

**TILER**

PITCHED ROOFING



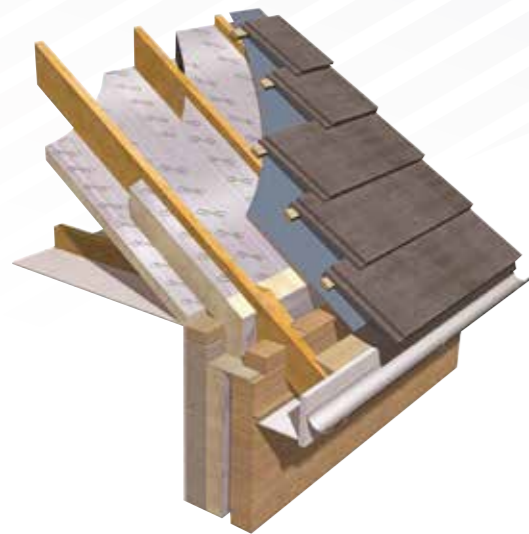
# PITCHED ROOF INSULATION

PITCHED ROOF SPECIFICATION GUIDE

## PITCHED ROOF INSULATION

Whether its a new build roof or the conversion of an existing structure to provide additional living accommodation, TIL-R Pitched Roofing Insulation Board offers the necessary thermal performance that is vital to any building project.

### TIL-R Pitched Roofing Insulation Board



#### Features

- High performance PIR insulation
- 0.022 W/mK lambda
- Manufactured using a blowing agent with zero ODP (Ozone Depletion Potential) and low GWP (Global Warming Potential)

#### Description

TIL-R Pitched Roofing Insulation Board is a high performance PIR insulation, perfectly suited to multiple applications. Suitable for pitched roof, floor or framed wall applications, TIL-R Pitched Roofing Insulation Board benefits from an excellent thermal performance. With zero Ozone Depletion Potential (ODP) and a low Global Warming Potential (GWP), this high quality product offers energy saving benefits to the entire building.

Lightweight, easy to cut, handle and install, the board is available in a variety of thicknesses to suit your precise specification and ensure you meet and exceed thermal regulations.

With TIL-R Pitched Roofing Insulation Board, you are specifying a board that:

- Has a low thermal conductivity value (0.022 W/mK) providing an excellent thermal performance.
- Is available in a range of thicknesses from 25mm - 160mm and in a board size of 2400mm x 1200mm.
- Will not degrade or deteriorate if exposed to moisture, therefore maintaining its thermal performance.

#### Applications

- Pitched roofs
- Framed walls
- Floors (compatible with underfloor heating systems)

#### Installation Guidelines

For full details of the installation of TIL-R Pitched Roofing Insulation Board, please refer to the applications pages of the Specifier's Guide. See applications section for installation and handling.

#### Thermal Resistance

Thickness (mm)	R-value (m <sup>2</sup> K/W)
25	1.10
30	1.35
40	1.80
50	2.25
60	2.70
70	3.15
75	3.40
80	3.60
90	4.05
100	4.50
110	5.00
120	5.45
130	5.90
140	6.35
150	6.80
160	7.25

#### Product Details

<b>Thermal Conductivity</b>	0.022 W/mK
<b>Compression Strength</b>	dN <50mm : 120 kPa - dN 50-160mm 140 kPa
<b>Moisture Vapour Resistance</b>	Installed value of 100 MNs/g
<b>Specific Heat Capacity</b>	1.4kJ/kgK
<b>Fire Performance</b>	Class 1 BS 476 (Part 7)
<b>Dimensions</b>	2400mm (l) x 1200mm (w)
<b>Facing</b>	Multi-layer gas tight aluminium foil

### Sustainable Solutions

TIL-R Pitched Roofing Insulation Board has been designed and manufactured to result in the lowest environmental impact. This drives our 'A rating' in the BRE Green Guide 2008 under element number 1415320205. TIL-R Pitched Roofing Insulation Board has a zero ODP (Ozone Depletion Potential) and low GWP (Global Warming Potential).

### Specification Clause

The insulation shall be TIL-R Pitched Roofing Insulation Board \_\_\_\_\_ thick for use in pitched roof/framed walls/flooring applications, manufactured in accordance with an ISO 9001 quality management system and an ISO 14001 environmental management system. It should comprise a rigid polyisocyanurate (PIR) core faced on both sides with a gas tight multilayer composite aluminium foil facing. The product should have a low GWP, zero ODP and achieve a CE marking compliance to BS EN 13165. TIL-R Pitched Roofing Insulation Board should be installed in accordance with TIL-R's recommendations.

### Thermal Performance

#### Typical U-values (W/m²k) achieved in common pitched roof constructions

#### INSULATION BETWEEN AND UNDER RAFTERS

- Unventilated roof construction
- Tiles and battens
- Breather membrane
- Low-emissivity rafter cavity, unvented
- Thickness indicated in first column, between rafters (spacing as indicated)
- Board fixed below rafters
- VCL
- Plasterboard finish

Insulation Thickness Under Rafters										
	25mm		40mm		50mm		60mm		75mm	
	400 cts	600 cts	400 cts	600 cts	400 cts	600 cts	400 cts	600 cts	400 cts	400 cts
75mm	0.24	0.23	0.20	0.19	0.19	0.18	0.17	0.16	0.15	0.15
80mm	0.23	0.22	0.20	0.19	0.18	0.17	0.17	0.16	0.15	0.14
90mm	0.22	0.20	0.19	0.18	0.17	0.16	0.16	0.15	0.14	0.14
100mm	0.20	0.19	0.18	0.17	0.16	0.15	0.15	0.14	0.14	0.13
110mm	0.19	0.18	0.17	0.16	0.16	0.15	0.14	0.14	0.13	0.12
120mm	0.18	0.17	0.16	0.15	0.15	0.14	0.14	0.13	0.13	0.12
130mm	0.17	0.16	0.15	0.14	0.14	0.13	0.13	0.12	0.12	0.11
140mm	0.16	0.15	0.15	0.14	0.14	0.13	0.13	0.12	0.12	0.11
150mm	0.16	0.14	0.14	0.13	0.13	0.12	0.12	0.12	0.11	0.11

#### INSULATION OVER/OVER AND BETWEEN RAFTERS

- Tiles, battens, and ventilated counterbatten void
- Breather membrane
- Board over rafters, stainless steel fixings, 6.7 per m²
- 50mm wide timber rafters, depth and centres as indicated
- Board between rafters, as indicated
- Low-emissivity clear cavity, unvented
- Plasterboard finish

Insulation over rafters (mm)	Insulation between rafters (mm)	Rafter Centres		
		400mm	600mm	
<b>Insulation over rafters</b>				
50	n/a	0.33	0.34	min. 100mm deep rafters
75	n/a	0.24	0.24	
90	n/a	0.21	0.21	
100	n/a	0.19	0.19	
110	n/a	0.17	0.17	
120	n/a	0.16	0.16	
140	n/a	0.14	0.14	
150	n/a	0.13	0.13	
<b>Insulation over and between rafters</b>				
40	40	0.26	0.25	min. 100mm deep rafters
50	50	0.22	0.21	
60	60	0.19	0.18	
70	70	0.16	0.16	
75	75	0.15	0.15	
80	80	0.14	0.14	
90	90	0.13	0.12	min. 150mm deep rafters
100	100	0.12	0.11	
110	110	0.11	0.10	
120	120	0.10	0.10	

## TYPICAL INSTALLATION - GENERAL

### TIL-R Pitched Roofing Insulation Board

#### Thermal Bridging

Linear thermal bridging is concerned with heat loss at junctions. To reduce heat loss it is necessary to ensure continuity of the insulation layer with adjacent building elements. This means careful detailing at junctions between elements to minimise the effects of thermal bridging.

For example, at gable ends continue the wall insulation 250mm above the height of the internal ceiling insulation and install a cavity tray over.

For further guidance on reducing thermal bridging, Accredited Construction Details (ACDs) and Enhanced Construction Details (ECDs) have been developed to assist the construction industry achieve the performance standards required to demonstrate compliance with the energy efficiency requirements of the building regulations.

It is recommended that any detailing and jointing of the boards achieves a draught free airtight envelope. Form tight joint details between boards at rafters and at ridges, valleys and hips.

#### Condensation Control

The specification of a vapour control layer (VCL) will vary depending on building use and the humidity of the internal environment. For all roof constructions it is recommended that a condensation risk analysis be performed in accordance with BS 5250 (Code of practice for control of condensation in buildings) in order to determine the requirement for a VCL.

A VCL typically acts as an airtightness membrane also, depending on the specific project requirements.

#### Breather Membranes

Should be installed in accordance with the specific manufacturer's instructions and BBA certificate. Air gaps between insulation and membrane should be 25mm to 50mm generally. Some membranes can be laid directly on the insulation (i.e. insulation can fully fill the rafters), but require a counterbatten layer above the membrane to provide an air gap.

#### Fire Performance

Installed in accordance with this installation guide and good practice guidance, TIL-R Pitched Roofing Insulation Board will not prejudice the fire resistance of the roof and adds no significant fire load to the building. The product has a Class 1 fire rating, tested to BS 476-7: 1997.

## INSTALLATION OVER RAFTERS

### Warm Roof

This is a true warm roof construction that does not require ventilation, and maintains the roof structure at (or close to) the internal temperature. A breathable sarking membrane is installed over the insulation, allowing condensate to diffuse outwards and preventing moisture ingress.

As well as insulating above the rafters, insulation can be added between to avoid an excessively deep roof construction. The insulation layer over the rafters should be at least as thick as the layer between to avoid possible condensation issues.

### Instructions

- A treated timber stop rail is secured at the base of the rafters at the eaves to provide a secure anchor for the counter battens.
- TIL-R Pitched Roofing Insulation Boards are laid with the long edges parallel to the rafters, tightly butted in a brick-bond pattern.
- All board joints running eaves to ridge should be supported by rafters. Boards can be temporarily fixed with nails prior to counter battening.
- Counter battens fixed over the insulation layer need to be appropriately sized to accept the helical nails being driven through to the rafters underneath. Secure the insulation boards using 38mm x 50mm counter battens down the line of each rafter. The lower end of the counter batten is nailed directly into the stop rail.
- Nail the counter batten through the TIL-R Pitched Roofing Insulation Boards into the rafter. Helical fixings are generally advisable to ensure resistance to wind loads. Fixing manufacturers provide calculations to work out the size and number of fixings required, and aid compliance with British Standards and Euro-codes.
- Lay the breathable sarking membrane over the counter battens. The membrane should extend over the fascia to ensure drainage of water into the gutter, a continuous timber fillet should be used to support the edge of the membrane.
- Secure the tiling battens, normally 50mm x 25mm, to the rafters by fixing through the insulation and the counter battens.
- Tiles are fixed in accordance with manufacturers recommendations.
- Where required, install the between rafter layer of TIL-R Pitched Roofing Insulation Board so that the boards are flush with the top of the rafters, with no air gap between the over rafter layer of insulation.
- Secure timber battens to the lower edge of the rafters to support the TIL-R Pitched Roofing Insulation Boards.
- Finish the ceiling internally with plasterboard as required.

## INSTALLATION BETWEEN & UNDER RAFTERS

### Unventilated Roof

This is a modern roof construction that potentially allows the full depth of the rafter to be used, depending on the requirements of the breathable sarking membrane manufacturer. Further insulation can be added under the rafters, head room permitting, which minimises the thermal bridge effect of the timber.

### Ventilated Roof

Most common in roof refurbishment, this is a traditional cold roof construction, normally featuring Type 1F vapour resistant sarking felt, with ridge to eaves ventilation and minimum 50mm airspace between the sarking felt and insulation. Again, further insulation can be added under the rafters.

### Instructions

- Secure minimum 25mm x 25mm battens flush with the top edge of the rafters to provide a stop, and to ensure the required space above the insulation for the drape of the breather membrane.
- Complete the tiling, battening and felting in the normal manner using a BBA approved breathable sarking membrane.
- Accurately cut the TIL-R Pitched Roofing Insulation Boards to fit between the rafter timbers and position against the stop battens.
- The stop battens should be positioned such that the bottom face of the TIL-R Pitched Roofing Insulation Board is flush with the bottom of the rafters.
- If required, an additional layer of TIL-R Pitched Roofing Insulation Board can be fixed below the rafters by means of plasterboard timber screws. Timber screws reduce the risk of nail popping, allow for the boards to be tightly fixed against the structure and reduce the ability of boards to flex.
- Under rafter insulation boards should be lightly butted together and not forced into position.
- The minimum distance from the screw to the edge of the board is 10mm. For horizontal or hand sawn edges a minimum distance of 15mm should be kept. The maximum distance between screws is 250mm.
- Screw length should be calculated based on a minimum penetration of 25mm into the timber structure.
- Screws should be tightened until the countersunk head is driven in just below the surface of the plasterboard. This allows a skimming over of the screw head.

## BUILDING REGULATIONS

### England

#### PART L 2013

U-values are part of wider assessment criteria to meet the requirements of Part L as a whole. Other factors taken into account include: airtightness, door and window U-values, the heating system, and thermal bridging.

'Limiting U-values' are the worst acceptable level of performance, but designing to these values is unlikely to result in compliance. The 'notional building specification' is a recipe approach that will ensure compliance if all standards are met. Regulatory compliance should be assessed through the appropriate SAP (for domestic) or SBEM (for non-domestic) calculation software.

#### NEW BUILD: L1A - new dwellings; L2A - new buildings other than dwellings

		Floor	External Wall	Flat Roof	Pitched Roof	
					Sloped Ceiling	Flat Ceiling
L1A	Notional dwelling	0.13	0.18	0.13	0.13	0.13
	Limiting values	0.25	0.30	0.20	0.20	0.20
L2A	Notional building	0.22	0.26	0.18	0.18	0.18
	Limiting values	0.25	0.35	0.25	0.25	0.25

#### EXISTING PROPERTIES: L1B - existing dwellings; L2B - existing buildings other than dwellings

U-value requirements for existing buildings are unchanged from Part L 2010.

		Floor	External Wall	Flat Roof	Pitched Roof	
					Sloped Ceiling	Flat Ceiling
L1B & L2B	New element	0.22	0.28	0.18	0.18	0.16
	Retained element	0.25	0.30*	0.18	0.18	0.16

\*Where insulation is installed internally or externally.

### Wales

#### PART L 2014

U-values are part of wider assessment criteria to meet the requirements of Part L as a whole. Other factors taken into account include: airtightness, door and window U-values, the heating system, and thermal bridging.

'Limiting U-values' are the worst acceptable level of performance, but designing to these values is unlikely to result in compliance. The 'notional building specification' is a recipe approach that will ensure compliance if all standards are met. Regulatory compliance should be assessed through the appropriate SAP (for domestic) or SBEM (for non-domestic) calculation software.

#### NEW BUILD: L1A - new dwellings; L2A - new buildings other than dwellings

		Floor	External Wall	Flat Roof	Pitched Roof	
					Sloped Ceiling	Flat Ceiling
L1A	Notional dwelling	0.15	0.18	0.11	0.11	0.11
	Limiting values	0.18	0.21	0.15	0.15	0.15
L2A	Notional building	0.22	0.26	0.18	0.18	0.18

#### EXISTING PROPERTIES: L1B - existing dwellings; L2B - existing buildings other than dwellings

		Floor	External Wall	Flat Roof	Pitched Roof	
					Sloped Ceiling	Flat Ceiling
L1B	New element	0.18	0.21	0.15	0.15	0.15
	Retained element	0.25	0.30	0.18	0.18	0.16
L2B - all elements	Domestic*	0.18	0.21	0.15	0.15	0.15
	Limiting values	0.22	0.26	0.18	0.18	0.15

\*Refers to buildings other than dwellings that are 'domestic' in character.

### Scotland

#### SECTION 6 2015

U-values are part of wider assessment criteria to meet the requirements of Section 6 as a whole. The 'notional building specification' is a recipe approach that will ensure compliance if all standards are met. Regulatory compliance should be assessed through the appropriate SAP (for domestic) or SBEM (for non-domestic) calculation software.

#### DOMESTIC NEW BUILD

As well as U-values, the notional dwelling specifications for gas, LPG and oil fuel packages take into account: airtightness, door and window U-values, the heating system, and thermal bridging. They also include photovoltaics and waste water heat recovery. Specifying U-values therefore needs to be done in careful consideration with the entire dwelling package.

	Floor	External Wall	Flat Roof	Pitched Roof	
				Sloped Ceiling	Flat Ceiling
New domestic (notional dwelling)	0.15	0.17	0.11	0.11	0.11

#### EXISTING PROPERTIES

For extensions to existing dwellings, the required U-values for the new elements depend on the performance of the existing building:

- 'A' applies where the walls of the existing building have a U-value better than 0.70 and the roof better than 0.25, or will be upgraded to those levels as part of the works.
- The higher standards in 'B' apply where the walls of the existing building have a U-value poorer than 0.70 and the roof is poorer than 0.25.

Where existing domestic elements are to be altered or refurbished, the standards in 'A' apply.

		Floor	External Wall	Flat Roof	Pitched Roof	
					Sloped Ceiling	Flat Ceiling
Existing	A	0.18	0.22	0.18	0.18	0.15
Domestic	B	0.15	0.17	0.13	0.13	0.11

#### NON-DOMESTIC BUILDINGS - NEW AND EXISTING

For all building types, early consultation with Local Authority Building Standards is advised.

Non-domestic new build standards are based on heating/ventilation specification (natural or mechanical) and have different limiting values depending on type of building (e.g. shell construction where future occupancy/use is uncertain).

For existing buildings, a degree of flexibility is available depending on the feasibility of achieving U-value targets (e.g. in listed buildings). Again, early discussion Local Authority Building Standards is recommended.

# TIL-R

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