



August 2008: Issue 1

## Residential New Build 2.4.1 Pitched Roofs - Ceiling Level



energy saving



warmth



quietness



fire protection



sustainability

# Residential New Build

## Pitched Roof - Ceiling Level Contents

<b>Introduction</b>	<b>find online</b>	<b>page</b>
Solution optimiser and pathfinder		<b>150</b>
Design considerations		<b>152</b>
<b>Design Details</b>		<b>500</b>
	<b>find online</b>	<b>page</b>
Between and above joists one layer	<b>Pc01</b>	<b>500</b>
Between and above joists two layers	<b>Pc02</b>	<b>502</b>
Between joists – ultra eco friendly	<b>Pc03</b>	<b>504</b>
Between and above joists two layers – carbon neutral	<b>Pc04</b>	<b>502</b>
Between and above joists encapsulated	<b>Pc05</b>	<b>506</b>
Between and above joists with a storage deck	<b>Pc06</b>	<b>508</b>
Between and above rafter with a storage deck	<b>Pc07</b>	<b>510</b>

# Pitched roofs – ceiling level

## Solution optimiser and pathfinder



Insulation placed at horizontal ceiling level creates a cold roof space. This is the lowest cost option for insulating a roof and uses low cost readily available glass mineral wool quilt insulation. Very high levels of thermal insulation can be achieved because there is virtually no restriction on the thickness of insulation that can be installed.

Key

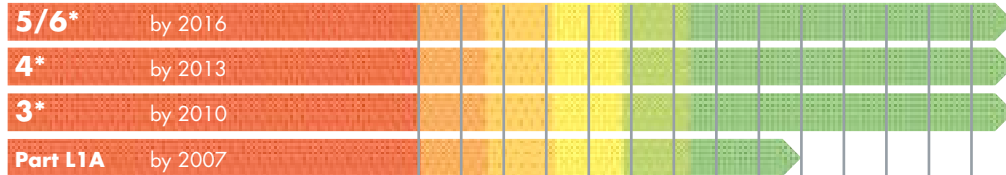
Thermal insulation achievable by constructions within this document.

\* Recommended Knauf Insulation product(s). Other products may be applicable.

Find online. Visit [www.knaufinsulation.co.uk](http://www.knaufinsulation.co.uk) and key in construction code to find the most up to date information on your chosen solution.

### Pitched roof with insulation at ceiling level

Construction compatibility with Code for Sustainable Homes rating

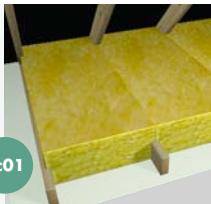


**Knauf Insulation solution**

**U-values**

0.25 0.24 0.23 0.22 0.21 0.20 0.19 0.18 0.17 0.16 0.15 0.14 0.13 0.12 0.11 0.10 0.09

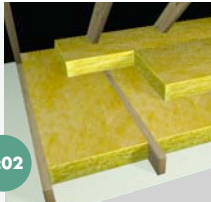
**Between and above joists one layer**  
 Product\*: Crown Loft Roll One  
 Description: One layer of extra thick glasswool between and overlapping joists



Page No: 500

Pc01

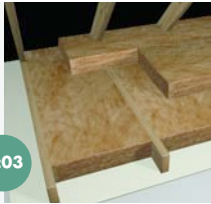
**Between and above joists two layers**  
 Product\*: Crown Loft Roll 44/40  
 Description: Two layers of glasswool between and above joists



Page No: 502

Pc02

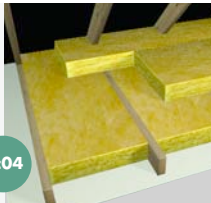
**Between and above joists two layers**  
 Product\*: Earthwool  
 Description: Two layers of ultra eco-friendly glasswool between and above joists



Page No: 504

Pc03

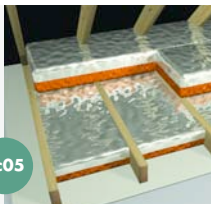
**Between and above joists two layers – carbon offset**  
 Product\*: Crown CarbonZero Loft Roll  
 Description: Two layers of carbon offset glasswool between and above joists



Page No: 502

Pc04

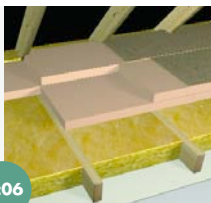
**Between and above joists two layers encapsulated**  
 Product\*: Space Blanket  
 Description: Two layers of encapsulated glasswool between and above joists



Page No: 506

Pc05

**Between and above joists with a storage deck**  
 Products\*: Crown Loft Roll 44, Space Board  
 Description: One layer glasswool between joists, two layers rigid XPS board above joists



Page No: 508

Pc06

# Pitched roofs – ceiling level

## Insulation at ceiling level design

### Introduction

It is possible to achieve very high levels of insulation in pitched roofs where the insulation is positioned at ceiling level because the insulation thickness is largely unrestricted by construction considerations. A major factor influencing the design of pitched roofs with insulation at ceiling level is the type of roof tile underlay chosen. Traditionally, roofs with cold loft spaces were ventilated to allow for the removal of moisture-laden air from the loft. Traditionally roof tile underlays (such as 1F sarking felt) had a high water vapour resistance and required ventilation. These are now often being replaced by roof tile underlays that have low water vapour resistance and require no or low levels of ventilation. Consequently the designer is now required to incorporate various design features into the ceiling and pitched roof dependent on the type of roof tile underlay used.

### Ventilation and control of condensation

BS 5250 provides guidance for pitched roofs with two types of tiling underlay:

- Type HR (high water vapour resistance – greater than 0.25 MN. s/g), such as traditional sarking felt
- Type LR (low water vapour resistance – less than 0.25 MN. s/g)

Where using an LR underlay which has third party certification by the British Board of Agrément, for use as a tiling underlay for a pitched roof with a cold loft space and insulation at ceiling joist level such as Knauf Breatheline, any water vapour that does pass through the insulation layer can disperse through the tiling underlay to the outside air. This is known as a 'breathing' roof and is recommended by Knauf Insulation for new dwellings.



Where an HR underlay, such as traditional bitumen based sarking felt, is used as the tiling underlay, it is necessary to provide cross ventilation to the cold side of the insulation to enable water vapour to dissipate to the atmosphere and thus prevent condensation forming in the roof construction.

BS 5250: 2002 places great emphasis on the air tightness of the ceiling to prevent water vapour entering the loft space (see below).

### A BS 5250 'well sealed' ceiling

In BS 5250, a 'well sealed' ceiling requires the following:

- The design should avoid holes in the ceiling and constructional gaps, especially at the junction with dry lined external walls.
- No access door or hatch should be located in rooms where large amounts of moisture are produced, such as kitchens or bathrooms.
- The access hatch should include draught seals that are compressed when the hatch is closed.
- Penetrations, such as those for services and rooflights, should be permanently sealed with suitable proprietary products.
- The ceiling should be sealed to the external walls to limit any leakage through cracks.
- Recessed light fittings should either comply with BS EN 60529 and be rated IP60 to IP65 (depending on room use), or incorporate an appropriate sealed hood or box.
- The head of any cavity in any wall or partition should be sealed to prevent transfer of warm moist air into the roof space.
- A well sealed ceiling is likely to be a prerequisite of achieving a satisfactory air leakage rate when a new building is tested.

Using LR underlays can eliminate the need for ventilation in a domestic pitched roof. BS 5250: 2002, Amendment No.1 defines LR underlays as having a water vapour resistance of less than or equal to 0.25 MN.s/g and recommends that only LR underlays with Technical Approvals given by UKAS accredited technical approval bodies (e.g. BBA) for this type of application are used without ventilation. Knauf Breatheline meets both these requirements.

If it is proposed to use a LR Underlay without this type of Technical Approval then ventilation is required - see Table 6. Technical Approvals will require a well sealed ceiling.

If the designer is not confident of achieving a well sealed ceiling then ventilation is required, as set out in Table 6.

Note that if there are likely to be high initial moisture loads in the building due to water introduced into the building during the construction phase, or if the designer has any doubts about the viability of constructing a well sealed ceiling then consideration should be given to installing 5mm high level ventilation irrespective of whether the LR underlay has a Technical Approval or not.

**Table 6: Ventilation requirements for LR underlays**

LR underlay approval	type of ceiling	Size of ventilation openings at:	
		eaves	high level
No technical approval	Normal	7mm	5mm
No technical approval	Well sealed*	3mm	5mm
With technical approval	Normal	7mm	5mm
With technical approval	Well sealed*	Not required	Not required

\*See page 152 for definition of well sealed ceiling.

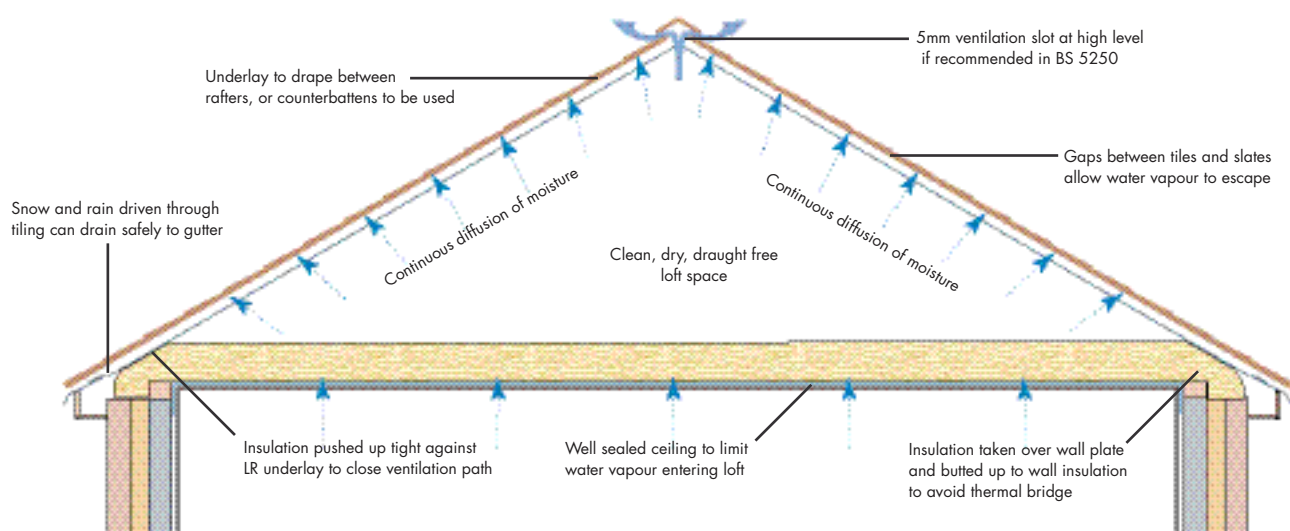


#### design detail finder

Knauf Insulation solutions for these types of construction can be found on pages 500-511.

Where no eaves ventilation is provided, the ceiling level insulation is usually pushed up tight against the LR underlay to prevent air leakage into the loft at eaves level.

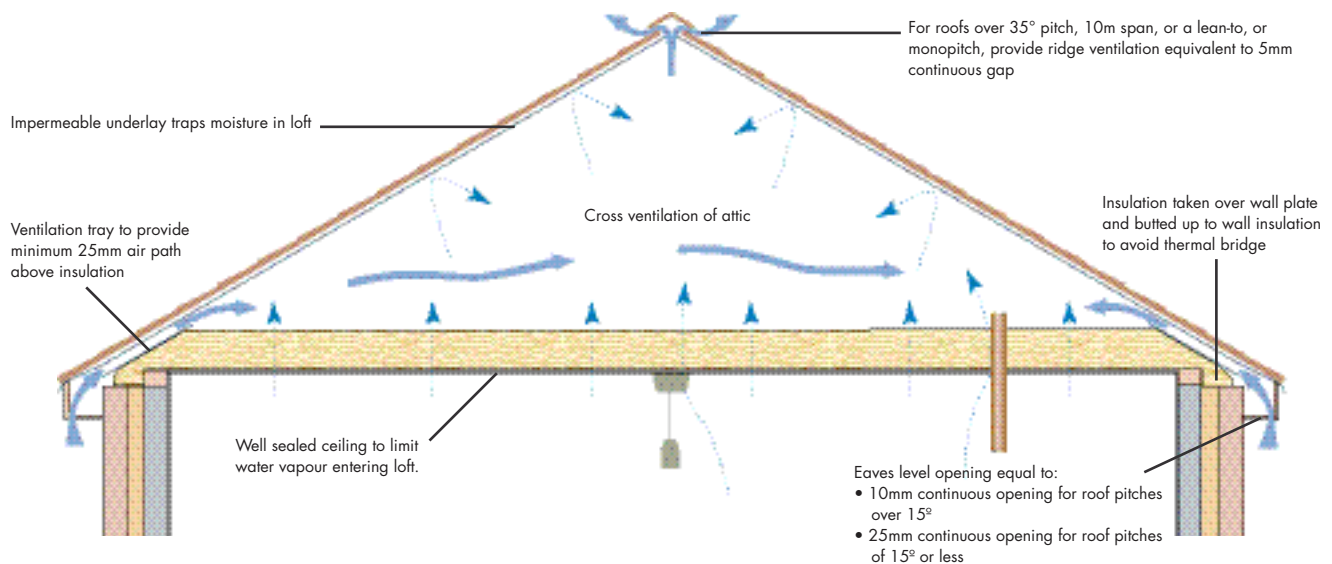
## Ceiling level insulation with LR underlay



# Pitched roofs – ceiling level

## Insulation at ceiling level design

### Ceiling level insulation with HR underlay



### Ventilated roof design

With a ventilated design, the insulation is placed at ceiling level and cross ventilation of the loft space is used to disperse moisture vapour.

It is important to allow a clear, unobstructed ventilation path at least 25mm wide between the insulation and the tiling underlay to allow outside air to ventilate the loft space and prevent the build-up of moisture.

The ventilation requirements for roofs with a double pitch are shown above. Lean-to and mono-pitch roofs should have a continuous gap equivalent to 10mm at the eaves and high level or ridge ventilation equivalent to a continuous gap of 5mm.

Ventilation openings should prevent the entry of insects. A 3mm or 4mm mesh across the ventilation holes should be incorporated. Gaps and holes in the ceiling should be sealed to restrict the amount of water vapour that enters the loft space. Draft seal the loft hatch and provide catches or bolts to compress the draft seal and prevent air leakage from wind uplift.

### Other precautions for ceiling level insulation

All tanks and pipes in the loft should also be insulated to prevent freezing. Tank insulation jackets should meet the standards for HEES (Home Energy Efficiency Scheme). Do not insulate directly under the cold water tank, unless the tank is elevated. The loft hatch should also be insulated to a minimum depth of 100mm and draught stripped.



#### design detail finder

Knauf Insulation solutions for these types of construction can be found on pages 500-511

## Accredited Construction Details

To avoid thermal bridging the roof insulation should butt up to or lap the wall insulation. The designer should consider at what stage this 'linking' insulation is installed, as this will affect the detailing of insulation at the eaves.

In cold roofs, one way of achieving this in practice is to place a short length of insulation quilt over the wall plate (and cavity closer where applicable) immediately before the tiling underlay is fixed. This avoids having to push the insulation into place from inside the roof once the roof covering has been completed.

The gap between gable/separating walls and the first joist/rafter should be insulated to avoid thermal bridging. In cold roofs, the second layer of insulation should be butted up against the gable and separating walls to avoid thermal bridging.

Knauf Insulation products are supplied in widths which suit standard joist/rafter spacings.

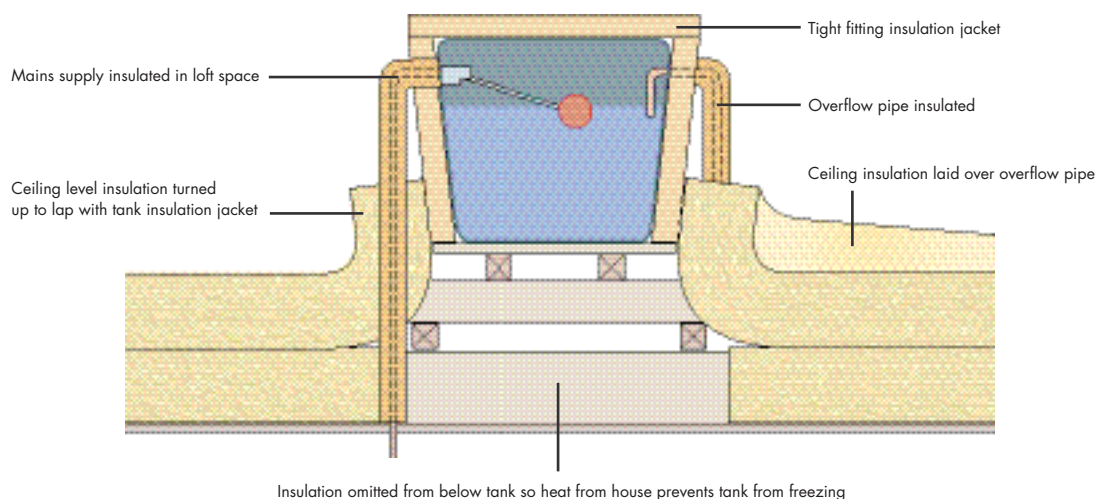
## Recessed light fittings

Where recessed light fittings are to be used, specify compact fluorescent or low voltage tungsten lamps to minimise heat build up. Locate the fittings in enclosures that provide at least 75mm clearance around the fitting for air to circulate. Seal the enclosure to prevent air leakage into the loft and, if necessary, ventilate to the room.

## Loft with storage deck

Where a boarded out storage deck is provided above the loft insulation, a check should be made to ensure that the ceiling joists are adequately sized to support the anticipated loadings.

## Cold roof – insulating the cold water tanks



# Pitched roofs – ceiling level

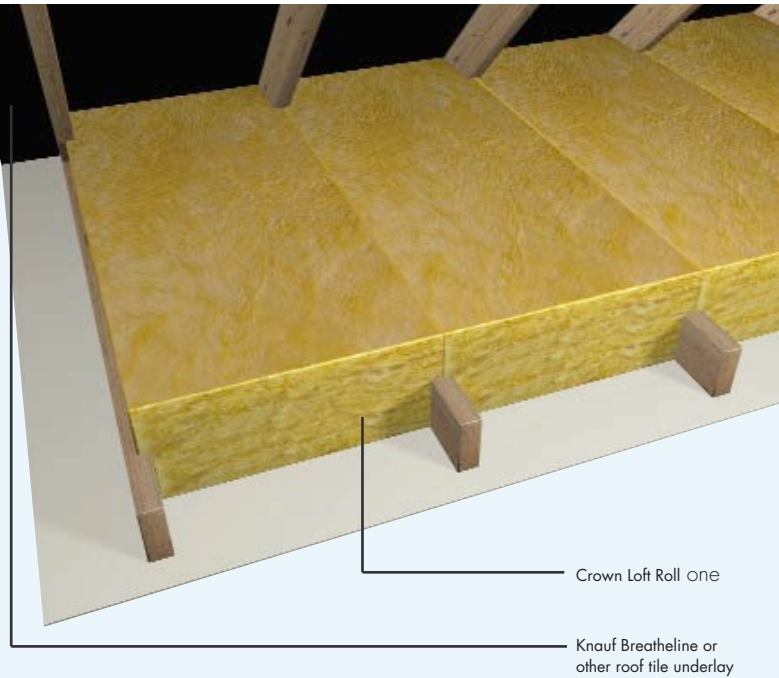
## Between and above joists one layer



Pc01

### Advantages

- ✓ Insulation installed in a single layer
- ✓ Lowest cost solution
- ✓ Familiar construction method
- ✓ Excellent thermal performance
- ✓ Enhances acoustic performance



### Products

**Crown Loft Roll ONE** is made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible. Its manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP\*

### Optional

Knauf Breatheline is a breathable membrane and Type LR roof tile underlay with a polypropylene non-woven coating on both sides – see also page 534.

\* Ecohomes and Code for Sustainable Homes classification

### Typical construction

A pitched roof of timber trussed rafters with tiles or slates on battens and roof tile underlay optionally on sarking board. Plasterboard ceiling below.

Crown Loft Roll ONE is installed in one layer between and overlapping the joists to minimise thermal bridging through the ceiling joists

### Ventilation requirements

If using Breatheline or similar third party accredited type LR roof tile underlay with a well sealed ceiling – no ventilation required

In all other circumstances ventilation at eaves and ridge required, see 'Typical details' pages 536-539 for full details.

### Installation

Crown Loft Roll ONE is laid between the joists. The insulation should be taken over the wall plate to link up with the wall insulation. All joints between the insulation to be close butted. The insulation should be pushed up tight against the roof tile underlay if no ventilation is required or tight to the eaves ventilator, taking care not to block the ventilation air path if ventilation is required.

### Performance

#### Thermal performance

Crown Loft Roll ONE has a thermal conductivity of 0.044 W/mK.

Table 1 gives U-values for typical constructions insulated with Crown Loft Roll ONE.

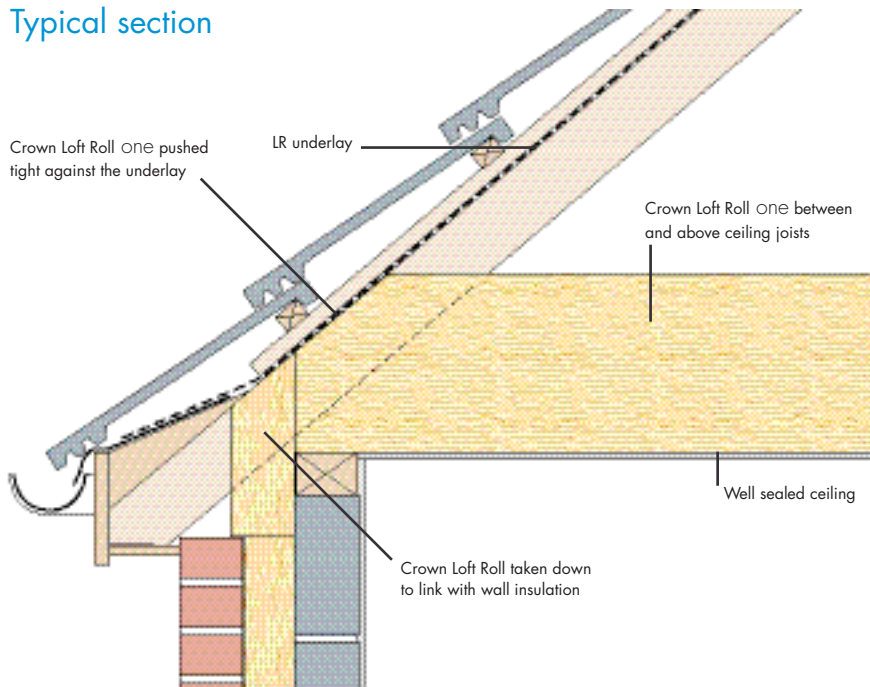
#### Fire performance

Crown Loft Roll ONE is classified as Euroclass A1 to BS EN ISO 13501-1.

#### Airtightness

Where enhanced airtightness performance is required the designer should consider the specification of a separate and fully sealed air leakage barrier to the underside of the ceiling joists, i.e. a 500 gauge polyethylene sheet.

## Typical section



## Typical specification

The whole area of the ceiling to be insulated with one layer of Crown Loft Roll ONE of total thickness 270mm.

Width of insulation to be appropriate to the joist centres. The insulation to be laid between the joists and to finish over wall plate on external walls.

All joints between the rolls of insulation to be close butted.

If an HR roof tile underlay is installed, maintain a 25mm ventilated airspace between the insulation and the sarking felt/sarking board at the eaves.

Do not insulate under cold water tanks unless they are elevated. Cold water tanks and pipes to be separately insulated.

Loft hatch to be insulated with a minimum 100mm depth of insulation.

Alternatively, refer to NBS clauses: P10/120 and 130.

Table 1: Typical U-values of pitched roofs with ceiling level insulation

Product	Thickness (mm)	U-values
	Between and over joists	(W/m <sup>2</sup> K)
<b>Crown Loft Roll ONE</b>	270	0.16

\* Joist sizes assumed to be 100 x 48mm at 600mm centres (8% bridging plus 1% for cross noggings). The U-value has been calculated in accordance with BS EN ISO 6946:1997.

# Pitched roofs – ceiling level

## Between and above joists two layers

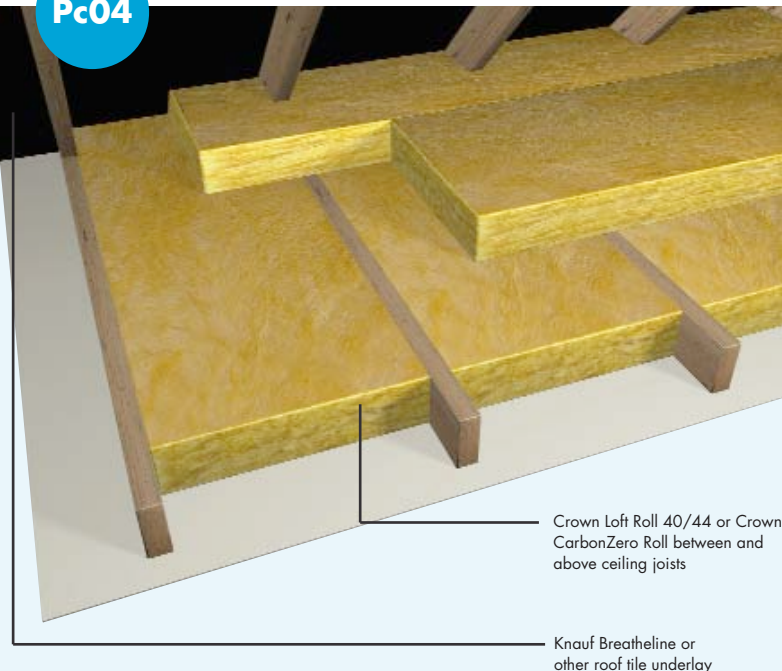


### Advantages

- ✓ Lowest cost solution
- ✓ Familiar construction method
- ✓ Excellent thermal performance
- ✓ Long roll lengths
- ✓ Greater coverage per roll than all other comparable products
- ✓ Enhances acoustic performance

Pc02

Pc04



Crown Loft Roll 40/44 or Crown CarbonZero Roll between and above ceiling joists

Knauf Breatheline or other roof tile underlay

### Products

**Crown Loft Roll 44 and Crown Loft Roll 40** are made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible – their manufacture has a very low impact on the environment and are classified as Zero ODP and Zero GWP\*

**Crown CarbonZero Roll** is made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible – its manufacture has a very low impact on the environment and it is classified as Zero ODP and Zero GWP. Furthermore, the effect of the carbon emitted from the manufacture and transport of the product is balanced with financial support for carbon reduction initiatives such as renewable energy and reforestation.

### Optional

Knauf Breatheline is a breathable membrane and type LR roof tile underlay with a polypropylene non-woven coating on both sides – see also page 534.

\* Ecohomes and Code for Sustainable Homes classification

### Typical construction

A pitched roof of timber trussed rafters with tiles or slates on battens and roof tile underlay optionally on sarking board. Plasterboard ceiling below.

Crown Loft Roll 44 or 40 is installed in two layers, the first layer between the joists and the second layer across the joists. This minimises thermal bridging through the ceiling joists.

### Ventilation requirements

If using Breatheline or similar third party accredited type LR roof tile underlay with a well sealed ceiling – no ventilation required.

In all other circumstances ventilation at eaves and ridge required, see 'Typical details' pages 536-539 for full details.

### Installation

The first layer of Crown Loft Roll 44 or 40 or Crown CarbonZero Roll, the same depth as the ceiling joists, is laid between the joists.

The insulation should be taken over the wall plate to link up with the wall insulation. If the roof requires ventilation this is most easily done just before the eaves ventilator is fixed, during installation of the roof tile underlay.

The second layer of Crown Loft Roll 44 or 40 or Crown CarbonZero Roll is laid at right angles to the ceiling joists, with all edges butt jointed. The insulation should be pushed up tight against the roof tile underlay if no ventilation is required or tight against the eaves ventilator, taking care not to block the ventilation air path if ventilation is required.

### Performance

#### Thermal performance

Crown Loft Roll 44 and Crown CarbonZero Roll have a thermal conductivity of 0.044 W/mK. Crown Loft Roll 40 has a thermal conductivity of 0.040 W/mK.

Table 2 gives U-values for typical constructions insulated with Crown Loft Roll 44 and Crown Loft Roll 40 or Crown CarbonZero Roll.

#### Fire performance

Crown Loft Roll 44, Crown Loft Roll 40 and Crown CarbonZero Roll are classified as Euroclass A1 to BS EN ISO 13501-1.

#### Airtightness

Where enhanced airtightness performance is required the designer should consider the specification of a separate and fully sealed air leakage barrier to the underside of the ceiling joists, i.e. a 500 gauge polyethylene sheet.

## Typical section

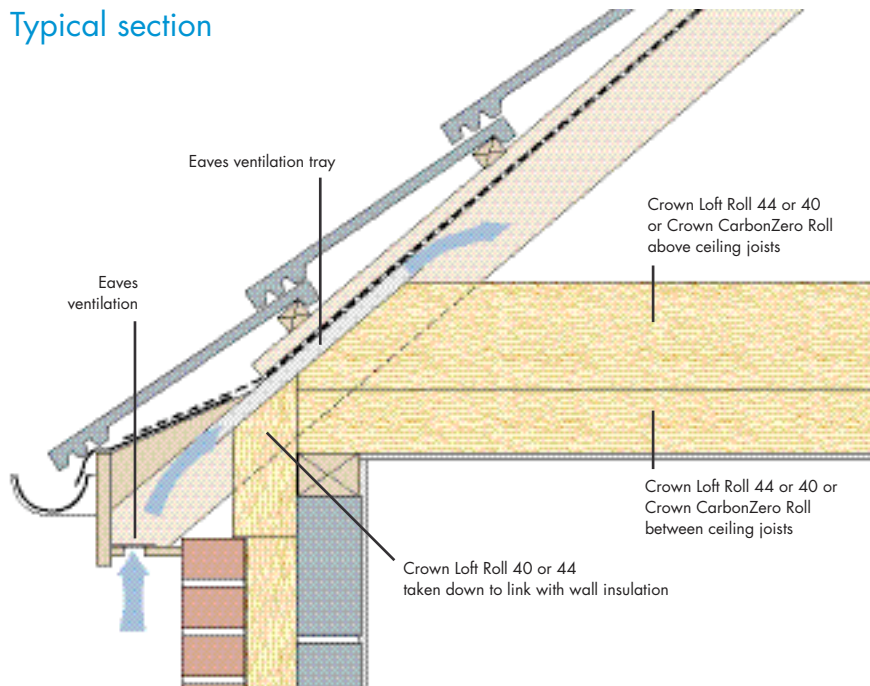


Table 2: Typical U-values of pitched roofs with ceiling level insulation

	(mm)		U-values (W/m <sup>2</sup> K)
	Between joists*	Over joists	
<b>Pc02</b> Crown Loft Roll 44	100	400 (2 x 200)	0.09
	100	300 (2 x 150)	0.11
	100	200	0.15
	100	170	0.16
	100	150	0.17
<b>Pc02</b> Crown Loft Roll 40	100	300 (2 x 150)	0.10
	100	200	0.13
	100	150	0.16
<b>Pc04</b> Crown CarbonZero Roll	100	300 (2 x 150)	0.11
	100	200	0.15
	100	170	0.16

\* Joist sizes assumed to be 100 x 48mm at 600mm centres (8% bridging plus 1% for cross noggings).  
The U-values have been calculated in accordance with BS EN ISO 6946:1997.

### Crown CarbonZero Roll

Crown CarbonZero Roll is the first "carbon neutral" loft insulation product available in the UK. Although glasswool is already a highly sustainable product, we balance the effect of the carbon emitted from the manufacture and transport of the product with financial support

for carbon reduction initiatives such as renewable energy and reforestation. Crown CarbonZero Roll is intended to be used on high profile "Eco-Projects" for which "Low Environmental Impact" is a key design consideration.

## Typical specification

The whole area of the ceiling to be insulated with two layers of Crown Loft Roll 40\*/44\*/Crown CarbonZero Roll\* of total thickness .....mm.

(\*Delete as appropriate)

Width of first layer of insulation to be appropriate to the joist spacings and of a thickness equal to joist depth. The insulation to be laid between the joists and to finish over wall plate on external walls.

The second layer to be laid at right angles to the first layer. All joints between the rolls of insulation to be close butted.

If an HR roof tile underlay is installed maintain a 25mm ventilated airspace between the insulation and the sarking felt/sarking board at the eaves.

Do not insulate under cold water tanks unless they are elevated. Cold water tanks and pipes to be separately insulated.

Loft hatch to be insulated with a minimum 100mm depth of insulation.

Alternatively, refer to NBS clauses: P10/120 and 130.



# Pitched roofs – ceiling level

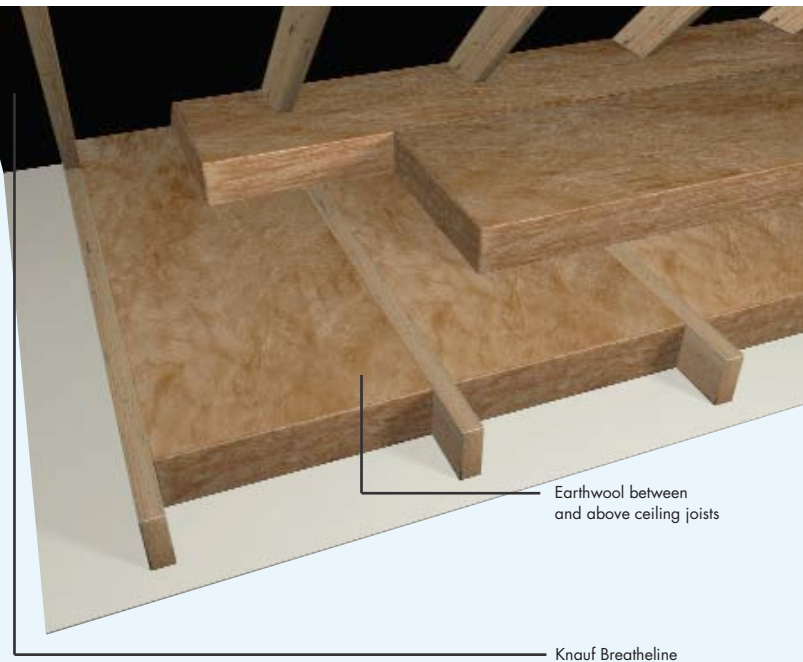
Between and above joists two layers – ultra eco-friendly



Pc03

## Advantages

- ✓ Excellent thermal performance
- ✓ Long roll lengths
- ✓ Greater coverage per roll than all other comparable products
- ✓ Enhances acoustic performance



## Products

**Earthwool** is made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible - its manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP\*

### Optional

Knauf Breatheline is a breathable membrane and type LR roof tile underlay with a polypropylene non-woven coating on both sides – see also page 534.

\* Ecohomes and Code for Sustainable Homes classification

### Typical construction

A pitched roof of timber trussed rafters with tiles or slates on battens and roof tile underlay optionally on sarking board. Plasterboard ceiling below.

Earthwool is installed in two layers, the first layer between the joists and the second layer across the joists. This minimises thermal bridging through the ceiling joists.

## Ventilation requirements

If using Breatheline or similar third party accredited type LR roof tile underlay with a well sealed ceiling – no ventilation required.

In all other circumstances ventilation at eaves and ridge required, see 'Typical details' pages 536-539 for full details.

### Installation

The first layer of Earthwool, the same depth as the ceiling joists, is laid between the joists. The insulation should be taken over the wall plate to link up with the wall insulation. If the roof requires ventilation this is most easily done just before the eaves ventilator is fixed, during installation of the roof tile underlay.

The second layer of Earthwool is laid at right angles to the ceiling joists, with all edges butt jointed. The insulation should be pushed up tight against the roof tile underlay if no ventilation is required or tight against the eaves ventilator, taking care not to block the ventilation air path if ventilation is required.

## Performance

### Thermal performance

Earthwool has a thermal conductivity of 0.040 W/mK Table 3 gives U-values for typical constructions insulated with Earthwool.

### Fire performance

Earthwool is classified as Euroclass A1 to BS EN ISO 13501-1.

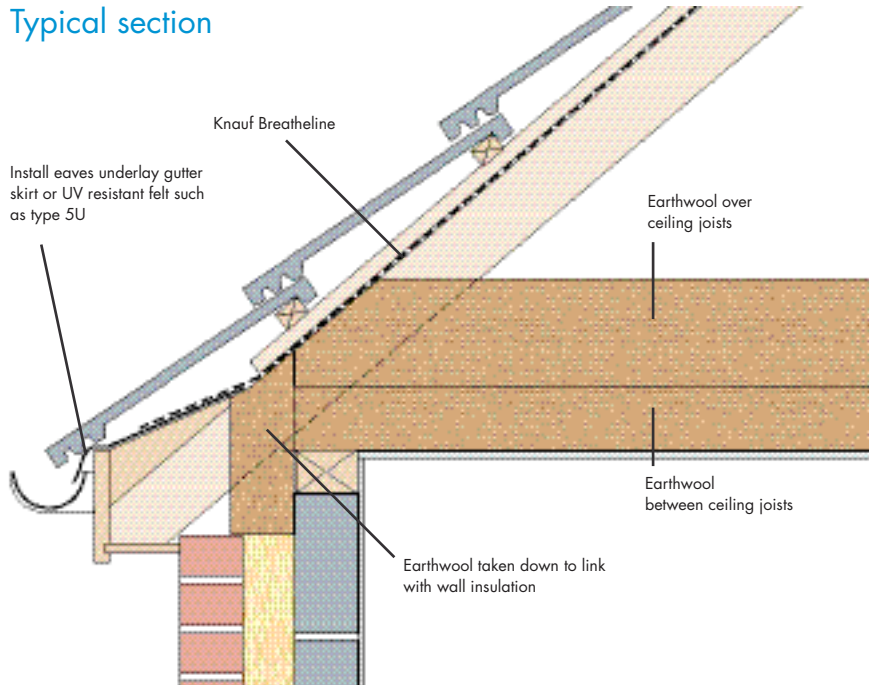
### Vapour resistance

Knauf Breatheline has a vapour resistance of 0.22 MN.s/g

### Airtightness

Where enhanced airtightness performance is required the designer should consider the specification of a separate and fully sealed air leakage barrier to the underside of the ceiling joists, i.e. a 500 gauge polyethylene sheet.

Typical section



Typical specification

The whole area of the ceiling to be insulated with two layers of Earthwool of total thickness .....mm. Width of first layer of insulation to be appropriate to the joist spacings and of a thickness equal to joist depth. The insulation to be laid between the joists and to finish over wall plate on external walls and pushed up tight to Knauf Breatheline.

The second layer of Earthwool to be laid at right angles to the first layer.

All joints between the rolls of insulation to be close butted.

If an HR roof tile underlay is installed maintain a 25mm ventilated airspace between the insulation and the sarking felt/sarking board at the eaves.

Do not insulate under cold water tanks, unless they are elevated. Cold water tanks and pipes to be separately insulated.

Loft hatch to be insulated with a minimum 100mm depth of insulation.

Alternatively, refer to NBS clauses: P10/120, 130 and 320



Table 3: Typical U-values of pitched roofs with ceiling level insulation

Product	Thickness (mm)		U-values (W/m <sup>2</sup> K)
	Between joists*	Over joists	
<b>Earthwool</b>	100	200	0.13

\* Joist sizes assumed to be 100 x 48mm at 600mm centres (8% bridging plus 1% for cross noggings). The U-values have been calculated in accordance with BS EN ISO 6946:1997.

# Pitched roofs – ceiling level

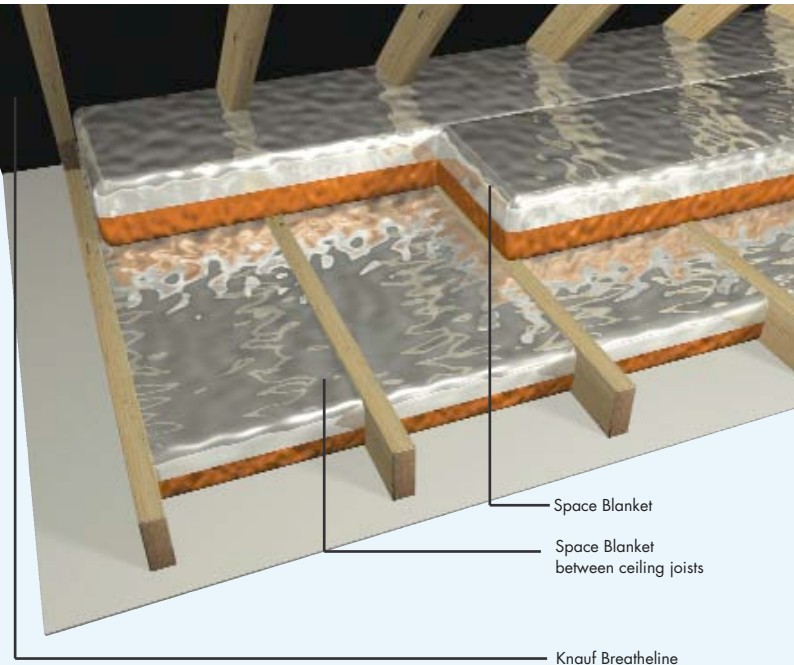
## Between and above joists two layers encapsulated



Pc05

### Advantages

- ✓ Clean and easy to install
- ✓ Excellent thermal performance
- ✓ Low cost solution
- ✓ Long roll lengths
- ✓ Enhances acoustic performance



### Products

**Space Blanket** is made from glass mineral wool and formed into rolls which are encapsulated in a lightweight part metalised polythene film. It is lightweight, flexible, resilient and non-combustible - its manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP\*

### Optional

Knauf Breatheline is a breathable membrane and type LR roof tile underlay with a polypropylene non-woven coating on both sides – see also page 534.

\* Ecohomes and Code for Sustainable Homes classification

### Typical construction

A pitched roof of timber trussed rafters with tiles or slates on battens and roof tile underlay optionally on sarking board. Plasterboard ceiling below.

Space Blanket is installed in two layers, the first layer between the joists and the second layer across the joists. This minimises thermal bridging through the ceiling joists.

### Ventilation Requirements

If using Breatheline or similar third party accredited type LR roof tile underlay with a well sealed ceiling – no ventilation required.

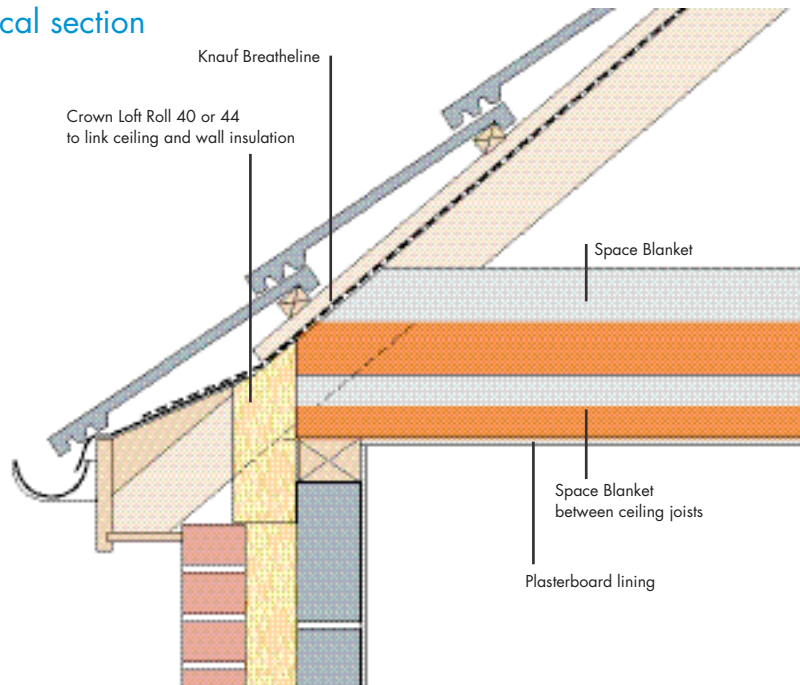
In all other circumstances ventilation at eaves and ridge required, see 'Typical details' pages 536-539 for full details.

### Installation

The first layer of Space Blanket, the same depth as the ceiling joists, is laid between the joists. The insulation should be taken over the wall plate to link up with the wall insulation. If the roof requires ventilation this is most easily done just before the eaves ventilator is fixed, during installation of the roof tile underlay.

The second layer of Space Blanket is laid at right angles to the ceiling joists, with all edges butt jointed. The insulation should be pushed up tight against the roof tile underlay if no ventilation is required or tight against the eaves ventilator, taking care not to block the ventilation air path if ventilation is required.

## Typical section



## Performance

### Thermal performance

Space Blanket has a thermal conductivity of 0.044 W/mK. Table 4 gives U-values for typical constructions insulated with Space Blanket.

### Fire performance

The mineral wool content of Space Blanket is a non-combustible, inorganic glasswool, and is Euroclass A1 to BS EN 13501-1. Because the product is encapsulated in polythene the classification for Space Blanket is Euroclass F.

### Vapour resistance

Knauf Breatheline has a vapour resistance of 0.22 MN.s/g.

### Airtightness

Where enhanced airtightness performance is required the designer should consider the specification of a separate and fully sealed air leakage barrier to the underside of the ceiling joists, i.e. a 500 gauge polyethylene sheet.

## Typical specification

The whole area of the ceiling to be insulated with two layers of Space Blanket of total thickness .....mm.

Width of first layer of insulation to be appropriate to the joist spacings and of a thickness equal to joist depth, laid between the joists.

The second layer to be laid at right angles to the first layer. All joints between the rolls of insulation to be close butted.

If an HR roof tile underlay is installed maintain a 25mm ventilated airspace between the insulation and the sarking felt/sarking board at the eaves.

Do not insulate under cold water tanks unless they are elevated. Cold water tanks and pipes to be separately insulated.

Loft hatch to be insulated with a minimum 100mm depth of insulation.



Alternatively, refer to NBS clauses: P10/120 and 130.

Table 4: Typical U-values of pitched roofs with ceiling level insulation

Product	Thickness (mm)		U-values (W/m <sup>2</sup> K)
	Between joists*	Over joists	
Space Blanket	100	200	0.15
	100	150	0.18

\* Joist sizes assumed to be 100 x 48mm at 400mm centres (12% bridging plus 1% for cross noggings).  
The U-values have been calculated in accordance with BS EN ISO 6946:1997.

# Pitched roofs – ceiling level

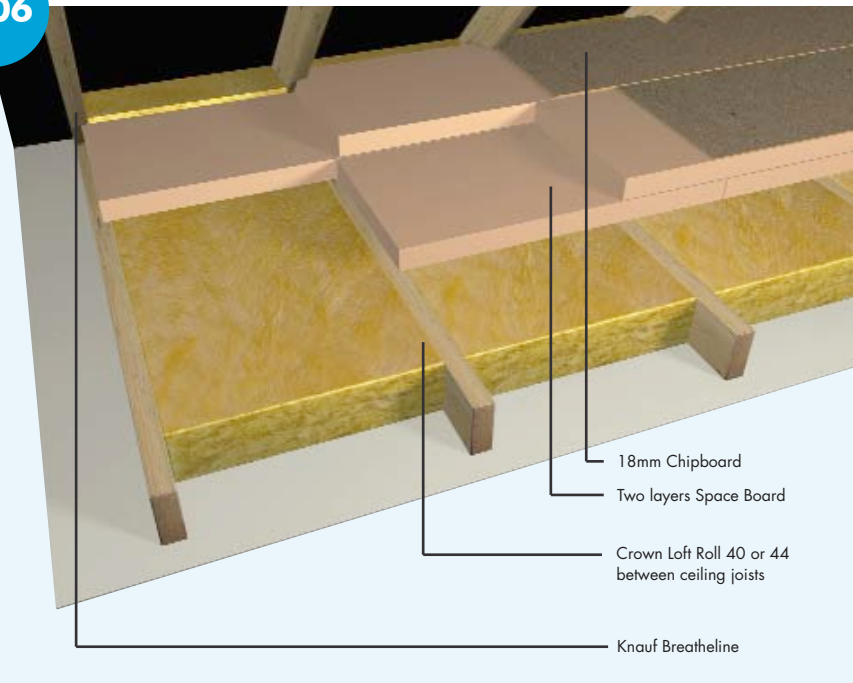
## Between and above joists with a storage deck



Pc06

### Advantages

- ✓ Turns unusable space into storage space
- ✓ Good thermal performance
- ✓ Clean attic
- ✓ Simple installation



### Products

**Space Board** is a 100% ozone friendly, extruded polystyrene, rigid board insulation.

**Crown Loft Roll 40** and **44** are made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible. Their manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP\*

**Optionally Knauf Breatheline** is a breathable membrane with a polypropylene non-woven coating on both sides – see also page 534.

\* Ecohomes and Code for Sustainable Homes classification

### Typical construction

A pitched roof of timber trussed rafters with tiles or slates on battens and counter battens on Knauf Breatheline, optionally on sarking board. Unventilated loft space and plasterboard ceiling.

Crown Loft Roll 40 or 44 is installed between the joists and Space Board over the joists and overlaid with chipboard, to form a boarded deck for storage in the loft.

If using Breatheline or similar third party accredited type LR roof tile underlay with a well sealed ceiling – no ventilation required.

In all other circumstances ventilation at eaves and ridge required, see 'Typical details' pages 536-539 for full details.

### Installation

Ensure joists are capable of accepting any expected extra load due to storage. If any part of the loft space to be boarded is above a high humidity area, ensure a vapour control layer is installed on the warm side of the insulation (i.e. the underside of the ceiling joists).

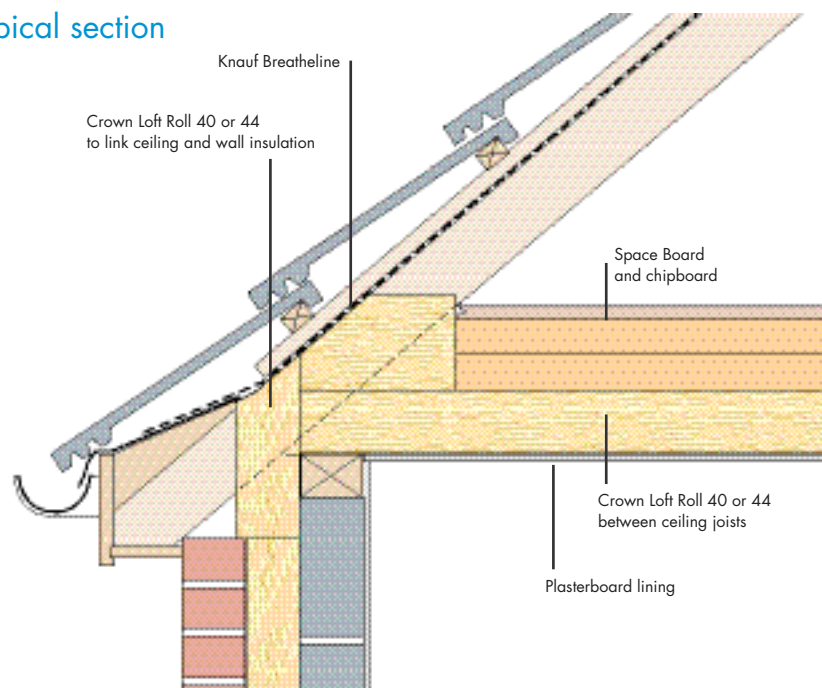
Lay Crown Loft Roll 40 or 44 between the ceiling joists. Take the insulation over the wall plate to link up with the wall insulation. Place short lengths of Crown Loft Roll 40 or 44 between the rafters at eaves level to provide continuity of insulation with the Space Board. Space Board is fixed to the joists using a solvent-free adhesive. Run a 10mm – 15mm bead of adhesive along the joist and then lay Polyfoam Space Board at right angles to the ceiling joists, applying pressure to each board as it is laid to ensure good adhesion between the board and the joist.

Lay long edge of Space Board parallel with the eaves, glue all joints to ensure a flat, secure deck.

Electrical cables should be located above the new deck. Where this is not practical, cables that are in contact with the extruded polystyrene insulation should either be enclosed in a cable housing/conduit or wrapped in aluminium foil faced tape, to prevent direct long term contact. For recessed light fittings ensure there is a minimum 75mm clear space around the fitting. Glue all tongue and groove joints in the chipboard deck.

Mark any runs of pipework on the surface for later reference and cut inspection hatches at junctions where required.

## Typical section



## Performance

### Thermal performance

Space Board has a thermal conductivity of 0.029 W/mK.

Crown Loft Roll 40 has a thermal conductivity of 0.040 W/mK.

Crown Loft Roll 44 has a thermal conductivity of 0.044 W/mK.

Table 5 gives U-values for typical constructions.

### Compression resistance

Whilst ceiling joists are not designed to carry large loads, Space Board is capable of withstanding the applied point loading of the ceiling joists when loaded with storage items. Moreover, the chipboard is capable of withstanding the expected loads.

Care should be taken to ensure that additional loads do not exceed the loading capability of the ceiling joists. If in doubt, consult a suitably qualified person.

Space Board is highly resistant to compression and withstands the long term static loads imparted in loft storage.

### Fire performance

Space Board contains a fire retardant additive. When installed in a roof construction it will not contribute to the development stages of a fire. Ensure the boards are not stored or installed close to open flame or other ignition sources, also avoiding volatile compounds and chemicals such as solvents.

Crown Loft Roll 40 and 44 are classified as Euroclass A1 to BS EN ISO 13501-1.

## Typical specification

The whole area of the ceiling to be insulated with Crown Loft Roll 40\*/44\*. Width of Crown Loft Roll to be appropriate to the joist spacings and of a thickness equal to joist depth. The insulation to be laid between the joists and to finish over wall plate on external walls and pushed up tight to Knauf Breatheline.

(\*Delete as appropriate)

Space Board, thickness .....mm to be laid over the Crown Loft Roll 40/44 long side parallel

to the eaves. Begin by running a bead of solvent-free adhesive along the joists and then lay the boards.

All chipboard joints to be glued.

Any gaps between the edge of the Space Board and the Knauf Breatheline to be filled with Crown Loft Roll 40/44.

If an HR roof tile underlay is installed maintain, a 25mm ventilated airspace between the insulation and the sarking felt/sarking board at the eaves.



Alternatively, refer to BS clauses: P10/120, 130 and 320

Table 5: U-value for pitched roofs insulated with Space Board with Crown Loft Roll 40/44 insulation between ceiling joists

Crown Loft Roll 44 between joists	Space Board	U-value
Thickness (mm)	Insulation/chipboard thickness (mm)	(W/m <sup>2</sup> K)
100	123(2 x 52.5 + 18)	0.16

Note: Ceiling joists assumed to be 100mm x 48mm wide at 600 centres (8% bridging plus 1% for cross noggin) and the same depth as the Crown Loft Roll 40/44 insulation. The U-values have been calculated in accordance with BS EN ISO 6946: 1997.

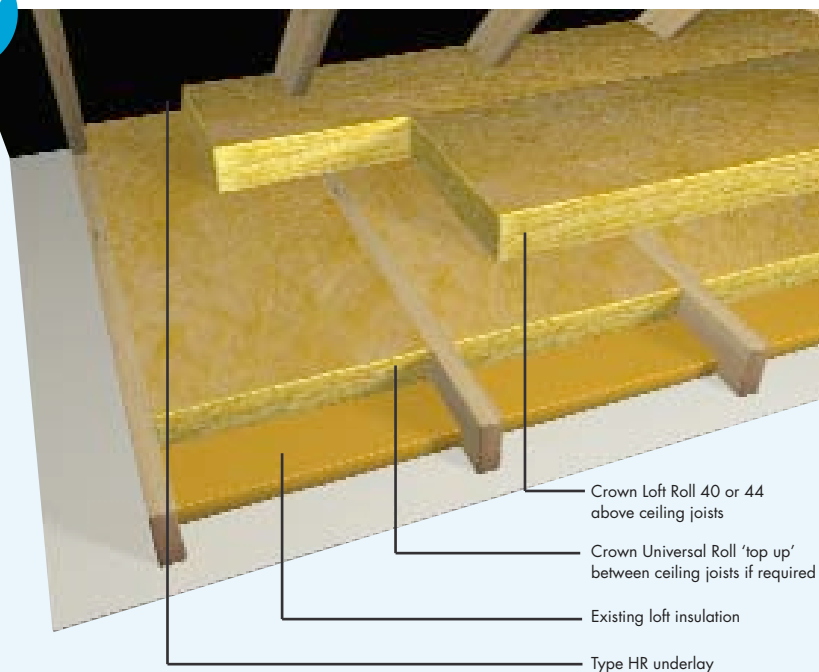
# Pitched roofs – ceiling level

## Between and above joists – top up

Pc07

### Advantages

- ✓ Lowest cost method of upgrading thermal performance
- ✓ Simple installation process
- ✓ Long roll lengths
- ✓ Greater coverage per roll than all other comparable products
- ✓ Enhances acoustic performance



### Products

**Crown Loft Roll 40** and **44** are made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible. Their manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP\*

**Crown Universal Roll** is made from glass mineral wool and formed into rolls which are lightweight, flexible, resilient and non-combustible – its manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP\*

\* Ecohomes and Code for Sustainable Homes classification

### Typical construction

A pitched roof with existing loft insulation and an HR underlay. Earlier Building Regulation requirements were achieved with 25, 50, 80, 100 and 150mm thickness of loft insulation. All these thicknesses may be found in existing properties.

To comply with 2006 Building Regulations, an overall insulation thickness of at least 270mm is recommended when upgrading the thermal insulation of an existing roof.

Ventilation should be provided as set out in 'Typical details' pages 536-539 for full details.

### Installation

In most pitched roofs, any existing insulation is likely to be between the ceiling joists. Where the existing insulation reaches the top of the joists, Crown Loft Roll 40 and 44 can simply be laid over the existing joists and insulation.

Where the existing insulation is below the joist height, top-up the insulation so it reaches the top of the joists, and then add a further 170, 200 or 300mm thickness over the joists.

Take care not to block the eaves ventilation. If the new insulation covers the top of the eaves ventilators, install new extended ventilators before installing the insulation.

Seal any gaps or holes in the ceiling to the loft to limit air leakage into the loft from the dwelling. This is particularly important to the ceiling above the bathroom. The loft hatch should also have draught seals fitted.

If upgrading a roof with a LR underlay, refer also to pages 536-539 for eaves details.

### Performance

#### Thermal performance

Crown Loft Roll 40 has a thermal conductivity of 0.040 W/mK.

Crown Loft Roll 44 has a thermal conductivity of 0.044 W/mK.

Crown Universal Roll has a thermal conductivity of 0.044 W/mK.

Table 6 gives U-values for typical constructions insulated with Crown Loft Roll 40/44/Crown Universal Roll.

#### Fire performance

Crown Loft Roll 40 and 44 and Crown Universal Roll are classified as Euroclass A1 to BS EN ISO 13501-1.

## Typical section

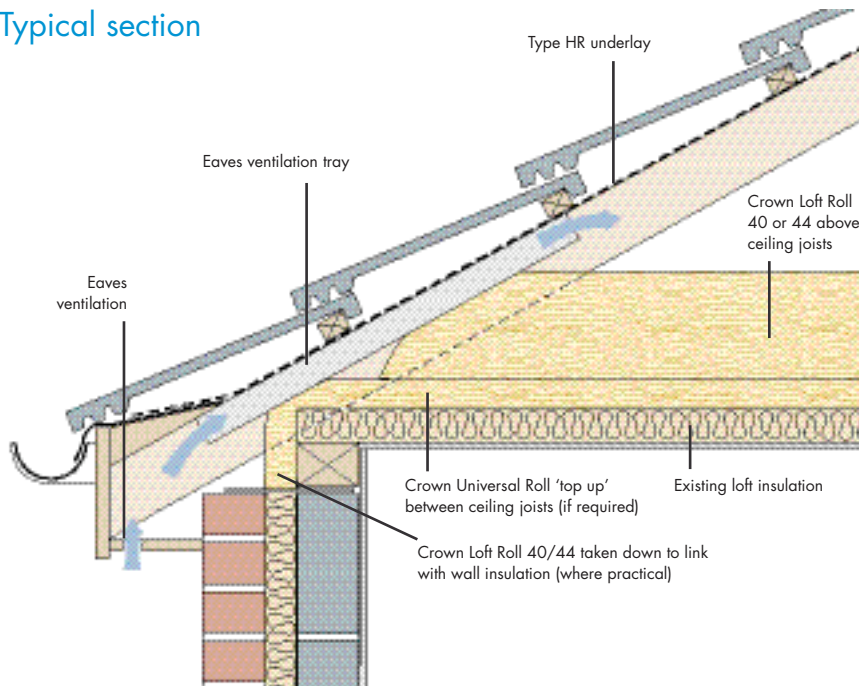


Table 6: Typical U-values for upgrading existing ceiling level insulation

Existing insulation thickness	Additional Crown Loft Roll 44 insulation		U-values (W/m <sup>2</sup> K)
	Between joists thickness (mm)	Over joists thickness (mm)	With or without sarking board
25	80*	170	0.16
50	60*	170	0.16
100	none	170	0.16
100	none	200	0.14
100	none	300 (2x150)	0.11

Joist sizes assumed to be 100 x 48mm at 600mm centres (8% bridging plus 1% for cross noggings).

The U-values have been calculated in accordance with BS EN ISO 6946:1997.

\*60mm and 80mm is Crown Universal Roll.

## Typical specification

The two alternative specifications:

### a) Between joists (where applicable)

The whole area of the existing ceiling to be insulated with Crown Loft Roll 40\*/44\*, thickness .....mm. Insulation of width appropriate to the joist spacings to be laid over the existing loft insulation and dressed over wall plate. Existing insulation to be topped up with Crown Universal Roll, thickness.....mm.

(\*Delete as appropriate)

### b) Across the joists

The whole area of the existing ceiling to be insulated with Crown Loft Roll 40\*/44\*, thickness .....mm. To be laid over the joists, with all lateral joints close butted.

(\*Delete as appropriate)

For both methods all end joints to be close butted. If an HR roof tile underlay is installed, maintain a 25mm ventilated airspace between the insulation and the sarking felt/sarking board at the eaves.

Do not insulate under cold water tanks. Cold water tanks and pipes to be separately insulated.

Loft hatch to be insulated with a minimum 100mm depth of insulation.



Alternatively, refer to NBS clauses: P10/120 and 130

# KNAUFINSULATION



Ref: KB53508

August 2008: Issue 1

[www.knaufinsulation.co.uk](http://www.knaufinsulation.co.uk)

[www.thinkinsulation.com](http://www.thinkinsulation.com)



**thinkinsulation.com**  
*it's time to save energy*

Knauf Insulation Ltd.  
PO Box 10  
Stafford Road  
St Helens  
Merseyside  
WA10 3NS

Customer Service (Sales)  
Tel: 0844 800 0135  
Fax: 01744 612 007  
email: [sales@knaufinsulation.com](mailto:sales@knaufinsulation.com)

Technical Advisory Centre (TAC)  
Tel: 01744 766666  
Fax: 01744 766667  
email: [tech@knaufinsulation.com](mailto:tech@knaufinsulation.com)

Literature  
Tel: 08700 668 660  
Fax: 0870 400 5797  
email: [info@knaufinsulation.com](mailto:info@knaufinsulation.com)