did not impose new standards at the current time was to lessen the impact of the extra cost burden on householders trying to improve their homes and the associated inconsistency with new planning permission reforms.

Summary

- No changes have been made to the fabric U-values for extensions nor to the performance of replacement windows or boilers
- Consequential improvements have not been implemented.

Compliance with Part L1B and L2B will be required when people elect to carry out work on existing buildings.

Scope of work covered:

- Extensions
- Material change of use and change of energy status
- Work on controlled fittings and services (which includes replacement windows and boilers)
- Renovation and repair work.

Achieving compliance

Compliance with fabric standards can still be achieved using an elemental U–value approach or for greater flexibility RDSAP/ SAP2012/SBEM may also be used.

For large non–domestic extensions (L2B), where the floor area of the extension is greater than 100m^2 and 25% of existing floor area, these should be treated as New Build using the SBEM methodology.

Elemental U-values for extension work (domestic and non-domestic)

Reasonable provision for newly constructed thermal elements such as those constructed as part of an extension would be to meet the standards set out in table below (these also apply to existing non domestic buildings).

Table 8: Summary of fabric U–values for new thermal elements L1B and L2B

Fabric element	U-values (W/m^{2}K)
Walls	0.28
Floors (1)	0.22
Pitched Roof insulation @ ceiling line	0.16
Pitched Roof insulation @ rafter line	0.18
Flat Roof or roof with integral insulation	0.18
Windows (2)	1.6

1. A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels. The floor U-value for the extension can be calculated using the p/a of the whole enlarged building.
2. For most existing buildings, the standard for new and replacement windows, is now expressed as a Window Energy Rating rather than a U-value, with the standard being raised by two grading bands (from "E" to "C"). Typically U of 1.6W/m^{2}K for dwellings (Ref to ADL1B and ADL2B tables for window and door standards dwellings and non dwellings)

Fixed building services means any part of, or any controls associated with:

a) fixed internal or external lighting systems (but not including emergency escape lighting or specialist process lighting);
b) fixed systems for heating, hot water, air conditioning or mechanical ventilation; or

any combination of systems of the kinds referred to in paragraph (a) or (b) above.

Refurbishment work to existing buildings (dwellings and non-dwellings)

Upgrading retained thermal elements and refurbishment in existing buildings (Dwellings and non-dwellings)

This applies to the following work:

- Material alterations
- Where existing element becomes part of the thermal envelope where previously it was not (change of energy status)
- Renovation and/or refurbishment of thermal elements.

Renovation work in relation to thermal elements
Renovation in relation to a thermal element means the process of stripping down the element to expose the basic structural components (brick, timber/metal frame, joists, rafters etc.) and then rebuilding to achieve all the necessary performance requirements.

Renovation only applies where the area to be refurbished is greater than one of the following limits
(smaller proportions being regarded as repairs):

a) Major renovation: means the renovation of a building where more than 25% of the surface area of the building envelope undergoes renovation (when assessing whether the area proportion constitutes a major renovation of a building, the surface area of the whole of the external building envelope should be taken into account i.e. external walls, floor, roof, windows, doors, roof windows and roof-lights).

b) Renovation: which amounts to the renovation of more than 50% of the elements surface area.

Where the works constitute either of the above, it must be carried out so as to ensure that the whole of the element complies with the requirement of the ADL insofar that it is technically functionally and economically feasible.
Reasonable provision for newly constructed thermal elements such as those constructed as part of an extension would be to meet the standards set out in Table 9 (these also apply to existing non domestic buildings).

Table 9: Upgrading retained thermal elements and refurbishment

Fabric element	a) Threshold U-values (W/m^2K)	b) Improved U-values (W/m^2K)
Walls - retrofit cavity insulation (2)	0.70	0.55
Walls –external or internal insulation (3)	0.70	0.30
Floors (4&5)	0.70	0.25
Pitched roof insulation @ ceiling line	0.35	0.16
Pitched roof insulation between rafters (6)	0.35	0.18
Flat roof or roof with integral insulation (7)	0.35	0.18

2 - this applies only in the case of a wall suitable for installation of cavity insulation. Where this is not the case then it should be treated as 'wall'- external or internal insulation.
3 - A lesser provision may be appropriate where meeting such standards would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall
4 - A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.
5 - The U-value of the floor of an extension can be calculated using the p/a of the whole enlarged building.
6 - A lesser provision may be appropriate where meeting such standards would create limitations on headroom. In such cases the depth of the insulation plus any required air gap, should be at least the depth of the rafters and thermal performance of chosen insulant such as to achieve the best practical U-value.
7 - A lesser provision may be appropriate if there are particular problems associated with the load bearing capacity of the frame or upstand height.

Notes relating to renovation work and Table 9 above:
Where a thermal element is subject to a renovation, the performance of the whole element should be improved to achieve or better the relevant U-value set out in column (b) of Table 9. If achievement of the relevant U-value set out in column (b) of Table 9 is not technically or functionally feasible or would not achieve a simple payback of 15 years or less the element should be upgraded to the best standard that is technically and functionally feasible.

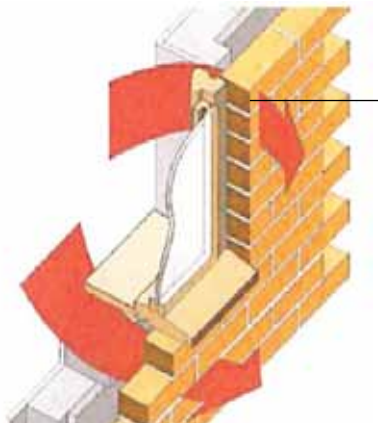
(Further guidance on this approach is given in Appendix A. Table A1 of ADL1B and L2B)

MINIMISING THERMAL BRIDGING:
AT DOOR AND WINDOW REVEALS

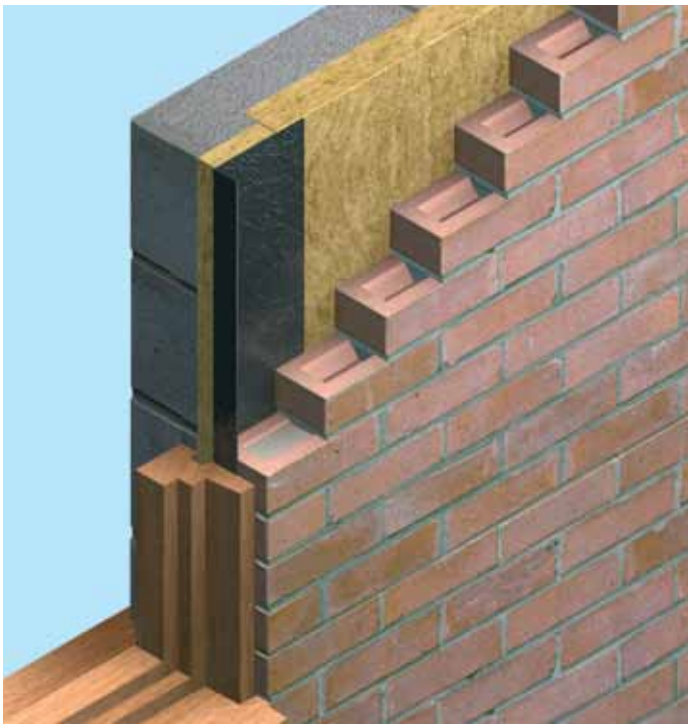
ROCKWOOL ROCKCLOSE® has been specifically developed to minimise thermal bridging at door and window reveals and other building interfaces.

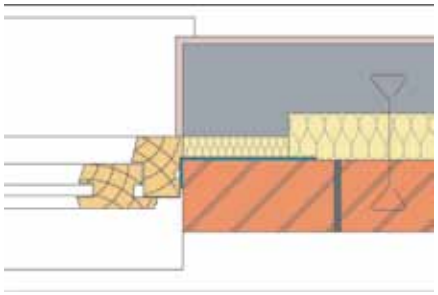
ROCKWOOL ROCKCLOSE® consists of a strip of semi-rigid ROCKWOOL insulation pre-bonded to a black polyethylene damp proof course. The product is self-supporting and designed to be installed within the cavity as work proceeds, prior to fitting of window and door frames.

By not addressing thermal bridging at door and window reveals will increase the risk of condensation and mould growth.

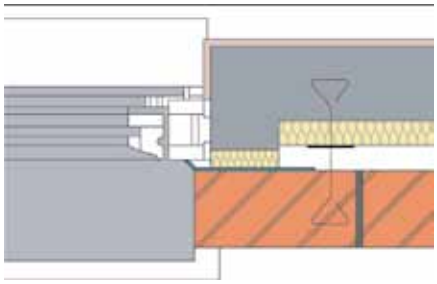


Thermal bridging at door and window reveals can result in 20% heat loss from buildings if left un-insulated.

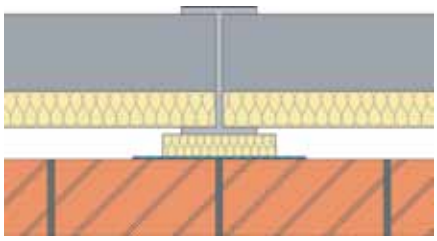




Plan view on timber window jamb



Plan view at jamb ROCKCLOSE® with Aluminium frame in rebated 'check' reveal



Plan view on column intrusion into cavity

ROCKWOOL ROCKCLOSE® also acts as a cavity barrier and has been assessed by WFRC (Report No C114334) to give 60 minutes integrity and 30 minutes insulation.

The product is 1200mm long x 100mm wide with a thickness range of 20mm, 30mm and 50mm.
ROCKWOOL ROCKCLOSE® provides the following thermal resistance paths.
20mm thick = 0.570 m^2K/W
30mm thick =0.857 m^2K/W
50mm thick =1.430 m^2K/W

For further information please refer to the ROCKWOOL ROCKCLOSE® data sheet.

HEAT LOSS VIA SEPARATING PARTY WALLS: THE PARTY WALL 'THERMAL BYPASS EFFECT'

Contrary to previous assumptions, party cavity-walls are not zero heat loss walls because air flow in the cavity provides a heat loss mechanism.

What is party wall thermal bypass?

The party wall thermal bypass is a process whereby heat is lost due to moving cold air which has entered an un-insulated party cavity wall from external flanking building elements, resulting in heat loss via convection.

Minimising heat loss from party walls

Heat loss via party walls can be reduced by measures that restrict air movement through the cavity, by means of fully filling the cavity with ROCKWOOL insulation and by providing effective perimeter edge sealing around the party wall cavity, such as ROCKWOOL PWCB (Party Wall Cavity Barrier). The extent to which heat loss can be reduced will be dependent on the detailed design and the quality of construction.

Building Regulations

Building Regulations Approved Documents L1A and L2A of England and Wales and Section 6 of Scotland's Building standards have recognised that where party cavity walls between connected buildings are untreated, considerable heat can escape through them.

A key feature of a SAP calculation is that party walls with unfilled and unsealed cavities are assumed to have a U-value of 0.5W/m^{2}K. Whereas the notional dwelling used in calculating the TER assumes the cavity party wall to have a zero heat loss (U-value 0.0W/m^{2}K).

The SAP calculation

The SAP calculation does permit a U-value of 0.20W/m^{2}K to be claimed when effective perimeter edge sealing is used around all exposed edges of the party wall. In order to claim a zero U-value the party wall cavity must be fully filled with an appropriate mineralwool insulation, and an effective perimeter edge sealing must be provided around all exposed edges.

In calculating the DER for a Dwelling, the party wall U-value to be assumed for the type of construction adopted is set out in the Table 10.

Table 10

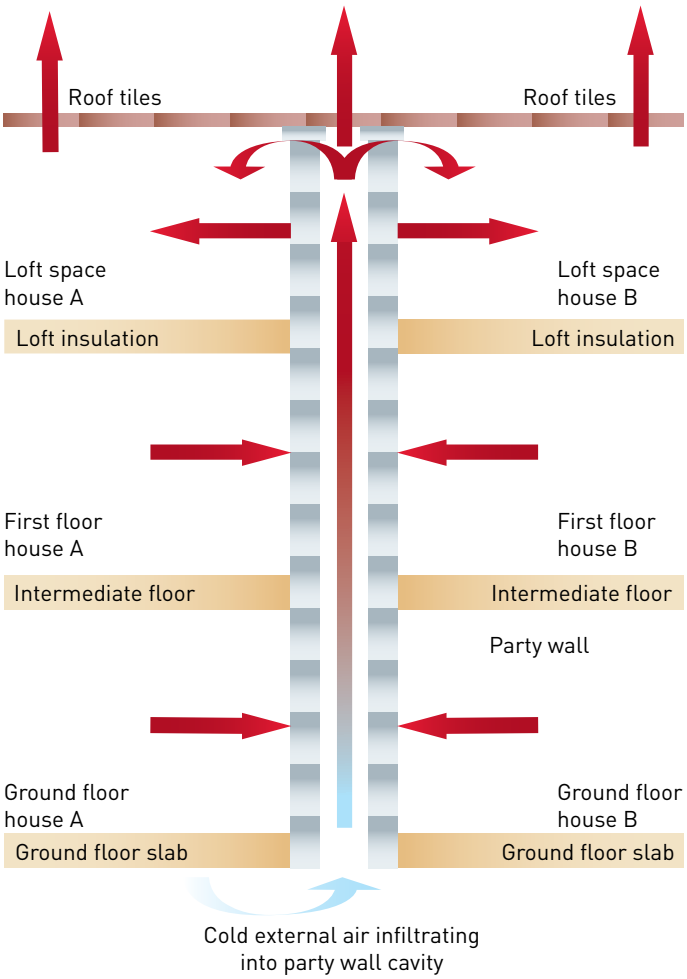
Party wall construction	U-value
Solid	0.00
Unfilled cavity with NO effective edge sealing	0.50
Unfilled cavity with effective edge sealing around all exposed edges and in line with insulation layers in abutting elements	0.20
Fully filled cavity with effective edge sealing around all exposed edges and in line with insulation layers in abutting elements	0.00

In applying the U-values shown in the table above the following considerations should also be made:

- Where edge sealing is adopted, either on its own or in conjunction with a fully filled cavity, the sealing is effective in restricting air flow and is aligned with the thermal envelope.
- In order to claim a reduced U-value (0.2 or 0.0) it will be necessary to demonstrate that the design adopted is likely to be robust under normal site conditions
- Although effective perimeter sealing may be part of a cavity barrier, (to comply with Approved Document B (Fire) a cavity barrier on its own may not be effective in restricting airflow.

How it occurs

Where outside air is able to flow into the party wall cavity, a cold zone is created which results in heat flux through the wall sections on either side. The extent of which will depend on external conditions such as wind and temperatures which create a ventilation stach effect caused by the warmed air rsing in the cavity to be replaced by cooler air drawn in from the outside. These air movements can be significant and, if no steps are taken to restrict flows, the resulting heat loss can be large.



Compensatory measures if not designing a zero effective U-value solution

Table 11 shows the improvements which could be required of other building elements, in order to compensate for the party wall if the 0.20W/m²K option is used rather than a zero effective U-value solution. Please note that the example scenario below was based on the previous 2010 Approved Document L1A regulations for a typical 3 bed mid-terrace house.

Table 11

Fabric element	Party wall cavity fully filled and edge sealed W/m²K	Party wall edge sealed only W/m²K
Party wall	0.00	0.25
External wall	0.25	0.25
Roof	0.25	0.25
Floor	0.25	0.25
Windows	1.40	0.25
Thermal bridging Y-value	0.05	0.04
Air tightness	6m³/br/m²	2m³/br/m²

ROCKWOOL solutions to prevent party wall thermal bypass

ROCKWOOL has a range of products and solutions to help eliminate the heat loss from party walls.

ROCKWOOL in conjunction with Mineral Wool Insulation Manufacturers Association (MIMA) have undertaken a wide ranging test programme to develop solutions which meet both thermal and acoustic performance requirements for masonry and timber frame party walls.

Extensive site trials have demonstrated that the U-value for a party wall can potentially be reduced to zero if the party wall cavity is fully filled with ROCKWOOL insulation, and effective edge sealing, (such as ROCKWOOL PWCB) takes place around the party wall cavity. When considering fully filling the party cavity-wall the overall method of construction will influence the choice of solution.

ROCKWOOL SOLUTIONS FOR MINIMISING HEAT LOSS AT PARTY WALLS: PERIMETER EDGE SEALING AT PARTY WALLS

ROCKWOOL PARTY WALL CAVITY BARRIERS (PWCB)

ROCKWOOL PWCB has been specifically designed to act as a party wall edge seal and cavity barrier.

If installed correctly, ROCKWOOL PWCB will help minimise the thermal party wall bypass effect, by restricting air leakage and heat loss between the party wall cavity and the external cavity. The product will also perform as an effective cavity barrier providing 60 minutes fire resistance.

PWCB'S are manufactured 200mm wide wall and are available in a wide range of thicknesses to suite standard cavity widths between 50-150mm.

Benefits of using ROCKWOOL PWCB

The ROCKWOOL PWCB addresses three building regulation requirements in one single product:

- Approved Document L (Thermal): ROCKWOOL PWCB will provide an effective perimeter edge seal, minimising air leakage and heat loss between the external cavity wall and the party wall cavity.
- Approved Document B (Fire): ROCKWOOL PWCB will perform as an effective cavity barrier. ROCKWOOL cavity barriers have been tested and assessed for up to 60 minutes fire resistance (integrity and insulation) in both masonry and timber framed constructions.
- Approved Document E (Acoustics): ROCKWOOL PWCB will act as an acoustic absorber reducing flanking transmission between adjoining properties.

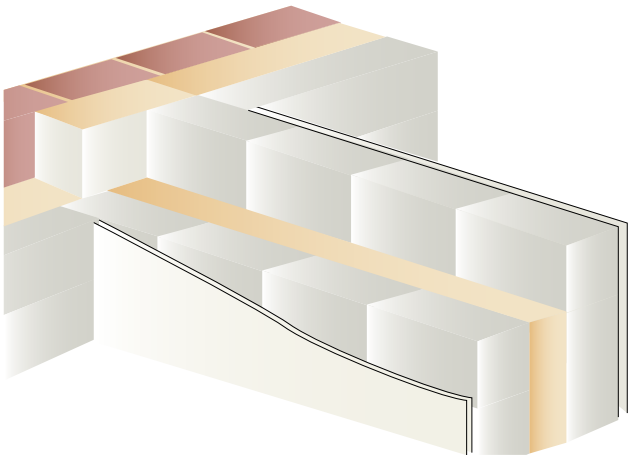
ROCKWOOL PRODUCTS FOR FULLY FILLING PARTY WALL CAVITIES

ROCKWOOL stone wool insulation has been shown by site trials to eliminate heat loss through the wall without adversely affecting its acoustic insulation performance.

CONSTRUCTION 1: MASONRY PARTY WALL CAVITIES

For masonry Party cavity walls ROCKWOOL offers specifiers a choice of two products to suit project requirements. ROCKWOOL full fill products for masonry party cavity walls include:

- ROCKWOOL CAVITY slab provides a built-in full fill solution
- ROCKWOOL Energy Saver provides a Retro fit blown solution

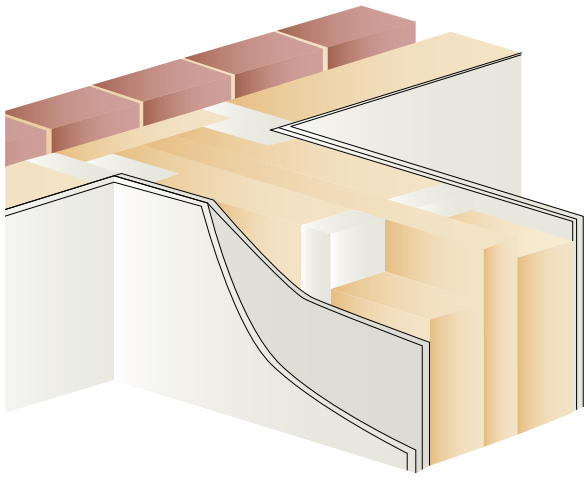


- **Perimeter edge sealing:** ROCKWOOL PWCB
- **Party wall insulation:** 75mm (min)-100mm party wall cavity fully filled with ROCKWOOL Cavity slab or Energy Saver blown insulation
- **Party wall block:** 100mm (min) each leaf, density 1350 to 1600 kg/m^3
- **Wall finish to party wall:** Gypsum-based board (nominal mass 8 kg/m^2) mounted on dabs with parged finish to block faces.

CONSTRUCTION 2: TIMBER FRAME PARTY WALL (WITH SHEATHING)

For timber frame the preferred method is to use a "built in" slab solution as the wall construction proceeds such as ROCKWOOL FLEXI®

Note: For sheathed timber frame party walls, the insulation thickness within the party wall cavity should be specified 10mm wider than the cavity width to allow for compression between the sheathing boards.



- **Perimeter edge sealing:** ROCKWOOL PWCB
- **Party wall width:** 240mm (min) between inner faces of plasterboard wall linings
- Minimum 50mm cavity space between sheathing boards
- **Insulation between studs:** minimum 60mm ROCKWOOL FLEXI® in each frame
- **Party wall insulation within cavity between sheathing boards:** 60mm ROCKWOOL FLEXI® (if 50mm Cavity) 70mm ROCKWOOL FLEXI® (if 60mm Cavity)
- **Wall lining:** 2 or more layers of gypsum-based board, with nominal mass per unit area 22kg/m^2 both sides, lay with staggered joints.

Thermally: ROCKWOOL CAVITY, Energy Saver and FLEXI® all provide full fill solutions to prevent air movement heat loss via convection. The products will also provide a zero effective U-value when used in conjunction with effective edge sealing such as ROCKWOOL PWCBs.

Acoustically: ROCKWOOL products can be used in conjunction with generic Robust Details solutions. The products offer excellent acoustic absorption and will not impair the acoustic performance of a party wall when installed correctly.

Section 2:
U-value Tables

GROUND FLOORS

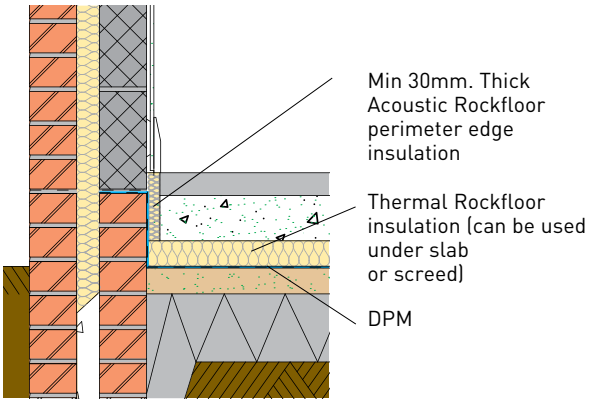
The U-value for a ground floor is determined by its size, shape, soil type, edge insulation etc. The following tables show the Rockfloor insulation thickness required to suit a number of floor types based on their P/A ratio (generally the larger the floor area the less insulation required). The P/A ratio is determined by dividing the total exposed perimeter length of the floor by area of the ground floor (exposed perimeter being the total length of the floor slab which is adjacent to an external wall or unheated space such as an integral garage).

Product - Thermal Rockfloor

CONSTRUCTION 1: GROUND BEARING SLAB

ROCKWOOL Rockfloor can be installed below the concrete slab or below screed.

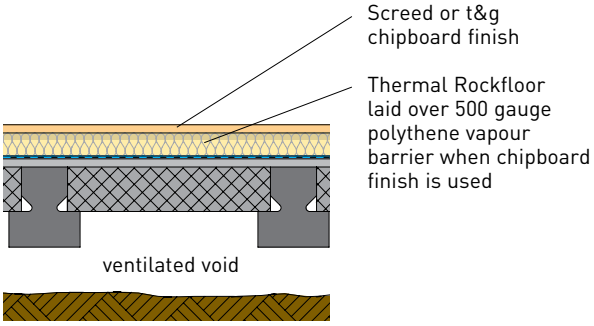
U-values P/A ratio	0.25	0.22	0.20	0.18	0.15
	Rockfloor thickness required (mm)				
0.1	nil	Nil	Nil	nil	40
0.2	30	50	65	85	120
0.3	60	80	95	115	150
0.4	75	95	110	130	170
0.5	80	100	120	150	180
0.6	90	110	130	150	190
0.7	95	115	130	150	200
0.8	105	120	140	160	200
0.9	105	125	140	160	200
1.0	110	130	145	165	200



CONSTRUCTION 2: SUSPENDED CONCRETE BEAM AND BLOCK

ROCKWOOL Rockfloor is laid over the dense beam and block floor, overlaid with screed or T&G flooring grade chipboard.

U-values P/A ratio	0.25	0.22	0.20	0.18	0.15
	Rockfloor thickness required (mm)				
0.1	nil	30	50	65	110
0.2	65	80	100	120	160
0.3	80	100	120	140	180
0.4	95	115	130	150	190
0.5	100	120	135	160	200
0.6	105	125	140	160	200
0.7	105	130	145	165	210
0.8	110	130	145	165	210
0.9	115	130	150	170	210
1.0	115	135	150	170	210



The standard thickness of ROCKWOOL Thermal Rockfloor range from 50mm-100mm.
For thickness greater than 100mm we recommend double layering the product.
Please contact our ROCKWOOL Technical solutions dept. for U-values relating to a specific project or application.

PART L 2013 U-VALUE REQUIREMENT FOR GROUND FLOORS:
Extensions: 0.22 W/m²K, Renovation and repair work: 0.25 W/m²K
New build requirements could range between 0.20-0.13 W/m²K for domestic type buildings and 0.25-0.22 W/m²K for non-domestic subject to build type

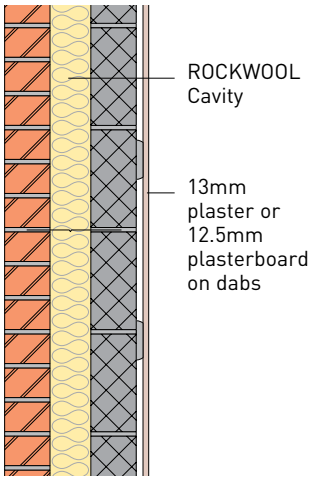
EXTERNAL WALLS: MASONRY CAVITY WALLS - FULL FILL

ROCKWOOL Cavity Slab

CONSTRUCTION 1:

102mm Facing brick outer skin, ROCKWOOL Cavity full fill, 100mm internal concrete block (various densities)
Internal finishes: light plaster or plasterboard on dab.

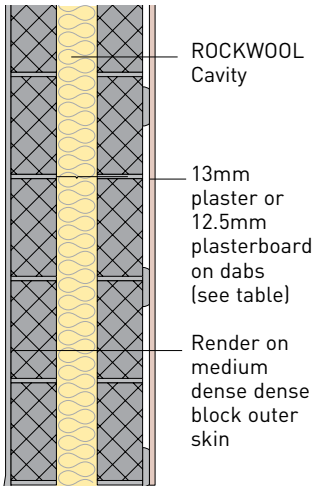
Inner block	Dense 1900-2250kg/m³		Medium Dense 1400-1450kg/m³		Aircrete High Strength 750kg/m³		Aircrete Standard 600kg/m³	
Block W/mK	1.130W/mK		0.470W/mK		0.190W/mK		0.150W/mK	
Internal finish	Light plaster	Pboard on dab	Light plaster	Pboard on dab	Light plaster	Pboard on dab	Light plaster	Pboard on dab
RW Cavity (mm)	W/m²K	W/m²K	W/m²K	W/m²K	W/m²K	W/m²K	W/m²K	W/m²K
100	0.32	0.30	0.31	0.29	0.28	0.27	0.28	0.27
115	0.28	0.27	0.27	0.26	0.25	0.24	0.25	0.24
130	0.25	0.24	0.25	0.24	0.23	0.22	0.23	0.22
140	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.21
150	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.20
170	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.18



CONSTRUCTION 2:

Render on 100mm medium dense block outer, ROCKWOOL Cavity full fill, 100mm internal concrete block (medium dense or Standard Aircrete) Internal finishes: light plaster or plasterboard on dab.

Block Density	Medium Dense 1400-1450kg/m³		Aircrete High Strength 600kg/m³	
Block W/mK	0.470W/mK		0.150W/mK	
Internal finish	Light plaster	Pboard on dab	Light plaster	Pboard on dab
RW Cavity (mm)	W/m²K	W/m²K	W/m²K	W/m²K
100	0.30	0.29	0.27	0.26
115	0.27	0.26	0.24	0.24
130	0.24	0.23	0.22	0.22
140	0.23	0.22	0.21	0.20
150	0.21	0.21	0.19	0.19
170	0.19	0.19	0.18	0.17



General Notes: The U-values assume that walls are lined with plasterboard on dab or 13mm lightweight plaster (lambda 0.220). Block sizes assumed to be 440 x 215mm, mortar joints assumed to be 10mm wide, stainless steel wall ties with a cross-sectional area of 12.5mm² for cavities up to 170mm wide. Above 170mm, the cross sectional area of tie wires is assumed to be 25mm².

PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m²K, Renovation and repair work: 0.30 W/m²K
New build requirements could range between 0.25 and 0.18 W/m²K for domestic type buildings and 0.28 and 0.22 W/m²K for Non-domestic, subject to build type

EXTERNAL WALLS: MASONRY CAVITY WALLS - PARTIAL FILL

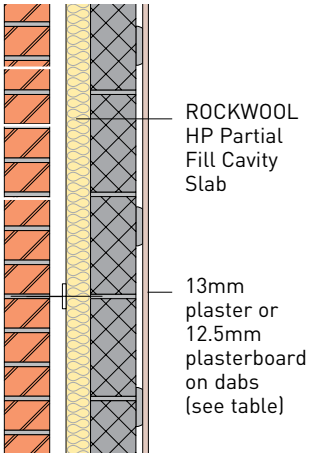
ROCKWOOL Partial fill Slab:

CONSTRUCTION 3:

102mm Facing brick outer skin, Residual cavity, ROCKWOOL Partial fill. 100mm internal concrete block (various densities) Internal finishes: light plaster or plasterboard on dab.

Inner block	Medium Dense 1400-1450kg/m³		Aircrete High Strength 750kg/m³		Aircrete Standard 600kg/m³	
Block W/mK	0.470W/mK		0.190W/mK		0.150W/mK	
Internal finish	Light plaster	Pboard on dab	Light plaster	Pboard on dab	Light plaster	Pboard on dab
RW P/Fill (mm)	W/m²K	W/m²K	W/m²K	W/m²K	W/m²K	W/m²K
80	0.31	0.31	0.30	0.29	0.29	0.28
100	0.28	0.27	0.26	0.25	0.25	0.24
120	0.24	0.23	0.23	0.22	0.22	0.21
135	0.22	0.21	0.21	0.20	0.20	0.20
150	0.20	0.19	0.19	0.18	0.19	0.18

General Notes: The U-values assume that walls are lined with plasterboard on dab or 13mm lightweight plaster (lambda 0.220). Block sizes assumed to be 440x215mm, mortar joints assumed to be 10mm wide, stainless steel wall ties with a cross-sectional area of 12.5mm² for cavities up to 170mm wide. Above 170mm, the cross sectional area of tie wires is assumed to be 25mm².



PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m²K, Renovation and repair work: 0.30 W/m²K
New build requirements could range between 0.25 and 0.18 W/m²K for Domestic type buildings and 0.28 and 0.22 W/m²K for Non-domestic, subject to build type

EXTERNAL WALLS: TIMBER FRAME

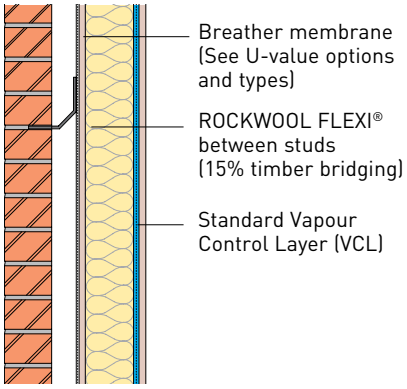
ROCKWOOL FLEXI®

CONSTRUCTION 1: STANDARD TIMBER FRAME CAVITY WALL (NO SERVICE VOID)

Facing brick, 50mm Cavity behind masonry, Breather membrane (see options) 9.0mm OSB.
Solid Timber Studs fully filled with ROCKWOOL FLEXI®, Std. VCL and 12.5mm plasterboard finish

No service void			Breather membrane type		
U-values (W/m^2K)	**FLEXI® (mm)**	**Stud depth (mm)**	**Standard**	**Tyvek Reflex**	**Protect TF200**
0.28	140	140	✓		
0.25	140	140		✓	
0.24	140	140			✓
0.23	180	184	✓		
0.21	180	184		✓	
0.20	180	184			✓
0.20	200	220	✓		
0.19	200	220		✓	
0.18	200	220			✓

U-values based on 15% timber bridging fraction

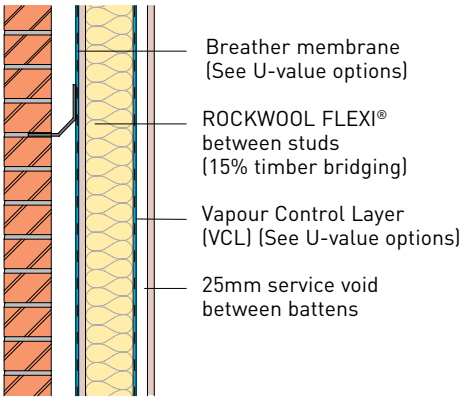


CONSTRUCTION 2: TIMBER FRAME CAVITY WALL (WITH SERVICE VOID)

As construction1 above but with additional 25mm battened service void

With service void			Breather membrane type			Service void VCL type		
U-values (W/m^2K)	**FLEXI® (mm)**	**Stud depth (mm)**	**Standard**	**Tyvek Reflex**	**Protect TF200**	**Standard**	**Tyvek AirGuard**	**Protect VC foil**
0.27	140	140	✓			✓		
0.21	140	140		✓			✓	
0.20	140	140			✓			✓
0.22	180	184	✓			✓		
0.18	180	184		✓			✓	
0.17	180	184			✓			✓
0.19	200	220	✓			✓		
0.17	200	220		✓			✓	
0.16	200	220			✓			✓

U-values based on 15% timber bridging fraction



Breather Membranes: The enhanced thermal benefits offered by high performance breather membranes can be seen from the tables. The low emissivity R-values of the external cavity used in the calculations above are based on manufacturers claims i.e Standard breather membrane 0.180m^2K/W;
TYVEK Reflex = 0.540m^2K/W; Protect TF200 =0.770m^2K/W

Service voids: Incorporating a service zone ensures that the insulation remains undisturbed and airtightness remains intact. Using a high performing reflective VCL also has the benefit of providing a low emissivity service void,which enhances the the thermal performance of the construction.

Vapour Control Membrane: The thermal benefits gained by using high performance breather membranes can also be seen from the tables. The low emissivity R-values used in the calculations for the service zone are based on manufacturers claims. Standard VCL 0.180 m^2K/W. TYVEK AirGuard = 0.680 m^2K/W. Protect VC Foil = 0.780m^2K/W

PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m^2K, Renovation and repair work: 0.30 W/m^2K
New build requirements could range between 0.25 and 0.18 W/m^2K for domestic type buildings and 0.28 and 0.22 W/m^2K for Non-domestic, subject to build type

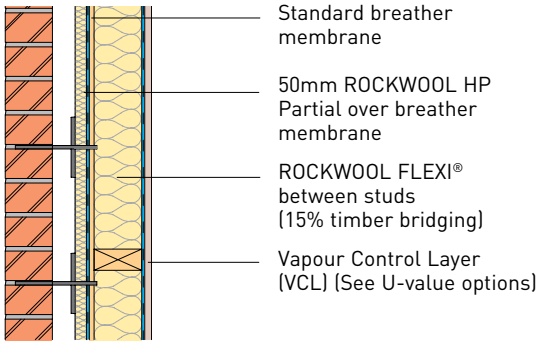
EXTERNAL WALLS: TIMBER FRAME

ROCKWOOL FLEXI®

CONSTRUCTION 3: TIMBER FRAME 'WARM/HYBRYD' CONSTRUCTION (WITH NO SERVICE VOID)

Facing brick 102.5mm: Cavity behind masonry R Value 0.18; Breather membrane (standard) 50mm ROCKWOOL Partial Fill over OSB/ROCKWOOL FLEXI® between solid Timber Studs, Std. VCL/no Service void/12.5mm plasterboard finish

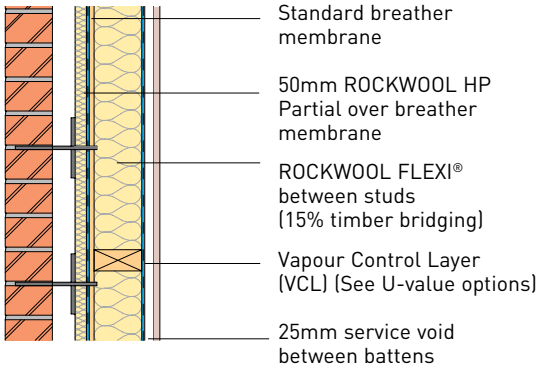
No service void (Standard)			
U-values (W/m^2K)	**Partial Fill over OSB (mm)**	**FLEXI® in frame (mm)**	**Stud depth (mm)**
0.25	50	90	89
0.19	50	140	140
0.17	50	180	184
0.15	50	200	220



CONSTRUCTION 3A: TIMBER FRAME 'WARM / HYBRYD' CONSTRUCTION (WITH SERVICE VOID)

As construction 3 above, but with additional 25mm battened service void

With service void				Service void VCL type		
U-values (W/m^2K)	**Partial Fill over OSB (mm)**	**FLEXI® (mm)**	**Stud depth (mm)**	**Standard VCL**	**Tyvek AirGuard**	**Protect VCL Foil**
0.24	50	90	89	✓		
0.22	50	90	140		✓	
0.21	50	90	90			✓
0.19	50	140	140	✓		
0.17	50	140	140		✓	
0.17	50	140	140			✓
0.16	50	180	184	✓		
0.15	50	180	184		✓	
0.15	50	180	184			✓



Vapour Control Membrane (VCL): The thermal benefits gained by using high performance breather membranes can also be seen from the tables. The low emissivity R-values used in the calculations for the service zone are based on manufacturers claims Standard VCL 0.180m^2K/W. TYVEK AirGuard = 0.680m^2 K/W. Protect VC Foil = 0.780 m^2K/W

PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m^2K, Renovation and repair work: 0.30 W/m^2K
New build requirements could range between 0.25 and 0.18 W/m^2K for domestic type buildings and 0.28 and 0.22 W/m^2K for Non-domestic, subject to build type

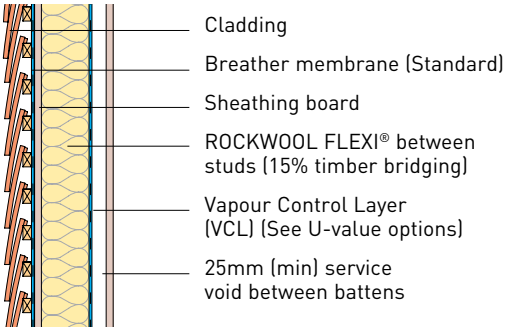
EXTERNAL WALLS: TIMBER FRAME

ROCKWOOL FLEXI®

CONSTRUCTION 4: TIMBER FRAME WITH CLADDING AND SERVICE VOID

External cladding or tile hanging; on battens on std. breather membrane on OSB.
ROCKWOOL FLEXI® between Timber Studs, VCL, Service void/and 12.5mm plasterboard finish

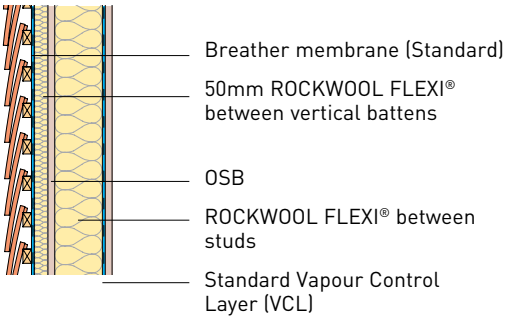
	Service void		Service void VCL type	
U-values (W/m^2K)	**FLEXI® (mm)**	**Stud depth (mm)**	**Standard**	**Tyvek AirGuard**
0.28	140	140	✓	
0.24	140	140		✓
0.23	180	184	✓	
0.20	180	184		✓
0.19	200	220	✓	
0.17	200	220		✓



CONSTRUCTION 5 TIMBER FRAME WITH CLADDING

External cladding or tile hanging on breather membrane, 50mm Flexi between outer vertical battens, 9mm OSB.
Rockwool Flexi between Timber Studs, std VCL 12.5mm plasterboard finish

	No service void (Standard bm and vcl)		
U-values W/m^2K	**FLEXI® between battens (mm)**	**FLEXI® in frame (mm)**	**Stud depth (mm)**
0.27	50	100	100
0.22	50	140	140
0.18	50	180	184



Vapour Control Membrane (VCL): The thermal benefits gained by using high performance breather membranes can also be seen from the tables. The low emissivity R-values used in the calculations for the service zone are based on manufacturers claims Standard VCL 0.180m^2K/W. TYVEK AirGuard = 0.680 m^2K/W. Protect VC Foil = 0.780 m^2K/W

PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m^2K, Renovation and repair work: 0.30 W/m^2K
New build requirements could range between 0.25 and 0.18 W/m^2K for domestic type buildings and 0.28 and 0.22 W/m^2K for Non-domestic, subject to build type

EXTERNAL WALLS: USING TIMBER 'I' STUD FRAME

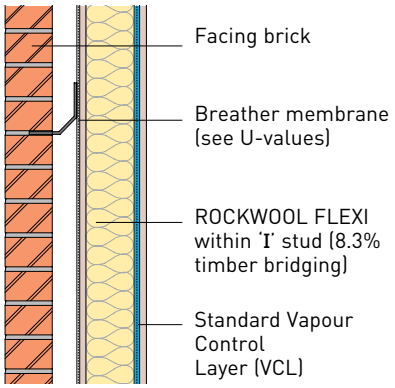
ROCKWOOL FLEXI®

CONSTRUCTION 6: TIMBER FRAME USING "ENGINEERED I STUDS" (NO SERVICE VOID)

Facing brick, 50mm Cavity behind masonry, Breather membrane (Standard or Tyvek Reflex or Protect TF200) 9.0mm OSB Sheathing board. ROCKWOOL FLEXI® between Timber I studs Std. VCL, no service void/12.5mm plasterboard finish.

No service void			Breather membrane type		
U-values (W/m^2K)	**FLEXI® (mm)**	**Stud depth (mm)**	**Standard**	**Tyvek Reflex**	**Protect TF200**
0.25	140	145	✓		
0.23	140	145		✓	
0.22	140	145			✓
0.20	180	180	✓		
0.19	180	180		✓	
0.18	180	180			✓
0.19	200	200	✓		
0.17	200	200		✓	
0.17	200	200			✓

U-values based on 8.3% timber bridging fraction

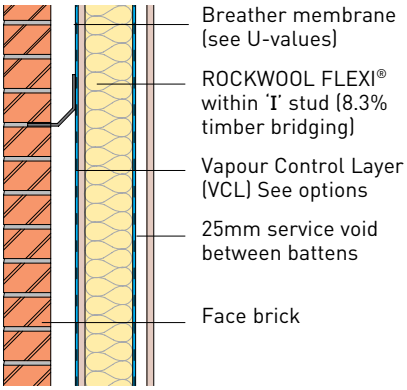


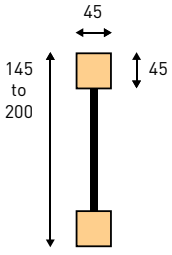
CONSTRUCTION 7: TIMBER FRAME USING "ENGINEERED I STUDS" (WITH SERVICE VOID)

Facing brick, 50mm Cavity behind masonry, Breather membrane (Standard or Tyvek Reflex or Protect TF200) 9.0mm OSB Sheathing board. ROCKWOOL FLEXI® between Timber I studs, VCL/25mm battened service void. 12.5mm plasterboard finish.

With service void			Breather membrane type			Service void VCL type		
U-values (W/m^2K)	**FLEXI® (mm)**	**Stud depth (mm)**	**Standard**	**Tyvek Reflex**	**Protect TF200**	**Standard**	**Tyvek AirGuard**	**Protect VC foil**
0.24	140	145	✓			✓		
0.20	140	145		✓			✓	
0.19	140	145			✓			✓
0.20	180	180	✓			✓		
0.17	180	180		✓			✓	
0.16	180	180			✓			✓
0.18	200	200	✓			✓		
0.16	200	200		✓			✓	
0.15	200	200			✓			✓

U-values based on 8.3% timber bridging fraction





PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m^2K, Renovation and repair work: 0.30 W/m^2K
New build requirements could range between 0.25 and 0.18 W/m^2K for domestic type buildings and 0.28 and 0.22 W/m^2K for Non-domestic, subject to build type

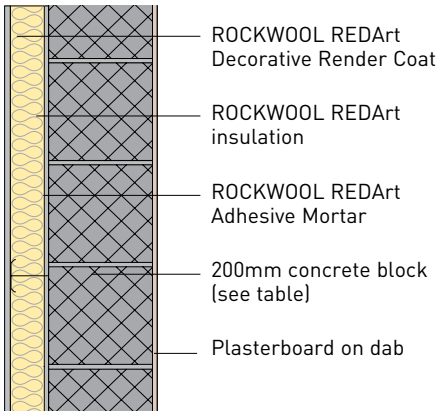
EXTERNAL WALLS: INSULATED RENDER SYSTEMS

ROCKWOOL REDArt systems

CONSTRUCTION 1: INSULATED RENDER SYSTEM ON SOLID BLOCK

ROCKWOOL REDArt insulated render system on 200mm Solid concrete block of varying thermal conductivities)
Internal finishes: Plasterboard on dabs

Block type	Medium Dense 200mm thick	Aircrete High Strength 200mm thick	Aircrete Standard 200mm thick
W/mK	1400kg/m³ 0.470W/mK	750kg/m³ 0.190W/mK	600kg/m³ 0.150W/mK
U values W/m²K	REDArt insulation (mm)	REDArt insulation (mm)	REDArt insulation (mm)
0.28	100	80	80
0.24	120	100	95
0.22	135	110	110
0.20	150	130	125
0.18	170	150	140
0.15	210	190	180



CONSTRUCTION 2: INSULATED RENDER SYSTEM ON METAL FRAME

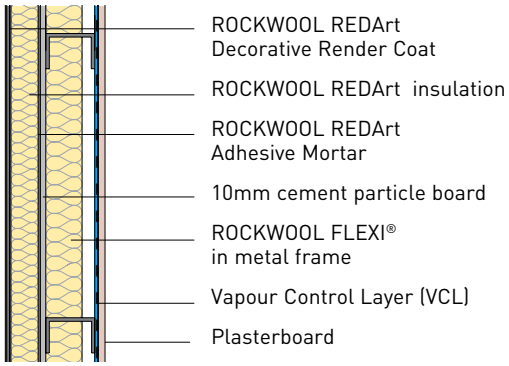
ROCKWOOL REDArt insulated render system on 10mm fibre cement board secured to metal studs 100mm deep at 600mm centres, and ROCKWOOL FLEXI®part filling or fully filling studs.
Table A: uses 50mm and 70mm ROCKWOOL FLEXI® part-filling frame.
Table B: uses 100mm ROCKWOOL FLEXI®, fully filling frame

Table A

U values W/m²K	REDArt thickness (mm)	50mm FLEXI® in frame	U values W/m²K	REDArt thickness (mm)	70mm FLEXI® in frame
0.27	90	50	0.27	80	70
0.25	100	50	0.25	90	70
0.22	120	50	0.22	110	70
0.19	140	50	0.19	130	70
0.18	150	50	0.18	140	70

Table B

U values W/m²K	REDArt thickness (mm)	100mm FLEXI® in frame
0.22	100	100
0.20	110	100
0.18	130	100



PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m²K, Renovation and repair work: 0.30 W/m²K
New build requirements could range between 0.25 and 0.18 W/m²K for domestic type buildings and 0.28 and 0.22 W/m²K for Non-domestic, subject to build type

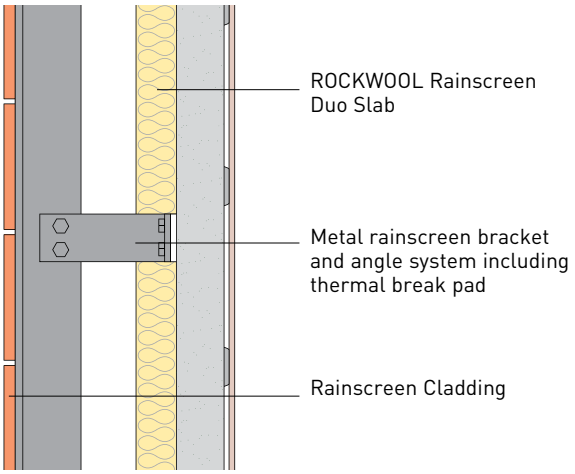
EXTERNAL WALLS: RAIN SCREEN CLADDING

Rainscreen Duo-Slab

CONSTRUCTION 1: REINFORCED CONCRETE SUBSTRATE

Rainscreen Duo Slab on 150mm Reinforced Concrete Wall.
Internal finishes: plaster or plasterboard on dabs

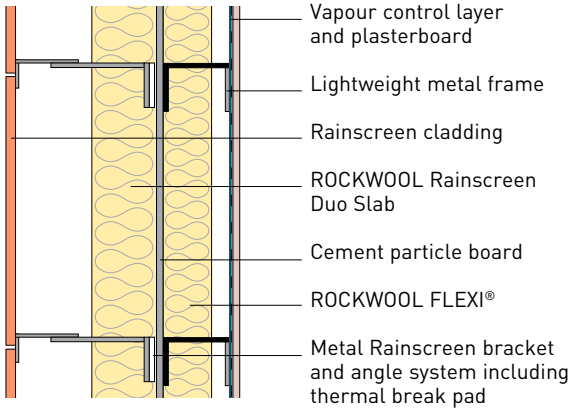
Internal finish **Rainscreen Duo Slab thickness (mm)**	Plaster **U-values W/m²K**	Plasterboard on dabs **U-values W/m²K**
125	0.35	0.34
150	0.32	0.31
175	0.28	0.28
190	0.27	0.27
200	0.26	0.26
215	0.25	0.25
230	0.24	0.24
275	0.22	0.22
325	0.22	0.20



CONSTRUCTION 2: LIGHT STEEL FRAME SUBSTRATE

Rainscreen Duo Slab on 150mm deep metal studs at 600mm centres with ROCKWOOL FLEXI® 140mm part-filling frame.

Rainscreen Duo Slab thickness (mm)	**FLEXI® thickness (mm)**	**U-values W/m²K**
50	140	0.34
75	140	0.30
100	140	0.27
125	140	0.25
140	140	0.24
150	140	0.24
175	140	0.23
225	140	0.22



- Tables based on pointloss scenarios where only the rainscreen brackets bridge the thermal insulation layer.
- A thermal bridging allowance of 0.1 W/m²K has been added to the wall U-value (e.g. a calculated U-value of 0.25 will be increased to 0.35 W/m²K to allow for predicted bridging).

(Based on data supplied by the BRE using a 5mm thick thermal break pad and brackets at 600mm x 600mm fixing matrix). ROCKWOOL recommend all U-value calculations for rainscreen application be verified by the cladding manufacturer utilising 3D thermal modelling software.

PART L 2013 U-VALUE REQUIREMENT FOR EXTERNAL WALLS:
Extensions: 0.28 W/m²K, Renovation and repair work: 0.30 W/m²K
New build requirements could range between 0.25 and 0.18 W/m²K for domestic type buildings and 0.28 and 0.22 W/m²K for Non-domestic, subject to build type

ROOFS AND WALLS: TWIN SKIN METAL CLADDING

ROCKWOOL Cladding Roll

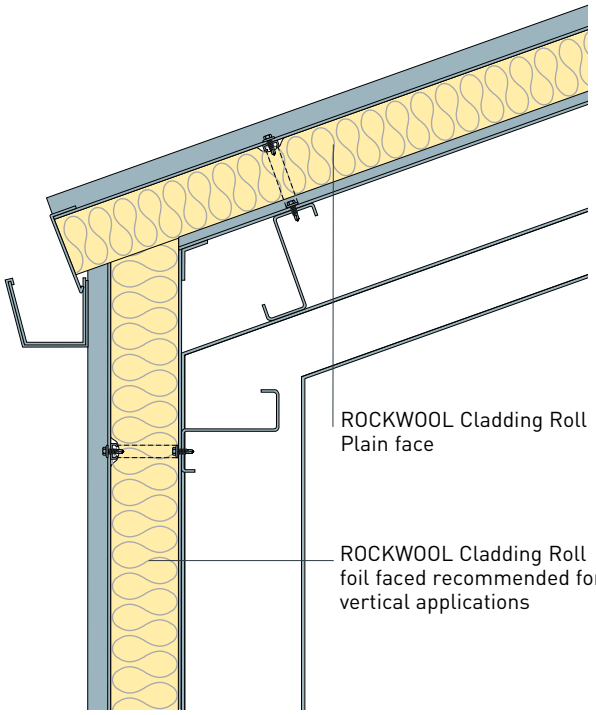
The U-values below are based on 'Euroclad Elite systems' using ROCKWOOL Cladding Roll

CONSTRUCTION 1: "BUILT UP" METAL WALL CLADDING

Cladding Roll walls (foil-faced) **U-values W/m²K**	**Thickness range (mm)**
0.26	160-180
0.24	180
0.22	200
0.20	220

CONSTRUCTION 2: "BUILT UP" METAL ROOF CLADDING

Cladding Roll walls (unfaced) **U-values W/m²K**	**Thickness range (mm)**
0.28	150
0.25	180-220
0.20	220-240
0.18	260-280
0.16	320
0.15	340-360



Cladding systems require a complex calculation method using 3 dimensional modelling, hence thickness ranges shown in tables above may vary pending specific system type.
Euroclad Ltd offer a range of cost effective system solutions associated with cladding systems. Confirmation of systems and U-values should therefore be obtained from Euroclad Ltd.
For further details of Euroclad systems visit www.euroclad.com or telephone +44 (0)2920 790 722.

2013 PART L U-VALUE REQUIREMENTS FOR NON DOMESTIC BUILDINGS:
External Walls: Extensions: 0.28 W/m²K Renovation and repair work: 0.30 W/m²K New build: range between 0.28-0.22W/m²K
Roofs: Non-domestic: Extensions, 0.18W/m²K Renovation and repair work: 0.18W/m²K
New build requirement could range between 0.20-0.16 W/m²K subject to build type

PITCHED ROOFS: HORIZONTAL LOFT INSULATION

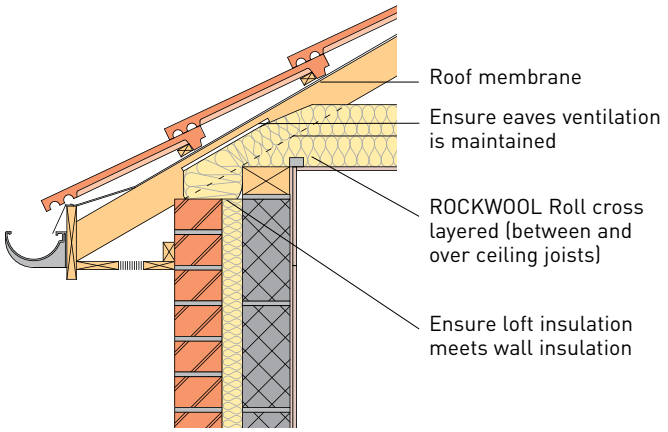
ROCKWOOL Roll

CONSTRUCTION 1:

100mm ROCKWOOL Roll fitted between joists, with an additional thickness of ROCKWOOL Roll laid over joists

ROCKWOOL Roll U-values W/m²K	Between joists	Over joists	Total thickness (mm)
0.16	100	170	270
0.14	100	200	300
0.13	100	220	320
0.11	100	300	400
0.10	100	320	420

Timber bridging fraction allowance 9%



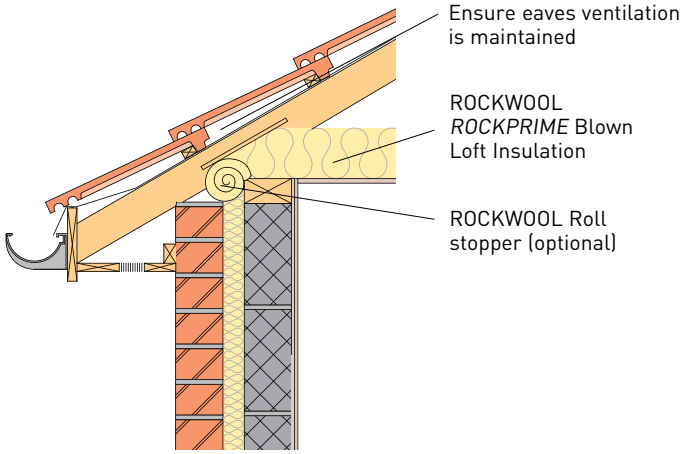
ROCKWOOL *ROCKPRIME* blown insulation

CONSTRUCTION 2:

ROCKWOOL *ROCKPRIME* is blown at an average density of 21kg/m³ blown
100mm ROCKWOOL *ROCKPRIME* blown between joists,
with the additional thickness of ROCKWOOL *ROCKPRIME* blown over joists.

ROCKWOOL *ROCKPRIME* Blown U-values W/m²K	Between joists	Over joists	Total thickness (mm)
0.16	100	180	280
0.14	100	220	320
0.13	100	250	350
0.11	100	300	400
0.10	100	350	450

Timber bridging fraction allowance 9%



2013 PART L U-VALUE REQUIREMENTS FOR HORIZONTAL LOFT INSULATION:
Extensions, Renovation and repair work: 0.16 W/m²K
New build requirements could range between 0.16-0.13 W/m²K
subject to build type

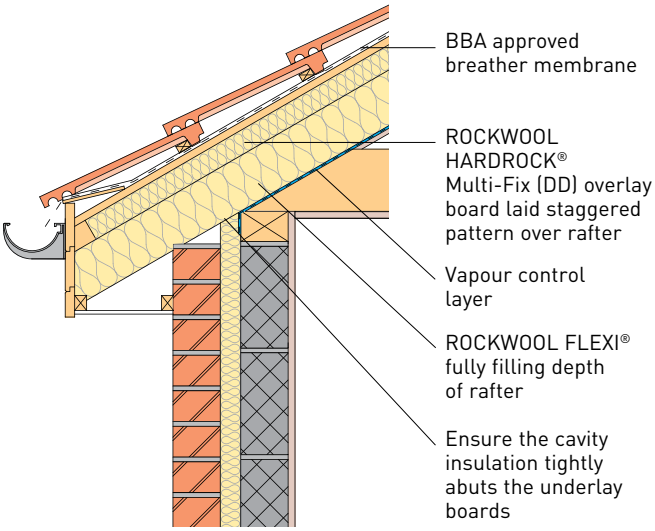
PITCHED ROOFS: INSULATION AT RAFTER LINE

ROCKWOOL Rockfall warm pitched roof system (insulation between and over rafters)

CONSTRUCTION 3:
47mm wide rafters @ 600mm ctrs 7.8% timber bridging
Overlay board: ROCKWOOL HARDROCK® Multi-fix (DD) 60mm or 85mm
Between rafters: ROCKWOOL FLEXI® fully filling rafter

U-values W/m²K	Over rafters HARDROCK® Multi-Fix (DD) (mm)	Between rafters FLEXI® (mm)
0.25	60	100
0.19	60	140
0.16	60	180
0.15	60	200
0.14	60	220
0.21	85	100
0.17	85	140
0.15	85	180
0.14	85	200
0.13	85	220

The Rockfall system is totally fire safe, minimises thermal bridging and provides an effective acoustic barrier against external noise pollution. The system comprises of a high density ROCKWOOL HARDROCK® Multi-Fix (DD) board mechanically fixed over the rafters with ROCKWOOL FLEXI® fitted between rafters. An air tight VCL membrane is stapled to the underside of the rafters finished with 12.5mm plasterboard.



2013 PART L U-VALUE REQUIREMENTS AT RAFTER LINE:
Extensions, Renovation and repair work: 0.18 W/m²K
New build requirements could range between 0.18-0.13 W/m²K subject to build type

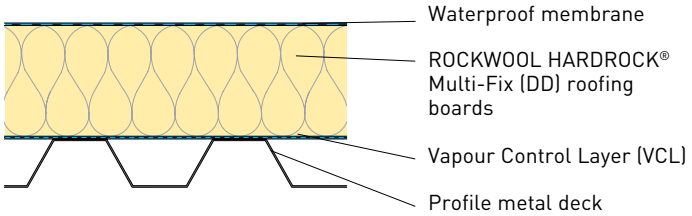
WARM FLAT ROOFS

ROCKWOOL HARDROCK® Multi-Fix (DD)

CONSTRUCTION 1: INSULATION ABOVE METAL DECK

Single ply membrane or built up roofing felt on ROCKWOOL HARDROCK® Multi-Fix (DD) flat roofing boards on approved VCL on profiled metal deck.

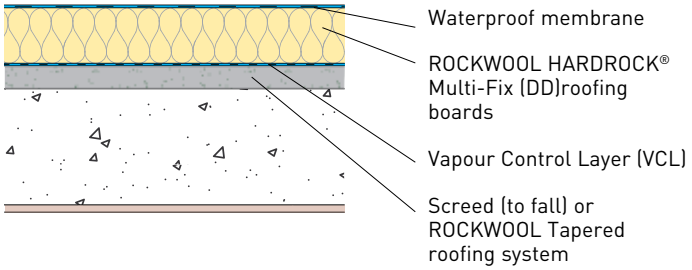
U-values W/m²K	HARDROCK® Multi-Fix (DD) (mm)
0.25	150
0.22	170
0.20	185
0.18	210 (150+60)
0.16	235 (150+85)
0.15	255 (150+105)
0.13	285 (115+170)



CONSTRUCTION 2: INSULATION ABOVE CONCRETE DECK (NO CEILING)

Single ply membrane or built up roofing felt on ROCKWOOL HARDROCK® Multi-Fix (DD) flat roofing boards on approved VCL on 150mm dense concrete deck. Ceiling finish 13mm plaster.

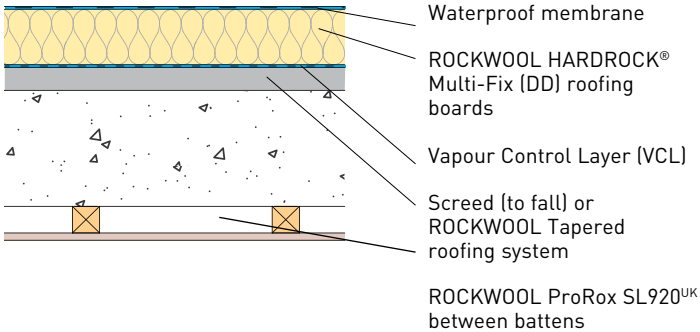
U-values W/m²K	HARDROCK® Multi-Fix (DD) (mm)
0.25	150
0.22	170
0.20	185
0.18	210 (150+60)
0.16	235 (150+85)
0.15	255 (150+105)
0.13	285 (115+170)



CONSTRUCTION 3: INSULATION ABOVE CONCRETE DECK (WITH TIMBER BATTENED CEILING)

Single ply membrane or built up roofing felt on ROCKWOOL HARDROCK® Multi-Fix (DD) flat roofing boards on approved VCL on 150mm dense concrete deck. Ceiling finish 50mm timber battens with 40mm or 50mm ROCKWOOL ProRox SL920^{UK} slabs between battens and12.5mm foil backed plasterboard.

U-values W/m²K	HARDROCK® Multi-Fix (DD) (mm)	ProRox SL920^{UK} between battens
0.25	105	40
0.22	115	50
0.18	150	50
0.16	185	50
0.15	210 (150+60)	40
0.13	235 (150+85)	50



2013 PART L U-VALUE REQUIREMENTS FOR INSULATION AT FLAT ROOFS:

Extensions, Renovation and repair work: 0.18 W/m²K

New build requirements could range between 0.18 and 0.13 W/m²K subject to build type

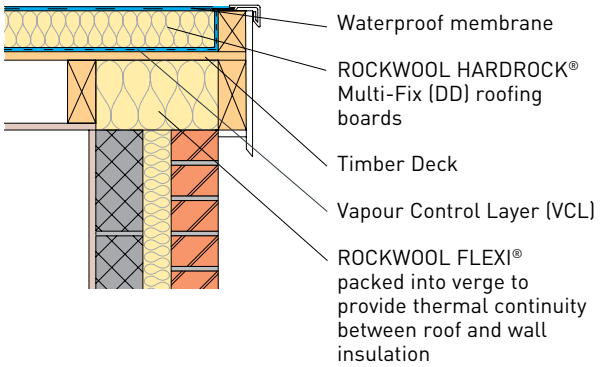
WARM FLAT ROOFS

ROCKWOOL HARDROCK® MULTI-FIX (DD)

CONSTRUCTION 4: INSULATION ABOVE TIMBER DECK (WITH PLASTERBOARD CEILING)

Single ply membrane or built up roofing felt on ROCKWOOL HARDROCK® Multi-Fix (DD) flat roofing boards on approved VCL on min. 15mm timber deck on joists. 12.5mm foil backed plasterboard finish.

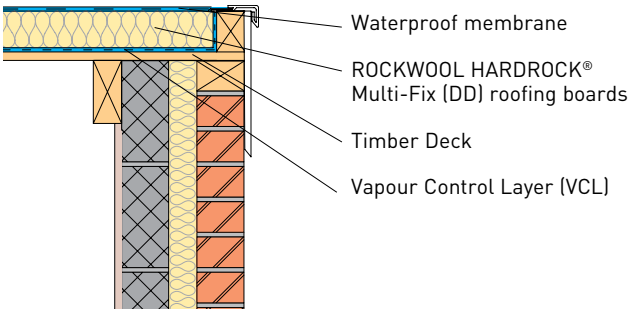
U-values W/m²K	HARDROCK® Multi-Fix (DD) (mm)
0.25	150
0.22	170
020	170
0.18	190 (105+85)
0.16	220 (105+115)
0.15	230 (115+115)
0.13	275 (105+170)



CONSTRUCTION 5: INSULATION ABOVE TIMBER DECK (NO CEILING)

Single ply membrane or built up roofing felt on ROCKWOOL HARDROCK® Multi-Fix (DD) flat roofing boards on approved VCL on min.15mm timber deck on joists (no ceiling).

U-values W/m²K	HARDROCK® Multi-Fix (DD) (mm)
0.25	150
0.22	170
020	185
0.18	210 (150+60)
0.16	235 (150+85)
0.15	255 (150+105)
0.13	285 (115+170)



2013 PART L U-VALUE REQUIREMENTS FOR INSULATION AT FLAT ROOFS:
Extensions: 0.18 W/m²K, Renovation and repair work: 0.18 W/m²K
New build requirements could range between 0.18 and 0.13 W/m²K
subject to build type

WARM FLAT ROOFS

ROCKWOOL HARDROCK® MULTI-FIX (DD) AND ROCKWOOL FLEXI®

CONSTRUCTION 6: TIMBER HYBRID ROOF (INSULATION OVER DECK AND BETWEEN JOISTS)

Single ply membrane or built up roofing felt on ROCKWOOL HARDROCK® Multi-Fix (DD) flat roofing boards on approved VCL on min. 15mm timber deck, on minimum 150mm deep joists. 12.5mm foil backed plasterboard finish.

Table A

100mm FLEXI® between min. 150mm deep joists

U-values W/m²K	HARDROCK® Multi-Fix (DD) (mm)	100mm FLEXI® between min 150mm joists
0.20	85	100
0.18	105	100
0.17	115	100
0.15	150	100
0.13	185	100

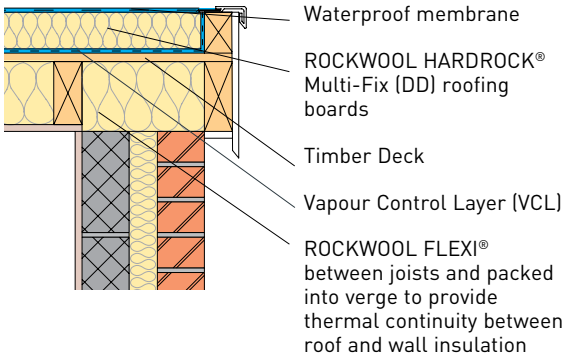
Calculations based on 47mm wide timber joists @ 600mm ctrs (bridging fraction 7.8%)

Table B

140mm FLEXI® between min. 150mm deep joists

U-values W/m²K	HARDROCK® Multi-Fix (DD) (mm)	100mm FLEXI® between min 150mm joists
0.17	85	140
0.15	105	140
0.13	115	140

Calculations based on 47mm wide timber joists @ 600mm ctrs (bridging fraction 7.8%)



2013 PART L U-VALUE REQUIREMENTS FOR INSULATION AT FLAT ROOFS:

Extensions: 0.18 W/m²K, Renovation and repair work: 0.18 W/m²K
New build requirements could range between 0.18 and 0.13 W/m²K subject to build type

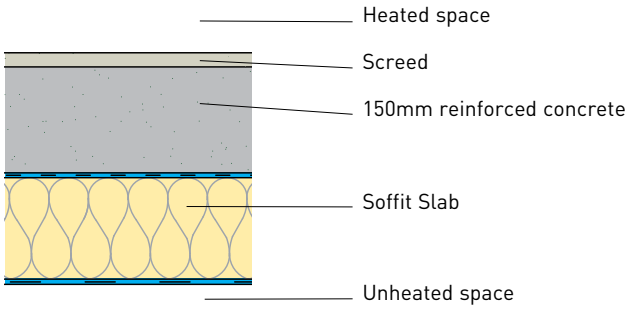
EXPOSED AND SEMI- EXPOSED CONCRETE FLOORS: SOFFITS

ROCKWOOL SOFFIT LINER

CONSTRUCTION 1: ROCKWOOL SOFFIT LINER BELOW REINFORCED CONCRETE FLOOR SLAB

ROCKWOOL Soffit Liner offers a high degree of thermal and fire protection to concrete floors
ROCKWOOLSoffit Liner is available plain faced, tissue faced and foil faced.
For high impact solutions a 6mm thick cementitious HD board is supplied as the facing.

Soffit liner base slab thickness (mm)	Using plastic fixings W/m²K	Using stainless steel fixings W/m²K
130	0.23	0.25
145	0.21	0.22
160	0.19	0.20
180	0.17	0.18
200	0.16	0.17



General notes:

- U-value calculations based on 8.3 fixings/m²
- Stainless steel fixings should be used in all fire applications or where the risk of fire is highly possible
- 200mm soffit slab is not available with tissue or foil facings

Further information can be found on the ROCKWOOL Soffit Liner data sheet

2013 PART L U-VALUE REQUIREMENTS FOR EXPOSED SOFFITS:
Extensions: 0.22 W/m²K, Renovation and upgrading work: 0.25 W/m²K
New build requirements could range between 0.20 and 0.18 W/m²K
Subject to build type

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As an environmentally conscious company, ROCKWOOL promotes the sustainable production and use of insulation and is committed to a continuous process of environmental improvement.

ROCKWOOL®