

A summary to Approved Document Part L - Conservation of fuel and power – Flat Roofing – Detail sheet 1

What are the Approved Documents?

The Building Regulations in the UK are statutory instruments (Act of Parliament). The building regulations control how buildings are to be designed or modified on the public grounds of safety and sustainability. Building Regulations approval is required for most buildings in the UK.

The Building Regulations in England and Wales are set out in the Building Act 1984, whilst those in Scotland are set out in the Building (Scotland) Act 2003. In England and Wales it allows detailed regulations to be made by the secretary of State.

The regulations made under the Act have been periodically updated, rewritten or consolidated, with the latest and current version being the Building Regulations 2010 plus amendments.

The requirements of the Building Regulations are defined within 16 Approved Documents each designated with a letter (Part A to Part R) and cover all aspects of construction works including workmanship, fire performance (Part B) and conservation of fuel and power (Part L).

The Building Regulations – Approved Documents:

- A: Structure
- B: Fire Safety
- C: Site preparation and resistance to contaminants and moisture
- D: Toxic Substances
- E: Resistance to the passage of sound
- F: Ventilation
- G: Sanitation, hot water safety and water efficiency
- H: Drainage and waste disposal
- J: Combustion appliances and fuel storage systems
- K: Protection from falling, collision and impact
- L: Conservation of fuel and power**
- M: Access to and use of buildings
- P: Electrical safety
- Q: Security in dwellings
- R: High speed electronic communications networks

Approved Document: Materials and workmanship 7

This document hopes to provide a summary guidance at date of issue to the Approved Document Part L – Conservation of fuel and power.

The reader should always refer to the current Building Regulations Approved Documents and Technical standards on the relevant government website.

The Regulations may also specify in some cases, that when enough work is done in an area (such as partial new insulation) the remainder of that area must be brought to an appropriate standard however, the standard required for an existing building may be less stringent than that required for a completely new building.

Approved Document Part L – Conservation of Fuel and Power

The Building Regulations - Approved Document Part L covers conservation of fuel and power, these documents deals with the energy performance of properties and all materials used in a specific construction, aiming to conserve power and reduce waste.

In simple terms Part L defines the thermal insulation performance requirements of specific building types, including allowable areas for windows, doors, and the air permeability of a structure, the heating efficiency of boilers and the insulation and controls for heating appliances.

It also sets out the requirements for Standard Assessment Procedure (SAP) calculations and carbon emission targets for dwellings.

The previous documents defining Part L- Conservation of fuel and power was split into 4 sections as listed below:

- L1A – New Dwellings
- L1B – Existing Dwellings
- L2A – New Buildings other than Dwellings
- L2B – Existing Buildings other than Dwelling

The latest revisions issued Dec 2021 have been streamlined into 2 documents:

- Volume 1 - Dwellings
- Volume 2 – Buildings other than Dwellings

These approved documents take effect on 15 June 2022 for use in England. It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work for each building is started before 15 June 2022.

This summary section of part L is aimed towards meeting the requirements for both dwelling and buildings other than dwellings in both new build and refurbishment situations where works involve flat roof works.

Approved Document L – Volume 1

Volume 1 – Dwellings

Volume 1 applies only to dwellings, which are defined as self-contained units designed to contain a single household. Rooms for residential purposes are not dwellings. Common areas containing more than one dwelling if they are heated then guidance from volume 2 should be followed. If unheated then guidance of Volume 1 should be followed. E.g. blocks of flats where multiple occupancy is evident then Volume 2 should be followed.

Regulations

The Approved Document L1 for New dwellings looks at the whole building performance including its CO₂ emissions, rather than one element of the building.

All new dwellings (domestic buildings) must be designed and constructed so their Target CO₂ Emission Rate (TER) is no worse than the performance of a defined notional dwelling (typical hypothetical building).

There is also a requirement that a Target Fabric Emission Energy Efficiency (TFEE) bring the need to specify improved insulation standards and focuses on thermal bridging and air tightness based on the notional dwelling. This fabric first approach also makes it easier to reach the Target Emissions Rate (TER).

The Target Emission Rate (TER) and Dwelling Fabric Energy Efficiency (DFEE) are calculated using a Standard Assessment Procedure (SAP)

Regulation 24

Regulation 24 outlines approved methods of calculation of the energy performance of a building, for new dwellings, the approved methodology is the standard assessment Procedure (SAP).

Regulation 26,26A and 26C

A new dwelling must be shown to meet regulations 26, 26A and 26C by the production of calculations to show that the dwelling meets all of the following:

- Target Primary Energy Rate (TPER) in kWh_{PE}/m² per year *(influenced by fabric and fuel)*
- Target Emission Rate (TER) IN kgCO₂/m² per year *(influenced by fabric and fuel)*
- Target Fabric Energy Efficiency Rate (TFEER) IN kWh/m² *(influenced by fabric only)*

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

The full properties of the notional dwelling are set out in the Government's Standard Assessment Procedure (SAP) for energy rating of dwellings appendix R of SAP Version 10.

Notional Dwellings

What is a notional building?

A notional building is a theoretical design of a compliant building. It is intended to be an aid to designers, showing how compliance might be achieved. As an aid, it is only providing an applied example and does not mandate certain technologies.

So long as a development meets the required performance targets and minimum standards within Part L and other Approved Documents, the strategy used to achieve this can be specified by the building designer and need not mirror those used in the notional building.

This grants designers and specifier's greater flexibility to ensure the project uses the best technologies for each individual project and stops industry being locked into a single option.

The area weighted average U-values, used in the Notional Dwelling specifications for setting the TER, are shown below. The actual specification required for a compliant building and necessary building fabric U-value targets may vary depending on the actual overall proposed specification and the outcome of the energy assessment.

Notional dwelling

Element type	Notional U Value W/m ² K
All roof types	0.11

What does this mean in terms of insulation thickness?

The Notional U Value for New build dwellings thermal insulation for flat roofs should be designed to achieve 0.11 W/m²K to which equates to 190mm enertherm Gold PIR insulation or 335mm mineral stone wool insulation and 290mm XPS insulation (where used within an inverted roof application).

Note where considering PIR insulation thickness greater than 140mm, then any specification should allow for multi-layer boards being used, and for adhered application the IKOpro 2 part PU adhesive should be used to bond the boards.

New Dwellings

Insulating fabric elements in new dwellings should meet the limiting standards as defined in the table below.

Limiting U Values of thermal elements – New Dwellings	
Element	Maximum U Value w/m ² K
All roofs types	0.16

Extensions to Dwellings

If a flat roof is part of a new dwelling in the form of a conservatory or porch and forms part of the main building and are over 30m² (below 30m², and at ground level can be exempt from the energy efficiency requirements), then should be treated as an extension and comply with Volume 1.

New fabric elements in existing dwellings should meet the limiting standard.

For extension to dwellings then the following should be followed.

Limiting U Values of thermal elements	
Element	Maximum U Value w/m ² K
All roofs	0.15

What does this mean in terms of insulation thickness?

Where extensions are being constructed to New build dwellings thermal insulation for flat roofs should be designed to achieve 0.15 W/m²K to which equates to 140mm enertherm Gold PIR insulation or 235mm mineral stone wool insulation and 220mm XPS insulation, where used within an inverted roof application.

Refurbishment of Dwellings

Existing dwellings

It can be difficult to determine when renovation works that may affect the thermal element triggers the need to comply with the building regulations part L and if you need to submit a planning application.

Where existing flat roofs are to be retained and upgraded, no further thermal insulation is required so long as the U-

Value to the existing roof is less than 0.35 W/m²K. Stand-alone buildings with an area less than 50m² that are not dwellings are exempt from the approved document requirements.

New or replacement of any existing fabric element or material change of use, then would need to comply with Volume 1.

Existing dwellings differ from new dwellings, in that they do not have to achieve a whole building Target CO2 Emissions Rate (TER). However, existing dwellings do have to meet certain target U-values for building elements (walls, floors and roofs).

With refurbishment works of dwellings these have slight variations to the requirements which will depend if the roof is to be stripped, partially stripped or overlaid.

Renovating and retained thermal elements

The U value of the existing thermal element that is being renovated should be no worse than the elements before it was renovated and meet the limiting standards as defined in the table below.

Thermal improvements – Dwellings Overlays:

Where the roof is being overlaid and as such the thermal performance is an upgrade, then the requirements are stated within the table below.

Dwellings - Overlays and thermal upgrades of flat roofs:

U Values of thermal elements – Refurbishment of dwellings		
Element	Threshold U Value W/m ² /k	Improved U Value w/m ² K
Flat roof with integral insulation	0.35	0.16

So what does this mean?

New fabric elements in existing dwellings should meet the limiting standard of 0.16W/m²K.

On dwellings where a roof is being refurbished and the existing threshold U value is below 0.35w/m²K (60mm PIR or 80mm Mineral stone wool), then a thermal upgrade will be required to meet the improved U value of 0.16 w/m²K

Removal of thermal element - Dwellings (stripping or partially stripped flat roof applications:

However where the roof is being stripped or partially stripped, then the U Value requirement is slightly different.

If removing over 50% of the waterproofing build up, then this to will require a thermal upgrade to achieve 0.15w/m²K and

equivalent of 140mm enertherm Gold and 235mm Mineral stone wool (based on timber deck) and 220mm XPS insulation where used within an inverted roof application.

Dwelling – removal and replacement to f thermal element

U Values of thermal elements – Refurbishment of dwellings		
Element	Threshold U Value W/m ² /k	Improved U Value w/m ² K
Flat roof with integral insulation	0.35	0.15

Regulation 23 – Approved Document L1

Is a requirement for the renovation or replacement of thermal elements. Regulation 23 is a mandatory part of the building regulations and provides that where work is being carried out to an individual thermal element and the amount of the renovation is more than 50% of the elements surface area.

Approved Document L – volume 2

Volume 2 – Buildings other than dwellings

Volume 2 applies to buildings other than dwellings and the Approved Document volume 2 adopts the same approach to Approved Document volume 1, taking the entire building's performance and CO2 emissions into consideration

All new buildings other than dwellings must be designed and built with their Building CO2 Emissions Rate (BER) being no worse than the Target CO2 Emissions Rate (TER). The TER is set from a Notional Building of the same size and shape to the actual building.

CO2 Emissions Rates for buildings other than dwellings are calculated using the Simplified Building Energy Model (SBEM).

New build

New buildings other than dwellings flat roofs should be designed to achieve a maximum 0.18w/m²K.

Limiting U Values for new or replacement elements in new and existing buildings.

Element type	Maximum U Value W/m ² K
Flat roof	0.18

Refurbishment of Buildings

Where such work is undertaken the performance of the thermal element needs to be improved. The table below gives a threshold U-value so any element which is worse than this threshold needs to be improved to the value given in the table (improved U-value) or better.

Upgrading retained thermal elements		
Element	Threshold U Value W/m ² /k	Improved U Value w/m ² K
Flat roof with integral insulation	0.35	0.18

Regulation 23 – Approved Document L1

Is a requirement for the renovation or replacement of thermal elements? Regulation 23 is a mandatory part of the building regulations provides that where work is being carried out to an individual thermal element and the amount of the renovation is more than 50% of the elements surface area.

Approved documents L – Volumes 1 and 2

Renovation and refurbishment

Renovation is defined as providing a new layer such as a waterproofing layer, which was not there before.

All thermal elements and elements that are subject to any renovation (including replacement of the waterproofing) should be upgraded and improved to achieve, or improve the U value.

The removal of a layer such as waterproofing layers is all subject to requiring an upgrade in thermal performance.

Renovation of a thermal element by means of adding a new layer to a thermal element or the replacement of an existing layer. The U Value requirement applies provided the renovation is to more than 50% of the surface of the individual element or 25% of the total of the building envelope, Building Regulations approval will be required prior to carrying out the work and the Thermal Element may require upgrading to provide more insulation.

If the roof is to be fully or partially (in excess of 50%) stripped and re-covered, then in most cases the thermal insulation layer will need upgrading to comply with the current standard. If the thermal insulation layer already complies then no upgrade is required but you will still be required to submit a Building Notice. If it is not technically or feasibly possible to improve the insulation level to the current standard, this should be discuss with the local Building Control

The regulations provide that any work that is not technically and functionally feasible which cannot be achieved by simple payback within 15 years (guidance is given on how this is achieved) then the best standard that is technically and functionally feasible should be achieved.

So what does this mean?

Where refurbishment of flat roofs are being undertaken, this will mean that compliance with Part L would require a minimum 60mm enertherm Gold or 80mm Mineral stone wool as the thinnest insulation board to sumps or gutter outlets with a typical insulation thickness of 120mm enertherm gold and 205mm Mineral stone wool (based on timber deck), and 180mm XPS insulation where used within an inverted roof application.

will either need to be removed and reformed preventing a cold bridge, by using either an IKO insulated hard edge, or any rooflight kerb needs to allow for forming a 150mm upstand from the finished roof level. Concrete or masonry kerbs will be required to be insulated to their vertical face to comply and meet a U value of 2.2Wm²K

Listed buildings

Dwellings that are listed do not need to fully comply with the energy efficiency requirements where it would unacceptably alter the buildings character or appearance.

- Listed building and conservations area act 1990
- Monuments maintained under Ancient monuments and archaeological areas Act 1979

Rooflights

Rooflights and roof mounted ventilators on a flat roof also need to comply with Part L. The table below will provide guidance on the requirements for rooflights.

Limiting U Values for new or replacement elements in new and existing buildings.

Element type	Maximum U Value W/m ² K
Rooflights	2.2
Roof ventilators (including smoke vents)	3.0

U-values for rooflights or rooflight-and-kerb assemblies should be based on the developed surface area of the rooflight (U d values), which is often greater than the area of the roof opening. Further guidance on U d-values is given in the Building Research Establishment's BR 443 and the National Association of Rooflight Manufacturers' Technical Document NTD02.

The limiting value for rooflights also applies to kerbs that are supplied as part of a single rooflight-and-kerb assembly sourced from the same supplier and for which the supplier can provide a combined U d-value for the assembly. An upstand built on site should have a maximum U-value of 0.35W/m²·K.

So what does this mean?

Rooflights both new build and refurbishment works are to be designed to meet the requirements of part L, as defined in the table.

Where a builder's kerb is present on a roof, this may act as a cold bridge and as such would now be deemed non-compliant. This will mean that existing timber builders kerbs

Scotland

The Building regulations for Scotland are covered under separate legislation and are covered within technical handbooks.

The handbooks are split into domestic and non-domestic documents. Section 6 relates to the thermal performance requirements for flat roofs.

Technical handbook - section 6 – energy - Domestic

The Scottish Technical Handbook for Domestic Buildings looks at the entire building's performance and CO2 emissions, rather than isolating one particular element. All domestic buildings must be designed and built so their individual Dwelling CO2 Emissions Rate (DER) is no worse than the Target CO2 Emissions Rate (TER).

The TER is generated from a package of measures set for each main heating fuel type; if buildings are constructed following the full package, then it is likely that the DER will meet the TER. As a simplified approach, the dwelling can be considered to reduce CO2 emissions to the same level. CO2 Emission Rates are calculated using a calculation methodology called SAP (Standard Assessment Procedure).

New Buildings – maximum U Value for building elements of the insulation envelop.

Type of element	Area weighted average U Value for all elements of the same type W/m ² K	Individual element U Value W/m ² K
Roof	0.15	0.35

Existing domestic buildings

For existing domestic buildings, the Scottish Technical Handbook provides specific U-values based upon the particular elements (walls, floors and roofs) that is being replaced, renovated or for extensions and conversions. There are different requirements for new elements (extensions or conversions)

Maximum U Value for building elements of the insulation envelop.

Type of Element	Area weighted average U Value for all elements of the same type W/m ² K		Individual element U Value W/m ² K
	a) Where U values for wall and roof of the existing dwelling are poorer than 0.7 and 0.25 respectively.	b) where Parameters for column a) do not apply	
Roof	0.13	0.18	0.35

Technical Handbook - Section 6 Energy - Non domestic

As with the requirements for new domestic buildings, the Scottish Technical Handbook for non-domestic sets a Target CO2 Emissions Rate (TER) for non-domestic buildings based on Notional Buildings that the individual Buildings CO2 Emissions Rate (BER) must meet. The TER is generated from a set of Notional Buildings; if buildings are constructed within these parameter values their BER should meet the TER. CO2 Emissions Rates are calculated using the Simplified Building Energy Model (SBEM).

Notional building – fabric and fixed building services values for TER (Target Emission Rate)

Element	Zone heated and naturally ventilated	Zone heated and mechanically ventilated
Roof	0.18	0.16

Renovations and conversions

Where an extension is formed or alterations made to the building fabric at the same time of the conversion, then the guidance below should be followed.

Renovations - Maximum U Value for building elements of the insulation envelop.

Type of Element	Area weighted average U Value for all elements of the same type W/m ² K	Individual element U Value W/m ² K
Roof	0.25	0.35

Extensions – Maximum U Value for building elements of the insulation envelop.

Type of Element	Area weighted average U Value for all elements of the same type W/m ² K	Individual element U Value W/m ² K
Roof	0.15	0.35

So what does this mean?

New fabric elements in existing dwellings should meet the limiting standard of 0.15W/m²K.

Where a roof is being refurbished and the existing threshold U value is below 0.35w/m²K (60mm PIR or 80mm Mineral stone wool), then a thermal upgrade will be required to meet the improved U value of 0.15 w/m²K , and equivalent of 140mm enertherm Gold and 235mm Mineral stone wool (based on timber deck)

Wales

Wales typically follow England however; a review of conservation of fuel and power has not completed in line with the updates issued in England at the time of the publication of this briefing document. Further details are to follow, once these amendments have been approved.

Thermal performance

What is a thermal element?

A thermal element can be a wall, floor or roof which separates a thermally conditioned (heated or cooled) space from any of the following:

- The outside, or
- An unheated part of the same building, or
- A structure exempt from the building regulations, such as a porch or conservatory, or
- Part of the same building heated or cooled to a different temperature.

R-Value: The measure of a material's resistance to heat flow. The higher a material's R-value, the more it insulates.

The formula for Thermal Resistance is $R = L / k$ where (L) is the material's thickness and (k) is the material's Thermal Conductivity constant. The higher a material's R-value, the better it insulates, and conversely.

The area in square metres through which a heat flow rate of one watt would occur under a temperature difference of one degree Kelvin (or one degree Celsius). It is the property of a given thickness of a material or combination of materials and is calculated by dividing the thickness (in metres) by the thermal conductivity. The higher the resistance figure, the better the thermal performance. Thermal resistance can be calculated for each component in a structure and then summed to give the overall thermal resistance. The reciprocal (1 divided by the total thermal resistance) of this is known as a U Value.

What is a U Value?

A U value is the measurement of heat transmission through a material or assembly of materials. The U value of a material is a gauge of how well heat passes through the material and the lower the U value, the greater the resistance to heat and therefore has better insulating values.

The overall coefficient of heat transfer of an assembly measured in BTUs per square metre, per degrees Kelvin difference in temperature per hour.

What is a U Value calculation?

U Value calculations measure whether the roof build up construction will meet specific standards by determining how well it will prevent heat transfer. This is measured in W/m^2K (Watts per meter squared degree Kelvin), and the lower the U value, the more effective the build-up will be. Thus resulting in less energy being required to heat or cool the habitable space beneath. So a building with higher levels of thermal insulation is more energy efficient.

Insulation thicknesses

The insulation thicknesses stated within the sections 'what does this mean' are for guidance purposes only, and any thermal performance U Values are to be undertaken in accordance with the regulations as referred earlier within this briefing document.

Material change of use

Where there is a material change of use of the whole of a building, such work, if any, shall be carried out as is necessary to ensure that the building complies with the applicable requirements of the following. The following are associated with any flat roofing element.

- B1 - means of warning and escape
- B2 - internal fire spread—linings
- B3 - internal fire spread—structure
- B4 (2) - external fire spread—roofs
- B5 - access and facilities for the fire service
- C2(c) - interstitial and surface condensation
- F1 - ventilation
- L1 - Conservation of fuel and power

Accredited Construction details

Formally referred to as robust details, where an Accredited Construction Detail is available, it may be possible for calculated thermal transmittance values to be used directly into the SBEM/SAP calculations for the building. These can have a significant effect on improving the thermal performance of a building and where ACD's are not used, generic values must be used.

Disclaimer

Whilst every precaution is taken to ensure that the information given in this literature is correct and up to date it is not intended to form part of any contract or give rise to any collateral liability, which is hereby specifically excluded.

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