

# Pitched Roof Specification Guide



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Burbo Point, Merseyside



## Introduction

Accounting for a quarter of total heat loss in dwellings, pitched roofs are a critical area of the building fabric. Strong fabric performance through low U-values and thermal bridging are the salient design goals to ensure buildings are energy efficient and meet the requirements of current Building Regulations. Warm roof designs featuring PIR insulation at the line of sloping rafters are becoming increasingly popular offering a number of advantages over traditional cold roof structures.

Celotex FR5000 is a premium PIR solution for use in pitched roof applications. FR5000 comprises a rigid polyisocyanurate foam core with a super low lambda value of 0.021 W/mK and Celotex IQ emissivity delivering enhanced thermal performance in unventilated pitched roof air spaces.

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Accounting for a quarter of total heat loss in dwellings, pitched roofs are a critical area of the building fabric

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# Product Properties

## Celotex FR5000

Celotex FR5000 is a multi-purpose insulation board with a rigid polyisocyanurate foam core adhesively bonded in the manufacturing process to super low emissivity aluminium foil facings on both sides.

**Dimensions:** 1200mm x 2400mm

**Thickness Range:** 25mm – 150mm

**Compressive Strength:**  $\geq 120$  kPa  
BS EN 826:1996 (Thermal insulating products for building applications – determination of compressive behaviour)

**Dimensional Stability:** DS (TH) 8  
BS EN 1604:2013 (Thermal insulating products for building applications – determination of dimensional stability under specified temperature and humidity conditions)

**Thermal Performance:** Celotex FR5000 has a declared thermal conductivity ( $\lambda$ -value) of 0.021 W/mK in accordance with BS EN 13165:2008 (Thermal insulation for products – factory made rigid polyurethane foam (PUR) products).

## Celotex GS5000

Celotex GS5000 is a thermal plasterboard laminate comprising a rigid polyisocyanurate foam core bonded to 9.5mm tapered edge gypsum plasterboard. The insulation component of GS5000 has super low emissivity aluminium foil facings on both sides delivering enhanced thermal performance in unventilated cavity air spaces.

**Dimensions:** 1200mm x 2400mm

**Thickness Range:** 25mm – 60mm + 9.5mm plasterboard

**Compressive Strength:**  $\geq 120$  kPa  
BS EN 826:1996 (Thermal insulating products for building applications – determination of compressive behaviour)\*

**Dimensional Stability:** DS (TH) 8  
BS EN 1604:2013 (Thermal insulating products for building applications – determination of dimensional stability under specified temperature and humidity conditions)\*

**Thermal Performance:** Celotex GS5000 has a declared thermal conductivity ( $\lambda$ -value) of 0.021 W/mK in accordance with BS EN 13950:2005 (Gypsum plasterboard thermal/acoustic insulation composite panels – definitions, requirements and test methods).\*

The thermal conductivity ( $\lambda$ -value) of the plasterboard component of Celotex GS5000 is 0.19 W/mK.

\* Insulation only

## Pitched Roof Insulation

### Celotex FR5000 Technical Data

Product Code	Thickness (mm)	R-value (m <sup>2</sup> K/W)	Weight (kg/m <sup>2</sup> )
FR5025	25	1.15	1.01
FR5040	40	1.90	1.49
FR5050	50	2.35	1.81
FR5060	60	2.85	2.16
FR5070	70	3.30	2.48
FR5075	75	3.55	2.64
FR5080	80	3.80	2.80
FR5090	90	4.25	3.12
FR5100	100	4.75	3.38
FR5120	120	5.70	4.02
FR5150	150	7.10	4.98

## Below Rafter Insulation

### Celotex GS5000 Technical Data

Product Code	Thickness (mm)	R-value (m <sup>2</sup> K/W)	Weight (kg/m <sup>2</sup> )
GS5025	25 + 9.5	1.20	7.20
GS5040	40 + 9.5	1.95	7.68
GS5050	50 + 9.5	2.40	8.00
GS5060	60 + 9.5	2.90	8.35

**Celotex FR5000 is faced with super low emissivity aluminium foil facings on both sides**

## Fire Performance

### Pitched Roof Insulation

Celotex FR5000 is Class O fire rated as described by the national Building Regulations having achieved:

A pass to BS 476 Part 6:1989 (fire tests on building materials and structures-method of test for fire propagation for products)  
Classification as Class 1 in accordance BS 476 Part 7:1997 (fire tests on building materials and structures-method of test to determine the classification of the surface spread of flame or products)

### Below Rafter Insulation

Celotex GS5000 is classified as Euroclass B-S1, d0 in accordance with:

BS EN 13501-1:2007 (fire classification of construction products and building elements -classification using test data from reaction to fire tests).

## Celotex IQ Emissivity

Celotex FR5000 and Celotex GS5000 is faced with super low emissivity aluminium foil facings on both sides. The highly reflective foil facings deliver better U-values in pitched roof constructions by enhancing the thermal resistance of the unventilated cavity air space adjacent to the board.

Lewandowski Wilcox, Eton

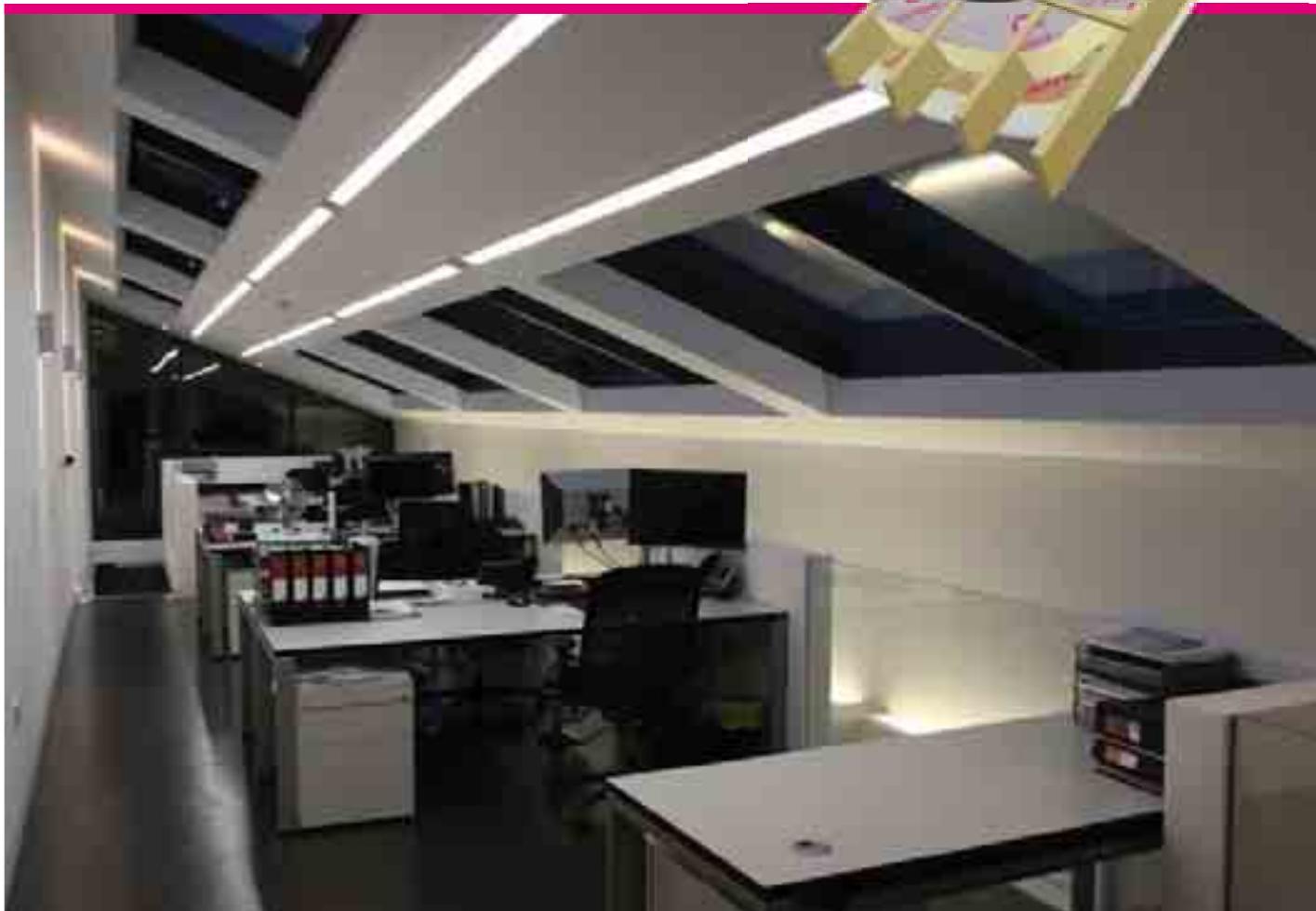


# Certification

Third party approvals play a key role in distinguishing product performance between different manufacturers. To eradicate the perception that all PIR is the same, we recognise the importance of approvals and certifications from a number of leading organisations, including BBA, BRE and ISO. These approvals include independent validation of thermal, fire and other product standards.

Product Code	Application	BBA No.	ISO 9001	ISO 14001
FR5000	Pitched Roofs	95/3197	✓	✓
GS5000	Under Rafter	-	✓	✓

Lewandowski Wilcox, Eton



# Sustainability

Suitable for use within a number of applications within the building fabric, the specification of Celotex products will significantly contribute to improving the energy efficiency of the UK's building stock.

Celotex is also able to independently certify the environmental impact for a selection of its product ranges. This includes Celotex FR5000.

Measured by its BRE Ecopoint score, Celotex achieve the lowest environmental impact of any PIR manufacturer and from its most recent recertification, has improved this score by over 5% since 2010. Moreover, when compared to the generic PIR Ecopoint value, Celotex' impact

is over 20% better than that of non-certified PIR manufacturers.

Through its BRE Approved Environmental Profile, Celotex was the first PIR manufacturer to achieve an A+ Green Guide rating. This rating has been maintained through ongoing recertification and now includes even more Celotex products as part of the profile.

Celotex products are all manufactured in accordance with environmental management system ISO 14001. As well as this, the suppliers of the principal raw materials used in the manufacture of Celotex products also possess this standard allowing a credit to be achieved within the Materials category of BREEAM assessments.

Celotex manufacture solutions that start saving energy as soon as they are installed. Over its useful life, PIR insulation saves over 100 times more energy than was used in its manufacture.

For further information please see Celotex' Sustainability Guide available at [celotex.co.uk](http://celotex.co.uk)



Pitched Roof Insulation		
Name of Insulation Material	FR5000	✓
Manufacturer	Celotex	✓
Unfoamed, Foamed or Installed using Propellants	Foamed	✓
Global Warming Potential (GWP)	Less than 5	✓
Blowing Agent	Pentane	✓
Green Guide Rating	A+	✓
Element Number	1315320025	✓
Environmental Management System (EMS) - Key Process	ISO 14001	✓
Environmental Management System (EMS) - Supply Chain Process	ISO 14001	✓

Under rafter Insulation		
Name of Insulation Material	GS5000	✓
Manufacturer	Celotex	✓
Unfoamed, Foamed or Installed using Propellants	Foamed	✓
Global Warming Potential (GWP)	Less than 5	✓
Blowing Agent	Pentane	✓
Green Guide Rating*	A+	✓
Element Number*	1315320025	✓
Environmental Management System (EMS) - Key Process	ISO 14001	✓
Environmental Management System (EMS) - Supply Chain Process	ISO 14001	✓

\*Insulation component only

# Specification Support



**Celotex**  
Energy Assessments

For more information on how to download Celotex FR5000 and GS5000 for BIM, visit [celotex.co.uk/bim](http://celotex.co.uk/bim)

## Specification Clause

### Celotex FR5000

The pitched roof insulation shall be Celotex FR5000 \_\_\_\_\_mm thick, comprising a polyisocyanurate (PIR) rigid foam insulation core featuring Celotex IQ providing super low emissivity textured aluminium foil facings on both sides and Class O fire performance throughout the product in accordance with BS 476. FR5000 is A+ rated when compared to the BRE Green Guide, is CFC/HCFC free with low GWP and zero ODP and achieves CE marking compliance to BS EN 13165. FR5000 is manufactured in accordance with quality management systems ISO 9001 and environmental management system ISO 14001. All products must be installed in accordance with instructions issued by Celotex.

### Celotex GS5000

The below rafter insulation shall be Celotex GS5000 \_\_\_\_\_mm thick comprising a polyisocyanurate rigid foam insulation core with a thermal conductivity of 0.021 W/mK with Celotex IQ aluminium foil facings on both sides bonded to a layer of 9.5mm tapered edge plasterboard. GS5000 is CFC/HCFC free with zero ODP and low GWP and achieves CE marking compliance to BS EN 13950. GS5000 is manufactured in accordance with quality management system ISO 9001 and environmental management system ISO 14001. All products must be installed in accordance with instructions issued by Celotex.

## Building Information Modelling (BIM)

Celotex FR5000 and GS5000 are available for BIM in the following software formats:

Autodesk Revit  
ArchiCAD  
Vectorworks  
Bentley  
Industry Foundation Classes (IFC)

Celotex products are available for BIM through both [celotex.co.uk/bim](http://celotex.co.uk/bim) and the NBS National BIM Library.

## NBS Specifications

Celotex FR5000 is referenced in the following NBS clauses:

P10 15  
P10 140  
K11 55

Celotex GS5000 is referenced in the following NBS clauses:

K10 15  
K10 25  
K10 205  
K10 245

## Technical Services

Celotex provide outstanding levels of technical expertise and personal assistance through two industry leading services:

### Celotex Technical Centre

When it comes to finding easy-to-understand, quick and helpful advice regarding PIR insulation, the Celotex Technical Centre (CTC) is where you will discover high levels of support and guidance on finding the most appropriate solutions to meet your requirements.

This includes provision of:

U-value calculations  
Condensation risk analysis  
Application and installation advice  
Guidance on compliance to Building Regulations  
Information on our product and environmental credentials

Call the Celotex Technical Centre on **01473 820850** to speak to one of our advisors, or alternatively email [technical@celotex.co.uk](mailto:technical@celotex.co.uk)

### Celotex Energy Assessments

Offering energy calculations including SAP, SBEM and bespoke thermal modelling as well as additional services for pre-tender planning and sustainability assessments for the Code for Sustainable Homes and BREEAM.

For more information on Celotex Energy Assessments (CEA) please take a look at the CEA brochure on [celotex.co.uk](http://celotex.co.uk) with a full breakdown of the services we can provide for your project requirements. For more information please phone **0333 733 0850** or email [info@celotexea.co.uk](mailto:info@celotexea.co.uk)

*Customers should be aware that Celotex and Darren Evans Assessments are separate legal entities and Celotex makes no warranty as to the quality of the services that DEA provides and assumes no responsibility in connection with those services. Customers should also be aware that, as an Assured Partner of Celotex, Darren Evans Assessments operate under a commercial agreement with Celotex for services provided by Darren Evans Assessments under the Celotex Energy Assessment Service.*

# Building Regulations

## England Part L 2013

Part L is an Approved Document within the Building Regulations for England dealing with the Conservation of Fuel and Power. It ensures that the design and construction of new buildings, as well as work done on existing buildings, meets targets designed to limit the associated CO<sub>2</sub> emissions from the building following its construction or modification. Below is a guidance table of U-values to help comply with Part L 2013 Building Regulations.

	New Build		Existing Buildings	
	Domestic Notional Value/Backstop	Non-Domestic Notional value/Backstop	New Thermal Element e.g. Extensions	Existing Thermal Element e.g. Garage Conversions
<b>Walls</b>	0.18 / 0.30	0.26 / 0.35	0.28	0.30
<b>Floors</b>	0.13 / 0.25	0.22 / 0.25	0.22	0.25
<b>Pitched Roofs</b>	0.13 / 0.20	0.18 / 0.25	0.18	0.18
<b>Flat Roofs</b>	0.13 / 0.20	0.18 / 0.25	0.18	0.18

## Scotland Section 6 2010

Section 6 of the Scottish Building Regulations is the Technical Handbook that deals with Energy within the built environment. Section 6 supports the Climate Change (Scotland) Act 2009 as it seeks to meet the target of an 80% reduction in carbon emissions by 2050 by ensuring that effective measures for the conservation of fuel and power are taken with constructing new or modifying existing buildings. Below is a guidance table of U-values to help comply with Section 6 2010 Building Regulations.

	New Build		Existing Buildings	
	Domestic Notional Value/Backstop	Non-Domestic Notional Value/Backstop	New Thermal Element e.g. Extensions	Existing Thermal Element e.g. Garage Conversions
<b>Walls</b>	0.19 / 0.25	0.26 / 0.27	0.19* / 0.22*	0.30
<b>Floors</b>	0.15 / 0.20	0.22 / 0.22	0.18* / 0.18*	0.25
<b>Pitched Roofs</b>	0.13 / 0.18	0.18 / 0.20	0.18* / 0.18*	0.25
<b>Flat Roofs</b>	0.13 / 0.18	0.18 / 0.20	0.18* / 0.18*	0.25

\*Value required when extensions for houses have a reasonable standard of insulation

# U-value Tables

## Pitched roof sarking - insulation over rafters

U-values (W/m<sup>2</sup>K) for Celotex FR5000 over rafters at 400ctrs

Product Code	Rafter Depth (mm)			
	100	125	150	175
FR5070	0.24	0.24	0.24	0.24
FR5075	0.23	0.23	0.23	0.23
FR5080	0.22	0.21	0.21	0.21
FR5090	0.20	0.19	0.19	0.19
FR5100	0.18	0.18	0.18	0.18
FR5120	0.15	0.15	0.15	0.15
FR5150	0.13	0.13	0.13	0.12

## Pitched roof - insulation between and over rafters

U-values (W/m<sup>2</sup>K) for Celotex FR5000 between and over rafters @ 600 ctrs

Product Code		Rafter Depth (mm)			
Between Rafter	Under rafter	100	125	150	175
FR5040	FR5040	0.24	0.23	0.23	-
FR5050	FR5050	0.20	0.20	0.19	-
FR5060	FR5060	0.17	0.17	0.17	0.17
FR5070	FR5070	0.15	0.15	0.15	0.15
FR5075	FR5075	0.14	0.14	0.14	0.14
FR5080	FR5080	0.13	0.13	0.13	0.13
FR5090	FR5090	0.12	0.12	0.12	0.12
FR5100	FR5100	-	0.11	0.11	0.11
FR5120	FR5120	-	0.09	0.09	0.09

## Unventilated pitched roof - insulation between and under rafters

U-values (W/m<sup>2</sup>K) for Celotex FR5000 between rafters @ 400 ctrs and Celotex GS5000 under rafters.

Rafter depth (mm)	Under rafter insulation	Between rafter insulation							
		FR5050	FR5060	FR5070	FR5075	FR5080	FR5090	FR5100	FR5120
100	GS5040	0.23	0.21	0.20	0.19	0.19	-	-	-
	GS5050	0.20	0.19	0.18	0.18	0.17	-	-	-
	GS5060	0.19	0.18	0.17	0.16	0.16	-	-	-
125	GS5025	-	-	-	-	-	0.20	0.19	-
	GS5040	-	-	0.20	0.19	0.18	0.17	0.17	-
	GS5050	0.20	0.19	0.18	0.17	0.17	0.16	0.15	-
	GS5060	0.18	0.17	0.16	0.16	0.16	0.15	0.14	-
150	GS5025	-	-	-	-	-	0.20	0.19	0.17
	GS5040	-	-	0.19	0.19	0.18	0.17	0.16	0.15
	GS5050	0.20	0.19	0.18	0.17	0.17	0.16	0.15	0.14
	GS5060	0.18	0.17	0.16	0.16	0.16	0.15	0.14	0.13

# Design Considerations and Installation Guidelines

## Design Considerations

A pitched roof is defined as an element that separates the external environment from the internal occupied space. The slopes of the rafters are pitched at greater than 10 degrees and not greater than 75 degrees. Celotex can be installed within the structure of a pitched roof in a number of ways to form part of the thermal envelope of the building.

A cold roof is formed where insulation follows the line of a horizontal ceiling. Celotex can be installed between the horizontal ceiling joists as well as above or below the joists as required.

A warm roof is formed where insulation follows the line of sloping rafters. Celotex can be installed above the rafters, or a combination of above, between and underneath depending on the requirements of the design. Warm roof applications are commonly used where habitable rooms are present within the roof space.

## Thermal Performance

### U-values

The tables on page 10 demonstrate how Celotex insulation can contribute to meeting the energy conservation requirements outlined in the Building Regulations.

### Linear Thermal Bridging

Building Regulations require building designers to consider heat loss through junctions within the construction. Approved Document L clarifies the requirement:

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

Similar performance standards are required in Scotland and Northern Ireland.

As insulation standards continue to evolve, it has become increasingly critical to consider heat loss in these areas. Accredited Construction Details (ACDs) for England & Wales, Scotland and Northern Ireland provide practical guidance on meeting this requirement. The documents provide approved design details for junctions within many common constructions, including pitched roofs.

Where work is being undertaken in an existing building – for example extensions, the requirement can be met by adopting the designs given in Accredited Construction Details. Where a new building is being constructed, heat loss through each junction is considered as part of the whole building carbon dioxide emissions calculation.

Using improved junction detailing will allow buildings to more easily meet the requirements of the Building Regulations. Heat loss through each junction is represented by the psi ( $\psi$ ) value. Where ACDs have been adopted then a default  $\psi$  value may be used for each junction.

Junctions can also be individually modelled by a competent person and the  $\psi$  value calculated. This value can be used directly in the whole building calculation. This approach will allow easier compliance and promotes strong fabric performance of the building. Celotex Energy Assessments are able to provide bespoke junction calculations.

## Resistance to Moisture

### Roof Covering

The permeability of the external roof covering is assessed in accordance with BS5534:2003 Annex L to ensure the rate of air flow will safely disperse any moisture which might occur between the batten spaces.

If the air flow is not sufficient, there is an increased risk of interstitial condensation forming between the battens and roof covering. This may cause degradation of the battens. In this instance there may be a requirement for ventilation in accordance with BS 5250:2011 code of practice for control of condensation in buildings.

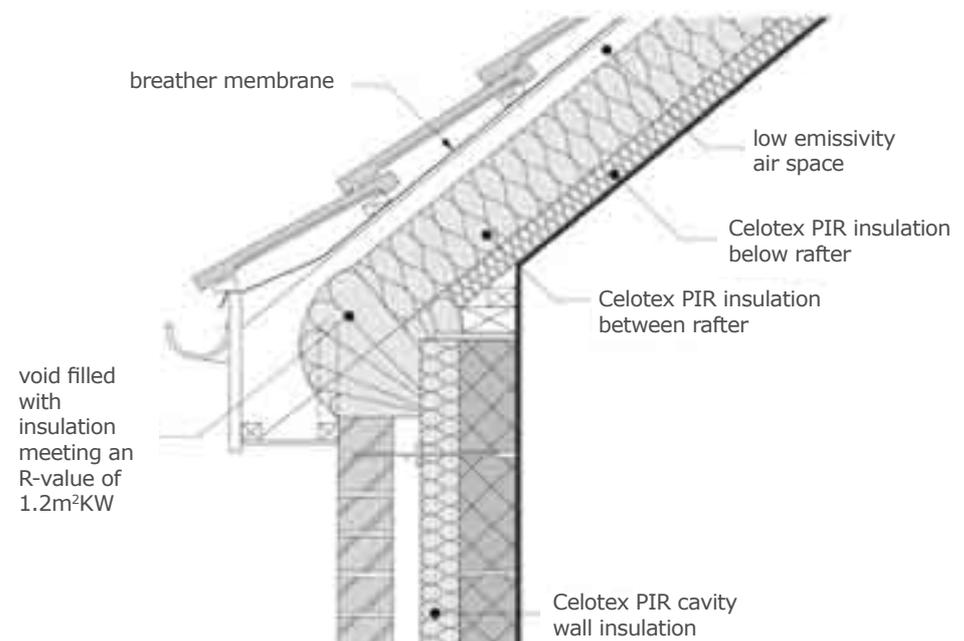
## Condensation

### Condensation within the roof structure

#### Cold Roof

Thermal bridging at wall and roof junctions should be considered in order to minimise the risk of surface condensation forming within the heated space and to improve energy efficiency.

There may be a requirement to ventilate the roof space when the roof underlay has a water vapour resistance greater than 0.25MN.s/g. Further guidance on the provision of ventilation can be found in BS 5250:2011 code of practice for control of condensation in buildings. Where a



Source: Celotex Pitched Roof BBA Certificate

Figure 1.

vapour permeable (breathable) roofing membrane is being used, the guidelines of the membrane manufacturer should be followed.

Where buildings are subject to a building warranty such as NHBC Standards, the requirements of the warranty provider must be met.

A condensation risk analysis should be carried out when the insulation line is above an area of high humidity. For example bathrooms or swimming pools. Controlled ventilation may be required to carry moisture outside.

Loft hatches with a low air leakage rate should be installed to reduce the transfer of moisture into the loft space. Air leakage through loft hatches are tested in accordance with BS EN 13141-1:2004. Manufacturers provide third party certification to support the products air leakage rate.

#### **Warm Roof**

Warm pitched roofs require careful design and detailing in order to minimise risks of harmful condensation.

Where Celotex is installed between the rafters with a secondary layer underneath, there maybe a requirement to fully ventilate between the rafter space depending on the permeability of the roof underlay. Some roof underlays are impermeable to moisture and have a high moisture resistance for example a bituminous sarking membrane while others are permeable for example a breathable membrane. The substrate the underlay is laid upon will affect the permeability. For example when a breathable membrane is laid upon plywood or open jointed sarking boards.

Design guidelines within BS5250:2011 Control of Condensation require a path of ventilation between the rafters when the roof underlay and/or its substrate has a high moisture resistance. The path of ventilation must be a minimum of 50mm and unobstructed in accordance with Building Regulations. Typically both high and low level ventilation must be provided to allow for a cross flow of air. This will minimise the risk of interstitial

condensation forming on the underside of the roof underlay.

When the roof underlay and/or its substrate is permeable the requirement to ventilate the roof should be assessed and a condensation risk analysis undertaken as appropriate. Where a breathable membrane is being used in an unventilated warm roof construction, it is recommended that the membrane is covered by third party accreditation. It is critical that the membrane is installed fully in line with the manufacturer's guidelines and certification. Where ventilation is required it should be provided in line with BS 5250:2011 code of practice for control of condensation in buildings.

In the event of the rafters being fully filled or the use of open jointed sarking boards, then counter battens are installed above the underlay.

Where Celotex is installed both between and on top of rafters (below counter battens), the insulation on top of the rafters must be equal to or greater than the thickness within the rafters. This satisfies the general principle of building design, where layers of the construction with the greatest thermal resistance should be positioned towards the cold side of the construction – in order to minimise the risk of interstitial condensation.

A condensation risk analysis should be carried out when the insulation line is above an area of high humidity. For example bathrooms or swimming pools. Controlled ventilation may be required to carry moisture outside.

#### **Vapour control layers and air tightness**

A vapour control layer is recommended when designing a cold or warm ventilated or unventilated pitched roof. It is positioned on the warm side of the insulation. Its main function is to limit the transfer of moisture into the roof structure and which in turn will minimise the risk of interstitial condensation. The requirement for a vapour control layer should be assessed to BS5250:2011.

In the same way, air leakage through

gaps or cracks through the ceiling, around thermal bridges and openings allow for heat and moisture transfer. Penetrations into the ceiling should be limited and those that are essential should be fully sealed. Penetrations to pipes and services should be sealed preferably with proprietary collars and gaskets.

#### **Services within the loft space**

Pipes, cisterns and ventilation ducts will be subjected to cold temperatures when installed on the cold side of the insulation within a pitched roof. Water vapour within the roof space can condense on the cold surfaces. In extreme temperatures service pipes may freeze. These services should be insulated and protected from extreme temperatures. For further guidance please refer to BRE report 262 Thermal insulation: avoiding risks.

#### **Downlighters**

It is recommended that recessed light fittings are installed within a service void between the vapour control layer and ceiling to reduce the risk of interstitial condensation and air leakage. Manufacturers installation guidance should be followed.

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**For more information  
please contact the Celotex  
Technical Centre on  
01473 820850 or email  
technical@celotex.co.uk**

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Where a secondary line of insulation is required to give the required U-value, use Celotex GS5000 to the underside of the rafters.

## Installation Guidelines

The general guidelines are installation considerations applicable to all design applications. Design applications include when the position of Celotex is:

- Over the rafters
- Between rafters and flush with the top
- Between rafters and flush with the underside
- Between only so rafters are fully filled
- Celotex GS5000 under rafters
- Cold roof

Specific guidance for each of these applications are outlined under individual headings.

### General Guidelines

Note that specific fixing requirements should be determined for each roof, taking into account roof design and location. Measure accurately the width of each rafter space to be filled prior to cutting the board. Ensure there is a tight fit between insulation and rafters to minimise air leakage and heat loss. Cut Celotex FR5000 and Celotex GS5000 with the Celotex insulation saw. Where FR5000 is installed between rafters, cut at a slight angle so the board width is slightly oversized on one surface to achieve a 'friction fit'.

Fill any gaps with expanding sealant. Where exposed rafters are required, plasterboard (or any other suitable decorative board) may be laid over rafters before fixing the insulation. A polythene vapour control layer must be installed directly over the plasterboard.

## Secondary layer under rafters

Where a secondary line of insulation is required to give the required U-value, fix Celotex GS5000 to the underside of the rafters. This will also further hold the Celotex between the rafters in place.

Install Celotex GS5000 in accordance with Celotex instructions to form a vapour control layer.

Where a secondary lining of insulation is not required to give the required U-value, fix a proprietary decorative board under the rafters and ensure a vapour barrier is provided.

Where no secondary lining is required under the rafters and insulation clips have been used, nail through the base of the clip directly into the rafter for additional security.

In all cases ensure a vapour barrier has been provided under the rafters.

Poundbury, Dorchester



## Celotex Over Rafters

Fix a treated timber stop batten equal in thickness to the Celotex insulation across the rafters at the eaves. Butt boards directly against this batten. Install Celotex insulation boards directly on top of the rafters with the long sides parallel to the line of the rafter with both edges supported by rafters. In Scotland, overlay the Celotex with the sarking board.

Cut insulation board to rake and splay at ridge and verges to ensure Celotex is continuous with close butted joints to minimise air leakage.

Fix boards in place temporarily using large headed nails until permanently secured by counter battens

Position a treated timber counter batten (minimum 38mm x 50mm) over the insulation on the line of each rafter. Nail the lower end of each counter batten directly into the stop batten.

Secure the counter battens to the rafters by fixing through both the counter batten and insulation using helical spike fixings at 400 centres along the counter batten.

Drape a breathable roof underlay over the counter battens and secure with tiling battens. The breathable roof underlay is installed in accordance with manufacturer's instructions.

Fix the tile battens to the counter batten at an appropriate gauge to suit the slates or tiles selected.

## Celotex FR5000 between the rafters – installed flush to the top

This application is used in conjunction with Celotex FR5000 across the top of the rafters to form a warm roof with insulation between and over rafters.

### Installed from Above

Secure the board between the rafters using Celotex insulation clips.

Push the insulation clips into the board at 1000mm intervals with the two prongs piercing the exposed foam down the long edge of the board.

Start the clips in between rafters and push the board into place. This should be a tight fit to minimise heat loss through the gaps between the rafters and insulation board.

Push the board fully into the void so that the base of the insulation clip is level with the face of the rafters.

If additional board security is required, for example where there is no lining under the rafters, nail through the base of the clip directly into the rafter.

### Installed from Below

Push the board into the void between the rafters until it is flush with the top. Celotex should be installed tightly against the underside of the insulation across the top of the rafters to reduce air movement and minimise air leakage.

Hold the Celotex in place flush with the top of the rafters using 'stop' battens positioned along the inside of the rafters.

Tightly fit the insulation to the ridge plate and carry over and tightly butt the wall plate at eaves

## Celotex FR5000 between rafters – installed flush to the underside

This application is used in conjunction with a secondary lining below to form a warm roof with ceiling along the sloping rafters.

### Ventilated

Ensure there is enough rafter depth for the thickness of Celotex and also a 50mm ventilated airspace above the boards.

Fix battens to the inside face of the rafter so that the bottom of the batten is 50mm below the roof underlay to maintain a ventilated airspace.

### Unventilated

Where insulation is to partially fill the rafter space, ensure there is enough rafter depth for the thickness of Celotex and also an air space above to allow the breathable membrane to sag between the rafters.

Fix 'stop' battens above Celotex down the side of each rafter to create an air space for the breathable roof underlay to sag between the rafters.

### Ventilated and Unventilated

Push the board into the void between the rafters until it contacts the stop batten above and is flush with the bottom.

Celotex should be installed flush with the bottom of the rafters with no gaps between the secondary layer of insulation below to reduce air movement and minimise air leakage.

Install a secondary layer of insulation or lining board as described above.

## Celotex FR5000 between rafters – fully filling the rafter space.

Install the roof underlay over the top of the rafters in accordance with manufacturer's instructions.

Fix counter battens over the membrane to provide a channel for moisture run off, leaving the entire rafter depth to be filled with Celotex.

Secure the board between the rafters using Celotex insulation clips as described above.

Celotex should be installed flush with the bottom of the rafters with no gaps between the secondary layer below to reduce air movement and minimise air leakage.

Install a secondary layer of insulation or lining board as described above.

## Celotex GS5000 Below Rafters

Position the long edges of Celotex GS5000 along the long edges of the rafters. Ensure all board joints are supported by timber and overlap rafters by 19mm at board joints.

Fix through the Celotex using drywall screws at 150 mm centres and at least 10mm from the edge of the boards. The fixing length should allow a minimum 25mm penetration of the timber rafter.

Care should be taken not to overdrive nails / screws.

## Cold Roof

Celotex can be installed between and over horizontal joists within a loft space. The line of insulation can either form the floor of the loft meeting with the walls to form the thermal envelope or as part of a loft conversion to form the flat ceiling below the apex of the pitched roof.

Ensure the loft void is ventilated and eave vents are left clear.

Ensure ceilings are strong enough to withstand loadings associated with installation.

To minimise air leakage and heat loss around the loft hatch seal the edges with draught seals.

Install Celotex between joists as described above.

Celotex is laid as a continuous layer across the top in the opposite direction to that of the ceiling joists. Ensure boards are laid across a minimum of two joists.

Board joints are tightly butted together correctly supported by the joists.

Celotex is then mechanically fixed to the joists with suitable fixings.

## General Information

### Storage

Celotex insulation boards should be stored dry, flat and clear of the ground. Only as much material as can be installed during a single working period should be removed from storage at any one time. If boards are stored under tarpaulins, care should be taken to prevent rope damage to boards.

### Installation

Always install Celotex insulation boards in accordance with the instructions supplied by Celotex.

Celotex insulation boards should not be installed when the temperature is at or below 4°C and falling.

Where possible, cut the product using the Celotex Insulation Saw to minimise dust creation.

When cutting Celotex insulation, dust extraction equipment, eye protection and face masks should be provided. Dust or particles in the eyes should be washed out with liberal quantities of water. If skin is sensitive to fibre irritation, apply a barrier cream to exposed areas before handling.

### Handling

Care should also be taken to ensure that packs are not dropped on to corners or edges.

Aluminium foil edges may be sharp. Avoid sliding bare hands along board edges.



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# Celotex

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