Ballytherm Ltd

CI/SfB (23.4) Rn7 (M2)

JUNE 2013

POLYISOCYANURATE INSULATION BOARD

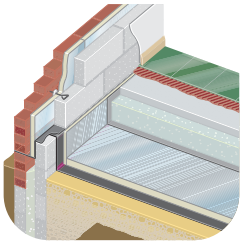
energy saving for the future

Introduction
Ballytherm Insulation

This brochure describes the use of Ballytherm Polyisocyanurate insulation to create well insulated, energy efficient buildings; it contains design guidance, design details, installation instructions and advice on sitework.

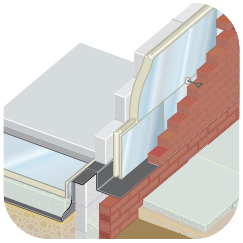
Floors 5 - 13

Ballytherm Insulation can be used in a wide variety of floor constructions including groundbearing concrete floors, suspended floors of pre-cast concrete units and suspended timber floors.



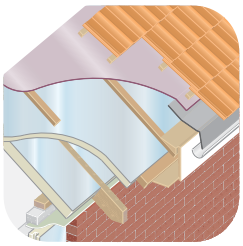
Walls 14 - 18

Ballytherm Insulation can be used in a number of wall constructions including masonry cavity walls and solid walls lined internally.



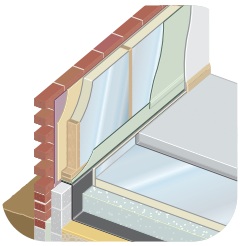
Roofs 19 - 25

Ballytherm Insulation board is ideal for forming warm pitched roofs in new build and refurbishment projects.



Timber frame 26 - 29

Ballytherm Insulation may be used to insulate timber framed buildings and is well suited to new build projects and extensions to existing buildings.



Sitework/References 30 - 31

Ballytherm Insulation may be ordered through builders' merchants or directly from Ballytherm. Call us for details of our overnight delivery service.

About Ballytherm

Ballytherm is committed to the manufacture and supply of effective insulation products to the construction industry.

Ballytherm operates from a purpose built manufacturing plant in County Cavan from where its products are distributed to the Republic of Ireland, Northern Ireland and the United Kingdom.

Ballytherm can supply insulation from stock or can produce bespoke boards to match the requirements of a specific project.

Ballytherm Insulation

Ballytherm Insulation is a foil-faced Polyisocyanurate (PIR) insulation board. The PIR board is formed by a continuous foaming process which gives the board its tight cell structure and bonds the facing to the foam. After foaming the boards are cut to size and left to cure.

Ballytherm Ltd
energy saving for the future

Introduction
Ballytherm Insulation

Technical description

Dimensions

Ballytherm Insulation boards are produced in sizes up to 2400 by 1200mm and in thicknesses from 25mm up to 150mm thick.
All Ballytherm boards are butt edged or tongued and grooved.

Appearance

Ballytherm insulation boards have a yellow foam core with laminated foil facings printed with the company logo.

Structural

Ballytherm is a strong, rigid board suitable for self-supporting applications in floors, walls and roofs. It can withstand the loadings in groundbearing floors.

Environmental

Ballytherm Insulation is produced with a zero ozone depletion blowing agent.

The Insulation boards' low thermal conductivity mean less material is required to achieve a given thermal resistance than for most other insulants. Ballytherm Insulation has a GWP (Global Warming Potential) of <5. Ballytherm Insulations Products are CFC/HCFC Free and have zero ozone depletion potential.

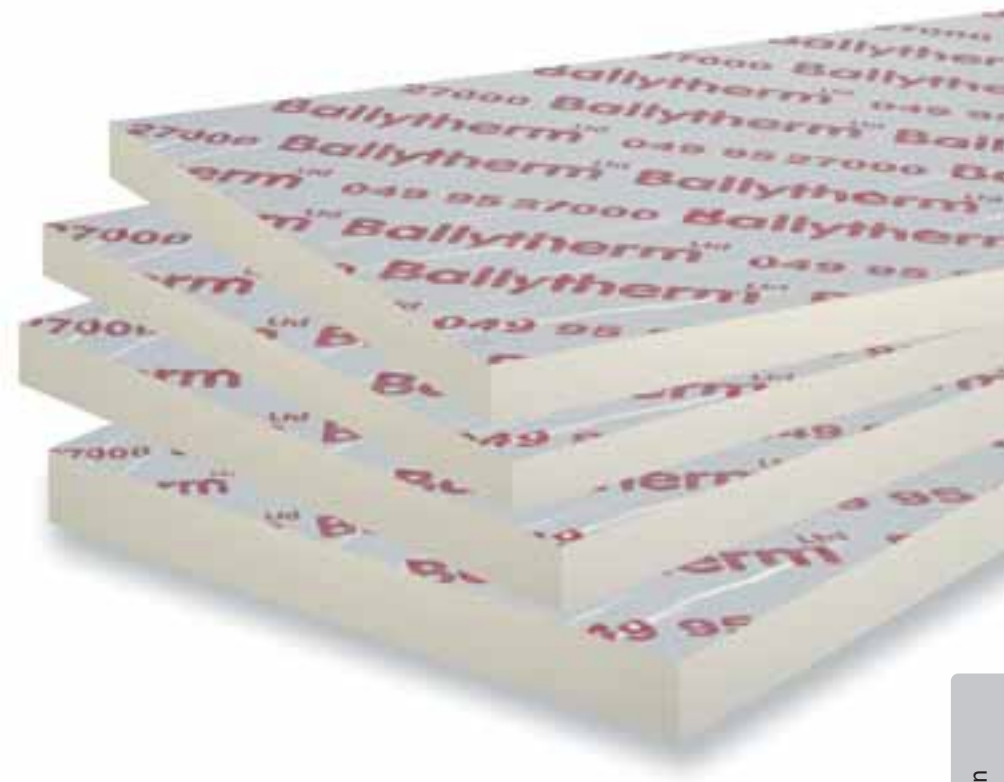
During its service life the insulation will save many times more energy than is taken to manufacture it.

Table 01 Ballytherm Insulation product dimensions

Characteristics	Units	Values
Floor & Roof Boards		
Length	mm	2400
Width	mm	1200
Thicknesses	mm	25, 30, 35, 40, 50, 60, 65, 70, 75, 80, 90, 100, 110, 120, 125, 130, 140 & 150
Cavity Wall Boards		
Length	mm	1200
Width	mm	450
Thicknesses	mm	30, 35, 40, 50, 60, 65, 70, 75, 80, 90 & 100
Edge profile		
Floor & Roof Boards		Butt edged
Cavity Wall Boards		Tongued & grooved available from 60mm up to 100mm thick.

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE Nos. 07/4422 & 07/4427

Certificate No. 05/0220



Introduction
Ballytherm Insulation

Fire

Ballytherm Insulation remains stable at temperatures up to 400ºC; at higher temperatures a protective char forms on the surface, slowing the spread of flame. Ballytherm insulation may be used safely behind non-flammable materials such as plasterboard; it has achieved a Class 1 surface spread of flame rating when tested to BS 476-7:1997.

Moisture

The PIR core of Ballytherm Insulation boards has a low moisture absorption capacity, making Ballytherm Insulation suitable for use in damp environments. The foil laminate facing gives the boards a high vapour resistance.

Biological

Ballytherm Insulation does not rot and does not contribute to the growth of mould, nor does it support insects or other pests.

Thermal

The PIR core of Ballytherm Insulation boards has an extremely low thermal conductivity, making the required thickness of insulation less than for most other insulants. The foil laminate facings of Ballytherm boards can also contribute to improved thermal performance: the low emissivity surface of the reflective foil can cut radiation heat transfer across an adjoining air space.

Durability

When Ballytherm Insulation is installed in accordance with manufacturer's guidance and industry codes of practice it has a service life comparable to that of the rest of the building.

Table 02 Performance of Ballytherm Insulation

Properties	Standards	Units	Values
Thermal conductivity Floor, Cavity Wall and Roof boards Dry lining boards (combined)	I.S. EN 12667	W/mK	 0.022 0.026
Compressive strength Floor boards Cavity wall. Dry lining and Roof boards	EN 826	kPa	 >140 CS (10\Y) 50
Dimensional stability	EN 1604		DS(TH) 6
Water absorption	EN 12087	% vol	Foil 1.2

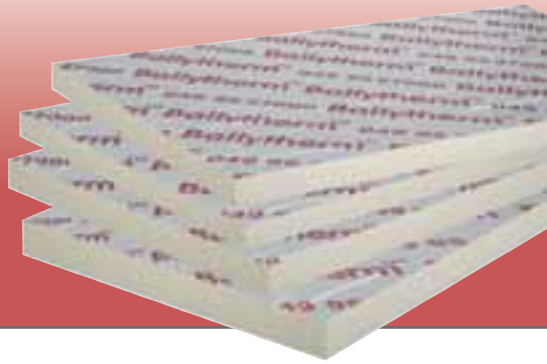
Table 03 Ballytherm Insulation pack sizes and thermal performance

Thickness	Sheets per lift	Sheets per pallet	m^2 per pallet	Thermal resistance
Floor & Roof Boards				
25mm	57	114	328.32	1.136m^2K/W
30mm	47	94	270.72	1.364m^2K/W
35mm	40	80	230.40	1.590m^2K/W
40mm	35	70	201.60	1.818m^2K/W
50mm	28	56	161.28	2.272m^2K/W
60mm	23	46	132.48	2.727m^2K/W
65mm	21	42	120.96	2.955m^2K/W
70mm	20	40	115.20	3.181m^2K/W
75mm	18	36	103.68	3.409m^2K/W
80mm	17	34	97.92	3.636m^2K/W
90mm	15	30	86.40	4.091m^2K/W
100mm	14	28	80.64	4.545m^2K/W
110mm	12	24	69.12	5.000m^2K/W
120mm	11	22	63.36	5.454m^2K/W
125mm	11	22	63.36	5.681m^2K/W
130mm	10	20	57.60	5.909m^2K/W
140mm	10	20	57.60	6.363m^2K/W
150mm	9	18	51.84	6.818m^2K/W

Thickness	Sheets per pack	Packs per pack	Sheets per pallet	m^2 per pallet	Thermal resistance
Cavity Wall Boards					
30mm	10	12	160	86.40	1.364m^2K/W
35mm	11	12	132	71.28	1.590m^2K/W
40mm	11	12	132	71.28	1.818m^2K/W
50mm	9	12	108	58.32	2.272m^2K/W
60mm	7	12	84	45.36	2.727m^2K/W
65mm	7	12	84	45.36	2.955m^2K/W
70mm	6	12	72	38.88	3.181m^2K/W
75mm	6	12	72	38.88	3.409m^2K/W
80mm	5	12	60	32.40	3.636m^2K/W
90mm	4	12	48	25.92	4.091m^2K/W
100mm	4	12	48	25.92	4.545m^2K/W

Other sizes available on request.

Floors
General considerations



Introduction

Ballytherm Insulation can be used in a wide variety of floor constructions including groundbearing concrete floors, suspended floors of pre-cast concrete units and suspended timber floors.

Loading

Floor insulation must be able to withstand the deadload of the floor construction and the imposed loads resulting from occupation of the building. Ballytherm has a sufficiently high compressive strength for it to be used in domestic projects.

Consult Ballytherm for advice on using the material in projects with more demanding loadings.

Thermal bridging

Improved standards of thermal insulation within building elements have focussed attention upon the amount of heat lost at junctions between elements where there is no continuity of insulation or there are exposed heat paths.
The simplest method to avoid thermal bridging at the floor/wall junction is be to ensure the insulation in the two elements meet. Where structural considerations make that impossible, for example when the wall insulation is inside a cavity, thermal bridging may be avoided by continuing the floor insulation vertically at the perimeter of the floor so it overlaps the wall insulation. The minimum thickness of Ballytherm boards for edge insulation is 20mm. It is sometimes more convenient to use the same board thickness as specified for the rest of the floor.

Thermal performance

U-values for ground floors are calculated according to EN ISO 13770: 2007. Because the ground has an innate thermal resistance the overall thermal performance of the floor depends upon the floor's dimensions and form factor, represented by the ratio P/A (the floor perimeter, P, divided by the floor area, A) as well as the insulation and other layers in the construction.

The thickness of Ballytherm Insulation required to meet the U-values required by regulations is shown in tables 04 to 07. To use the tables, calculate the ratio P/A and consult the appropriate column in the table. Contact Ballytherm for U-value calculations for other floor constructions.

Building Regulations and Standards

Building Regulations and Building Standards set targets for the overall energy efficiency of buildings, as well as setting limiting U-values for building elements.

The U-value tables in this brochure indicate the maximum area-weighted U-values permitted by local regulations. However, it may be necessary to achieve U-values lower than those shown, in order to attain the whole-building energy efficiency target.

Radon protection

Radon is a naturally occurring gas which is generated during the radioactive decay of uranium to lead. High concentrations of radon can cause cancer.

For the most part radon percolating to the surface disperses harmlessly in the atmosphere; however, radon generated beneath buildings can seep in through gaps and cracks in the structure and build-up to dangerous concentrations. To protect building occupants from risk of harm, buildings in at-risk areas must include radon protection measures*. The minimum measure will be the provision of a radon barrier across the entire footprint of the building.

The detailing of the barrier will depend upon the floor construction, but in many cases one membrane can act as damp-proof membrane (DPM) and radon barrier. Difficulties can arise at external walls, where the radon barrier has to be carried across a cavity: one solution is to seal the radon barrier to a gas-proof damp-proof course (DPC) which is stepped down from the inner to outer leaf.

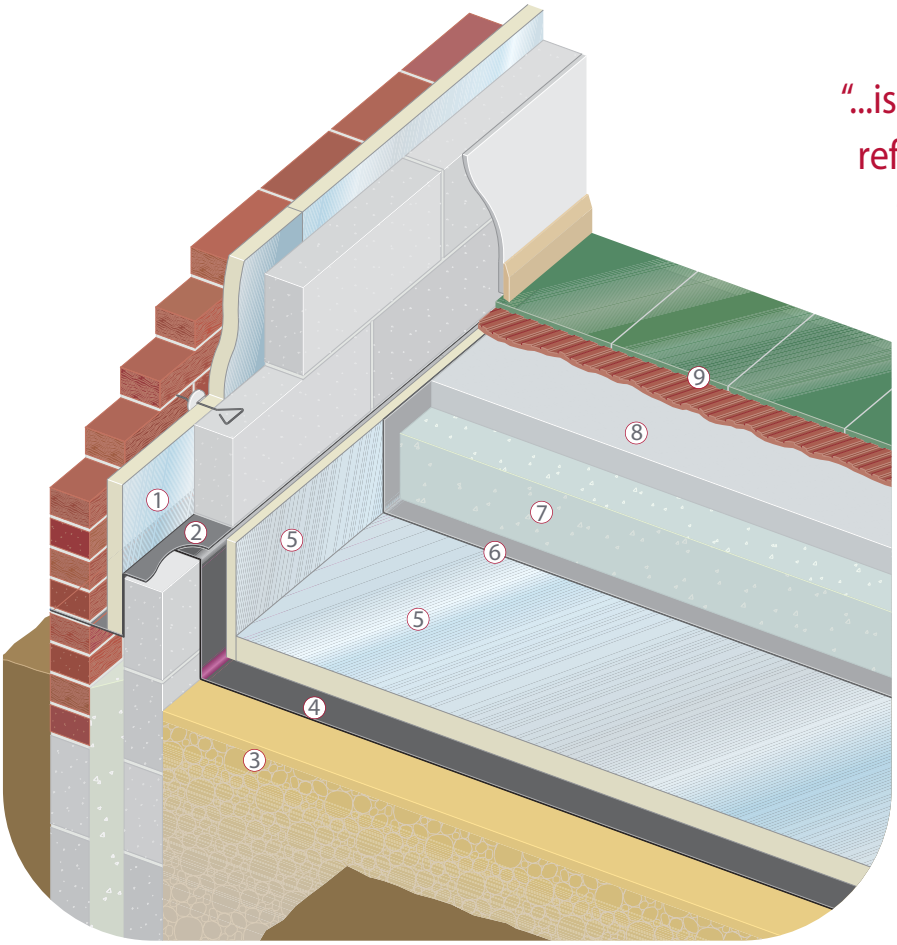
For details of radon protection measures refer to:

- BR 211. Radon: guidance on protective measures for new buildings. 2007.
- Radon in the workplace. A guide for building owners and managers. 2011.
- HomeBond House Building Manual. 7th edition.

* In the Republic of Ireland all new dwellings must include a radon barrier. In England and Wales, Scotland and Northern Ireland radon protection measures are required in areas assessed as high risk.

Floors

Insulating below a groundbearing slab



"...is well suited to new build and refurbishment projects where a timber floor is to be replaced by a concrete floor..."

1. Ballytherm wall insulation boards
2. Cavity tray
3. Hardcore with sand binding
4. DPM / radon barrier
5. Ballytherm floor Insulation boards
6. VCL / slip sheet
7. Concrete slab
8. Screed
9. Floor tiles on adhesive / mortar

Insulating below a groundbearing slab

Figure 01

Insulating a groundbearing floor below the slab brings the thermal mass of the slab within the insulation envelope, helping to maintain the building at an even temperature: the construction is suited to buildings which are continuously heated.

This construction is compatible with masonry wall constructions and underfloor heating. Below slab insulation is well suited to new build and to refurbishment projects where a timber floor is to be replaced by a concrete floor.

The properties of Ballytherm insulation match those required for this application: it is robust and moisture resistant, whilst its low thermal conductivity minimises the thickness of insulation within the floor construction.

The thickness of Ballytherm insulation required to meet regulations may be determined from table 04.

Table 04 Thickness (mm) of Ballytherm required for insulating below a groundbearing slab

U-value	P/A	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.16	-	25	60	75	90	100	100	100	-	-	-
0.18	-	25	45	65	75	80	90	90	90	90	90
0.20	Scotland	0	35	55	60	65	70	75	75	80	80
0.21	Republic of Ireland	0	30	50	55	65	65	70	70	75	75
0.25	Northern Ireland / England & Wales	0	25	30	40	45	50	55	55	55	60

U-values (W/m²K) calculated according to ISO 6946:2007 and ISO 13770: 2007.

Floor construction: Ballytherm Insulation below 150mm concrete slab with 25mm thick edge insulation, extending 150mm vertically.

Design guidance

The Ballytherm boards should be laid on top of the DPM / radon barrier to protect the boards from ground moisture and contaminants.

The DPM should be laid on sand blinding to prevent puncturing and joined to the DPC at all edges. Any radon barrier should be laid beneath the slab and should extend across the whole footprint of the building. A correctly specified membrane can function as DPM and radon barrier.

A VCL, such as 1000 gauge polyethylene, is recommended between the insulation and the slab to prevent condensation at the interface and to stop concrete penetrating between the insulation boards.

Edge insulation at least 20mm thick should be installed around the perimeter of the floor to eliminate thermal bridging at the edge of the slab (see figures 02 & 04). The depth of the edge insulation should be equal to the combined thickness of the insulation, slab and screed.

Loadbearing partitions must not be built off the slab, but must have their own foundations.

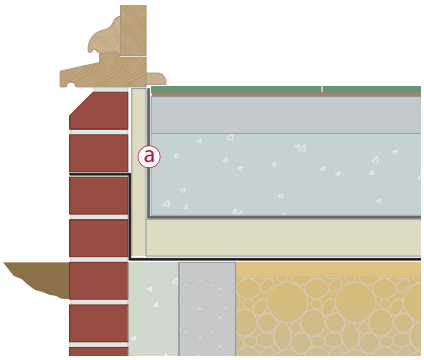
Sitework

Installation sequence

1. Blind the hardcore with sand to give a smooth surface.
2. Install the DPM / radon barrier.
3. Cut Ballytherm boards to height and fit vertically around the perimeter of the floor.
4. Lay boards across the floor surface in broken bond. Butt boards tightly together and cut to fit neatly at edges and around penetrations.
5. Lay VCL: lap and seal all joints.
6. Pour and tamp slab.
7. Pour screed.

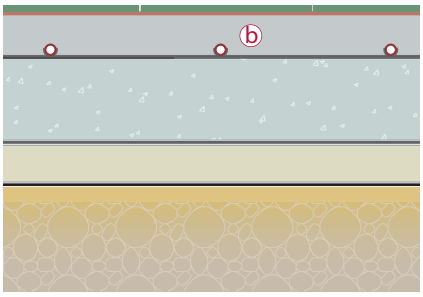
Points to watch

- Test any embedded services before pouring the slab,
- Protect Ballytherm boards from damage while the slab and screed are being poured: use barrow boards.
- Protect the exposed edge of the Ballytherm boards when levelling the slab.
- Cut boards to fit tightly together.



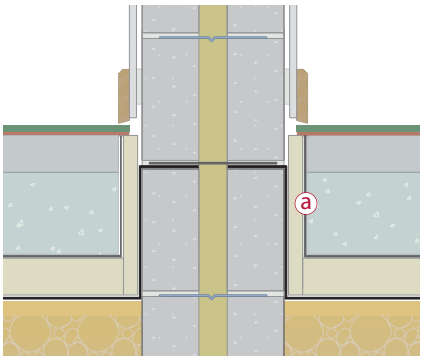
Avoiding thermal bridges at threshold

Figure 02



Screed incorporating floor heating elements

Figure 03



Avoiding thermal bridges at party walls

Figure 04

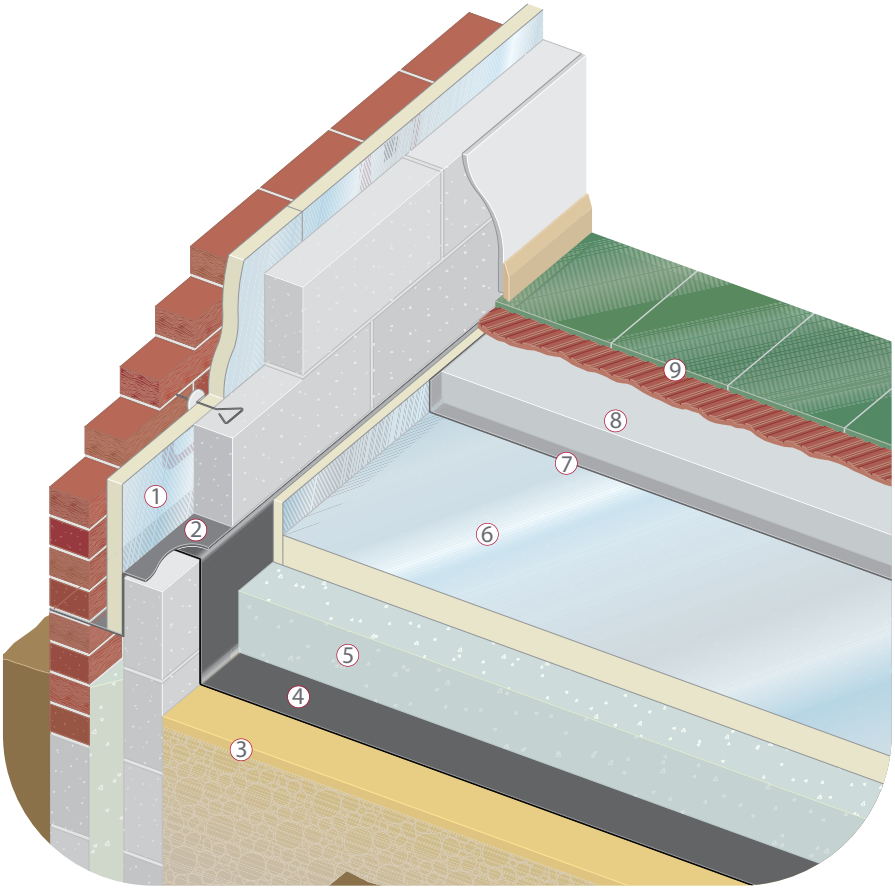
NOTES

a 20mm min. edge insulation at perimeters

b heating elements

Floors

Insulating above a groundbearing slab



"...when installed with a screed is ideal for underfloor heating..."

Ballytherm wall insulation boards ①
Cavity tray ②
Hardcore with sand binding ③
DPM / radon barrier ④
Concrete slab ⑤
Ballytherm floor Insulation boards ⑥
VCL / slip sheet ⑦
Screed ⑧
Floor tiles on adhesive / mortar ⑨

Insulating above a groundbearing slab

Figure 05

Insulating a groundbearing floor above the slab excludes the thermal mass of the slab from the building envelope, making the building more responsive to heating: the construction is suited to buildings which are intermittently heated. This construction is compatible with masonry and timber framed wall constructions and, when installed with a screed, is ideal for underfloor heating.

The properties of Ballytherm insulation match those required for this application: it is robust and moisture resistant, whilst its low thermal conductivity minimises the thickness of insulation within the floor construction.

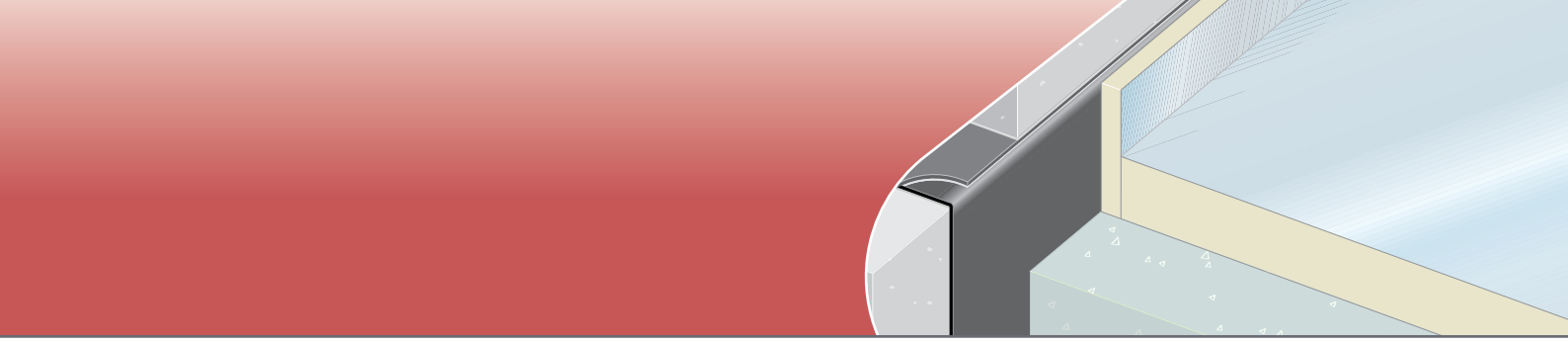
The thickness of Ballytherm insulation required to meet regulations may be determined from table 05.

Table 05 Thickness (mm) of Ballytherm required for insulating above a groundbearing slab

U-value	P/A	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.16	-	25	60	75	90	100	100	100	-	-	-
0.18	-	25	45	65	75	80	90	90	90	90	90
0.20	Scotland	0	35	55	60	70	70	75	75	80	80
0.21	Republic of Ireland	0	25	50	55	65	65	70	75	75	75
0.25	Northern Ireland / England & Wales	0	25	30	40	45	50	55	55	60	60

U-values (W/m²K) calculated according to ISO 6946: 2007 and ISO 13770: 2007.

Floor construction: 150mm concrete slab, Ballytherm insulation, 60mm cement:sand screed. 25mm thick edge insulation extending 60mm vertically.



Design guidance

The DPM should be laid beneath the slab. Any radon barrier should be laid beneath the slab and should extend across the whole footprint of the building. A correctly specified membrane can function as DPM and radon barrier. The upper surface of the slab should be blinded with sand or ground down to produce a level surface for laying Ballytherm boards (maximum posible deflection +/- 5mm over 2m).

Where the Ballytherm boards will be overlaid with a screed, a VCL/slip sheet of 1000 gauge polyethylene should be laid between the insulation and the screed to prevent condensation at the interface and possible screed migration.
The screed should be at least 65mm thick and may incorporate pipework for underfloor heating.

Edge insulation at least 20mm thick should be installed around the perimeter of the floor to eliminate thermal bridging at the edge of the screed (figure 06).
The depth of the edge insulation boards should be equal to the combined thickness of the insulation and screed.
Where chipboard or other sheet flooring is to be laid onto the Ballytherm boards without a screed a VCL/slip sheet should be installed between the insulation and the flooring. The VCL/slip sheet will allow for differential movement and protect the flooring from construction moisture, particularly during the drying out period. The VCL should be turned up behind the skirting.

Intermediate walls should be built directly off the floor slab (figure 08).

At thresholds and other places where heavy traffic or high loadings are expected (for example beneath kitchen or sanitary fittings) timber battens should be installed to prevent the flooring sagging.

Sitework

Installation sequence - beneath screed

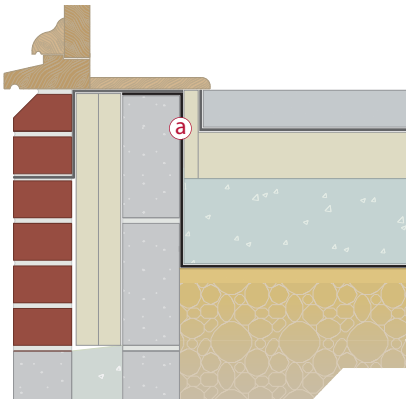
1. Blind slab with sharp sand or grind off protrusions.
2. Fit vertical edge insulation.
3. Lay Ballytherm boards across the surface of the floor in broken bond.
4. Lay VCL/slip sheet over the boards with joints lapped and sealed.
5. Pour screed.

Installation sequence - beneath sheet flooring

1. Blind slab with sharp sand or grind off protrusions.
2. Fit timber battens at thresholds and points of high loading.
3. Lay Ballytherm boards across the surface of the floor in broken bond.
4. Lay VCL/slip sheet over the boards with joints lapped and sealed.
5. Lay sheet flooring.

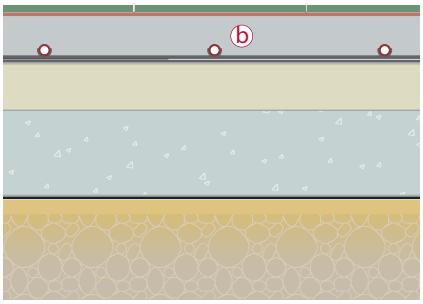
Points to watch

- Ensure boards fit tightly together.
- Seal service penetrations with sealant.
- Test any services before pouring the screed.
- Protect Ballytherm boards from traffic while laying screed or flooring.
- Protect exposed board edges when levelling the screed.



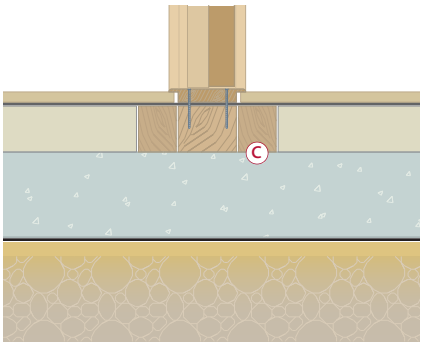
Avoiding thermal bridges at thresholds

Figure 06



Screed incorporating floor heating elements

Figure 07



Loadbearing at internal threshold

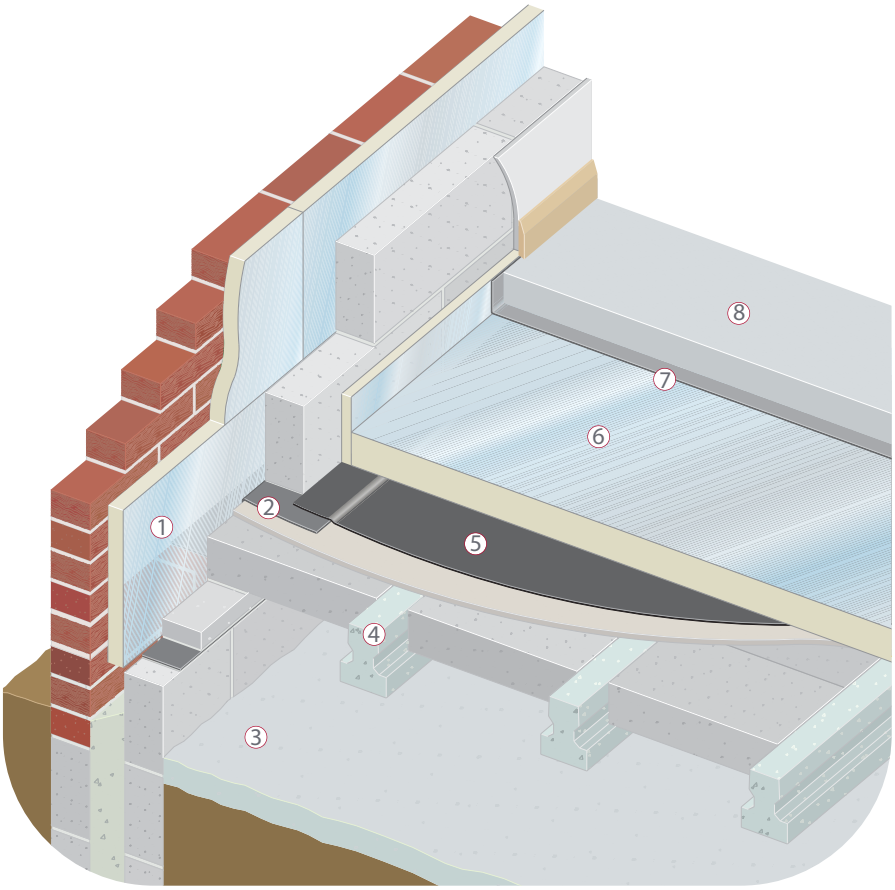
Figure 08

NOTES

a 20mm min. edge insulation at perimeters
b heating elements
c timber battens at loadbearing areas

Floors

Insulating above pre-cast concrete floors



"...is compatible with masonry and timber framed wall constructions..."

Ballytherm wall insulation boards ①
Cavity tray ②
Site concrete ③
Pre-cast concrete floor ④
Radon barrier ⑤
Ballytherm floor Insulation boards ⑥
VCL / slip sheet ⑦
Screed ⑧

Insulating above pre-cast concrete floors

Figure 09

Floors consisting of pre-cast concrete units, including concrete plank or beam and block, can be rapidly installed and are suitable for use where conditions preclude a groundbearing floor. Insulation should be installed above the bearing surface.

This construction is compatible with masonry and timber framed wall constructions and may be used with underfloor heating set in a screed.

The properties of Ballytherm insulation match those required for this application: it is robust and moisture resistant, whilst its low thermal conductivity minimises the thickness of insulation within the floor construction.

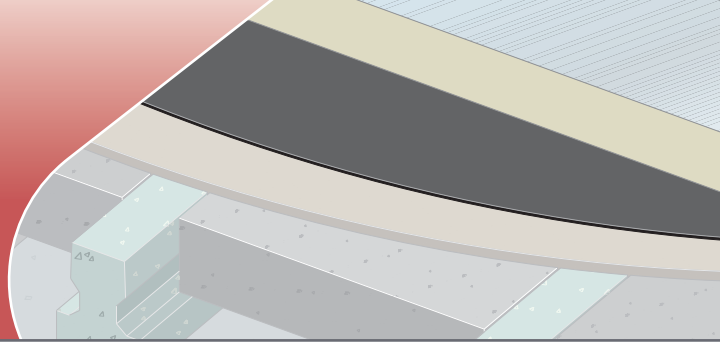
The thickness of Ballytherm insulation required to meet regulations may be determined from table 06.

Table 06 Thickness (mm) of Ballytherm required for insulating above pre-cast concrete floors

U-value	P/A	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.16	-	50	80	100	100	-	-	-	-	-	-
0.18	-	35	70	80	90	90	90	100	100	100	100
0.20	Scotland	25	55	70	75	75	80	80	90	90	90
0.21	Republic of Ireland	25	50	60	70	70	75	75	80	80	80
0.25	Northern Ireland / England & Wales	0	35	45	50	55	60	60	60	65	70

U-values (W/m²K) calculated according to ISO 6946: 2007 and ISO 13770: 2007.

Floor construction: 100mm medium density concrete blocks supported on concrete beams, Ballytherm insulation, 50mm cement:sand screed.



Design guidance

A suspended floor does not require a DPM. Where a radon barrier is required it may be installed across the top of the structural floor beneath the insulation, or may be installed within the concrete covering of the sub-floor void. In all cases the radon barrier must extended across the entire footprint of the building. Joints in the surface of the structural floor should be grouted and a 13mm levelling screed laid (maximum possible deflection +/- 5mm over 2m).

Where the Ballytherm boards will be overlaid with a screed, a VCL/slip sheet of 1000 gauge polyethylene should be laid between the insulation and the screed to prevent condensation at the interface and possible screed migration.
The screed should be at least 65mm thick and may incorporate pipework for underfloor heating. Edge insulation should be installed around the perimeter. The depth of the edge insulation boards should be equal to the combined thickness of the insulation and screed.

Where chipboard or other sheet flooring is to be laid onto the Ballytherm boards without a screed, a VCL/slip sheet should be installed between the insulation and the flooring. The VCL/slip sheet will allow for differential movement and protect the flooring from construction moisture particularly during the drying out period. The VCL should be turned up behind the skirting. At thresholds and other places where heavy traffic or high loadings are expected (for example beneath kitchen or sanitary fittings) timber battens should be installed to prevent the flooring sagging (figure 11).

Sitework

Installation sequence - beneath screed

1. Grout slab and lay levelling screed.
2. Fit vertical edge insulation.
3. Lay Ballytherm boards across the surface of the floor in broken bond.
4. Lay VCL/slip sheet over the boards with joints lapped and sealed.
5. Pour screed.

Installation sequence - beneath sheet flooring

1. Grout slab and lay levelling screed.
2. Fit timber battens at thresholds and points of high loading.
3. Lay Ballytherm boards across the surface of the floor in broken bond.
4. Lay VCL/slip sheet over the boards with joints lapped and sealed.
5. Lay sheet flooring.

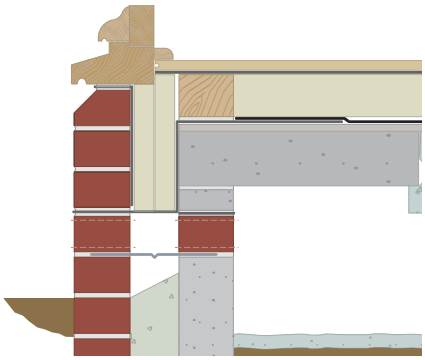
Points to watch

- Ensure boards fit tightly together.
- Seal service penetrations with sealant.
- Test any services before pouring the screed.
- Protect Ballytherm boards from traffic while laying screed or flooring.
- Protect exposed board edges when levelling the screed.

NOTES

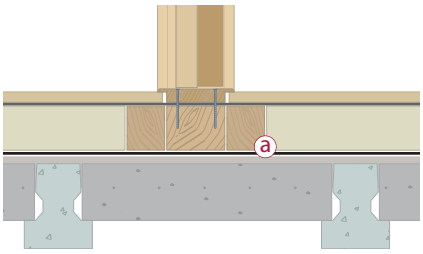
a timber battens at loadbearing areas

b heating elements



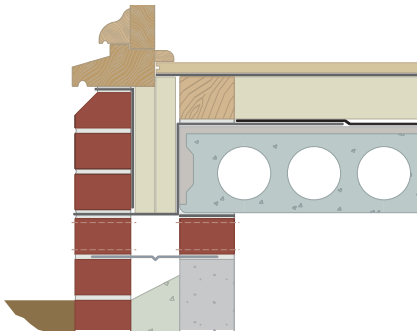
Avoiding thermal bridges at threshold

Figure 10



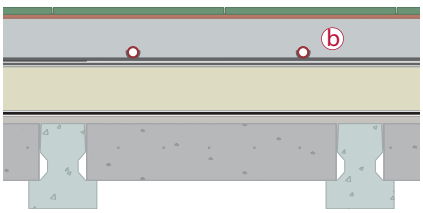
Loadbearing at internal threshold

Figure 11



Avoiding thermal bridges at threshold using hollow core concrete plank

Figure 12

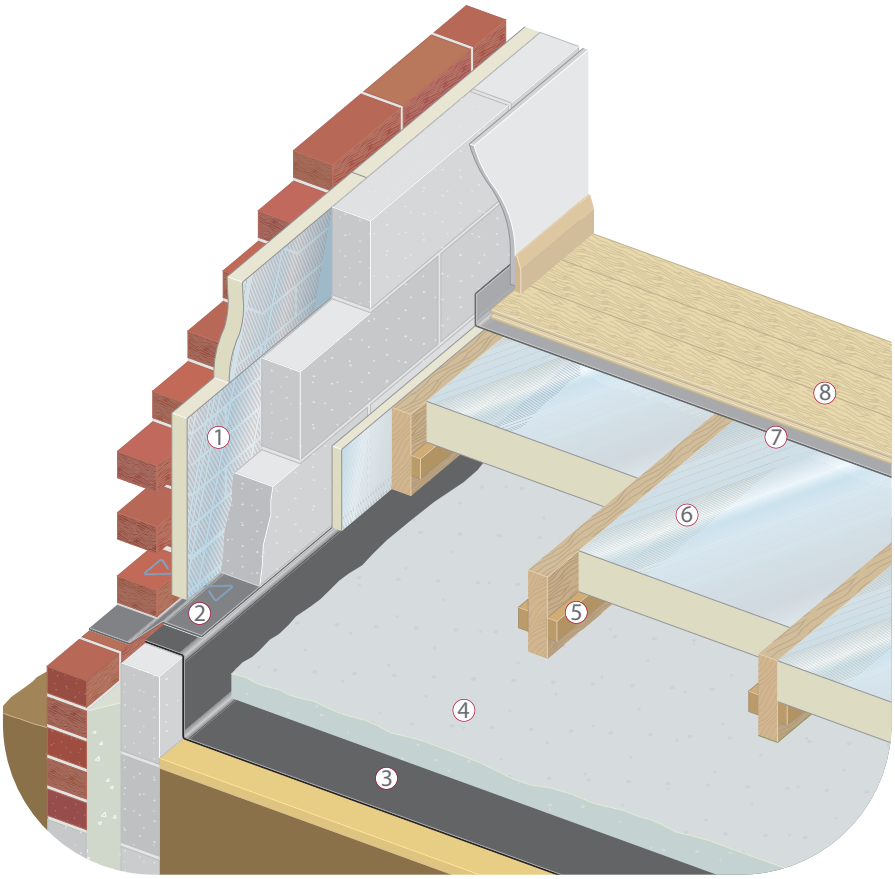


Screed incorporating floor heating elements

Figure 13

Floors

Insulating below suspended timber floors



"...may be used to upgrade existing floors or to create new floors..."

Ballytherm wall insulation boards ①
Cavity tray ②
Radon barrier ③
Site concrete ④
Timber joists and support battens ⑤
Ballytherm floor Insulation boards ⑥
VCL / slip sheet ⑦
Floor finish ⑧

Insulating below suspended timber floors

Figure 14

The thermal performance of timber floors may be improved by fitting installation between the joists, immediately beneath the deck. This construction may be used to upgrade existing floors or to create new floors. Timber floors in extensions can be easily matched to the levels of existing floors.

The properties of Ballytherm Insulation match those required for this application: it is robust and self-supporting, whilst its low thermal conductivity minimises the thickness of insulation between the joists.

The Ballytherm boards are installed between the joists, resting on battens fixed to the sides of the joists or on nails. The boards may be set either directly under the flooring with no air gap or, close to the base of the joists, leaving voids between the boards and the flooring.

In the latter construction the reflective surface of the boards will result in a series of low emissivity air spaces which will cut the rate of radiation heat loss across the cavity and improve the thermal performance of the floor.

The thickness of Ballytherm insulation required to meet regulations may be determined from table 07.

Table 07 Thickness (mm) of Ballytherm required for insulating below suspended timber floors

U-value	P/A	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.16	-	70	-	-	-	-	-	-	-	-	-
0.18	-	50	100	-	-	-	-	-	-	-	-
0.20	Scotland	30	80	100	-	-	-	-	-	-	-
0.21	Republic of Ireland	25	70	90	100	-	-	-	-	-	-
0.25	Northern Ireland / England & Wales	0	45	65	75	80	90	90	90	90	100

U-values (W/m²K) calculated according to ISO 6946: 2007 and ISO 13770: 2007.

Floor construction: Ballytherm insulation between joists (11% bridging), boarding across the joists.

Design guidance

Any radon barrier should be installed within the concrete covering of the void beneath the floor and should extend across the entire footprint of the building.

To ensure the insulation extends to the perimeter of the floor Ballytherm Insulation should be packed between the inner surface of a wall and the joist which runs next to it (figure 15).

Service penetrations should be designed out wherever possible: at any unavoidable penetrations the Ballytherm boards should be cut neatly to accept the pipework or cable and the remaining gap sealed.

An alternative method is to fit the Ballytherm boards at the base of the joists to form a series of service voids (figure 16).

Sitework

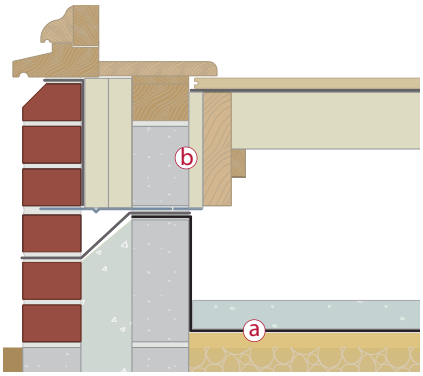
Installation sequence

1. Install joists at specified centres.
2. Fix timber battens to the sides of the joists.*
3. Cut Ballytherm boards to fit between the joists and set them on the battens.
4. Lay and fix flooring.

* The distance from the top of the battens to the top of the joists will depend upon the thickness of Ballytherm board specified and whether a service void is specified.

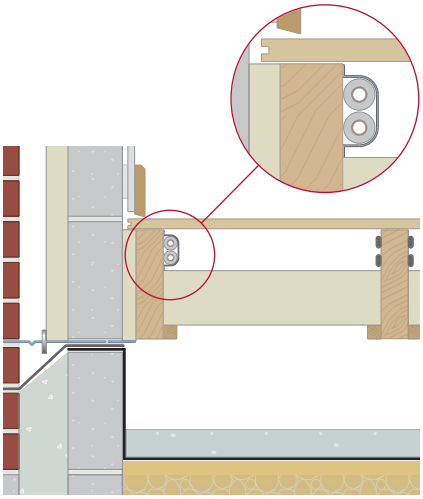
Points to watch

- Cut Ballytherm boards carefully to give a snug fit.
- Pack insulation between the perimeter joists and the wall to avoid thermal bridging.
- Seal service penetrations with flexible sealant.



Avoiding thermal bridges at threshold

Figure 15



Ballytherm Insulation positioned to allow for services

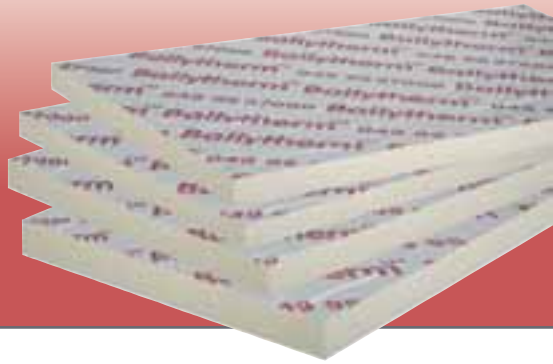
Figure 16

NOTES

a radon barrier (if required)

b Ballytherm Insulation packed between inner surface of wall and joist

Walls
General considerations



Introduction

Ballytherm insulation can be used in a number of wall constructions including masonry cavity walls and internally lined solid walls.

Moisture

Walls must be designed to prevent damage to the structure and to the health of the occupants as a result of water penetration.

There are three sources of moisture to consider:

1. To prevent ground moisture rising into the building, walls must have an effective DPC which should be joined to any DPM. Where radon protection is required the radon barrier must extend to the outer face of the external walls: this may be achieved by using pre-formed cavity trays and sealing them to the radon barrier within the cavity. A DPC and radon barrier should not be set within the same mortar joint as there is a risk of creating a slip plane between the two membranes.
2. Rain driven by the wind onto the surface of walls can penetrate to the building's interior. The risk of water penetration is affected by the severity of the environmental conditions, the surface finish and joint treatment, and the type and positioning of the insulation.

   Because Ballytherm has a very low thermal resistance, a wall can have the required thermal performance with a residual clear cavity without a great increase in thickness. Further guidance is given in BS EN 1996-2: 2006 (with national annex) and PD 6697: 2010.
3. Water vapour can condense within walls as it passes from a warm interior to cold exterior. Ballytherm foil-faced boards can be of great benefit: in drylining, the joints between boards can be sealed with metalised tape to form a vapour control layer immediately behind the plasterboard. Condensation risk analysis should be carried out for all walls, using the method in ISO 13788: contact Ballytherm for details.

Thermal bridging

Maintaining continuity of insulation at the wall/roof junction can be difficult to achieve: with cold roofs (insulation between and above ceiling joists) fibrous insulation should be pushed between the rafters onto the wall head. In warm roofs (with rigid insulation in the plane of the rafters) Ballytherm insulation may be extended vertically from the wall head, between the rafters, to the underside of the roof insulation.

Openings should be detailed to ensure insulation meets door and window frames: setting the windows and doors behind reveals makes it easier to butt insulation to the framing and enables a better seal at the junction of the frame and wall.

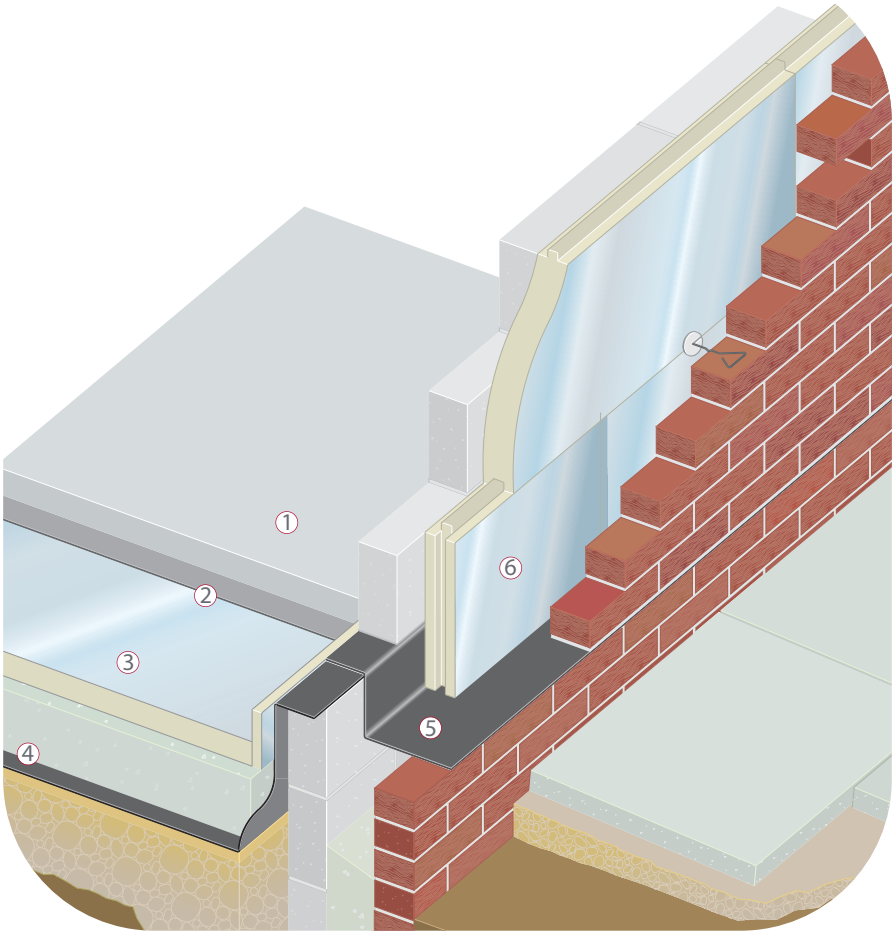
Fixings which penetrate wall insulation, such as wall ties or screws, will reduce the thermal performance of the insulation layer: the use of stainless steel fixings or plastic ties and fixings with small cross-sectional areas will minimise the effect.

Heating flues

Where flues from boilers and other heating appliances penetrate the walls precautions must be taken to avoid the hot pipe coming into contact with the insulation. There should either be a 25mm gap between the insulation and the flue - provided by a pipe sleeve - or a combination flue should be specified.

Walls

Insulating partial fill cavity walls



"...is well suited to new build projects..."

Screed ①
VCL / Slip sheet ②
Ballytherm floor insulation boards ③
DPM / radon barrier ④
Cavity tray ⑤
Ballytherm wall Insulation boards ⑥

Insulating partial fill cavity walls

Figure 17

The thermal performance of cavity walls may be improved by installing Ballytherm insulation within the cavity. This method is well suited to new build projects. The properties of Ballytherm insulation match those required for this application: its low thermal conductivity minimises the thickness of insulation required to meet performance standards and so limits the overall cavity width.

Ballytherm is moisture resistant and will not be affected by moisture within the cavity. Ballytherm boards should be fitted to the outer face of the inner leaf. They should be supported on wall ties and restrained against the masonry by clips fitted over the wall ties.

The boards are available with butt edged or tongue and grooved edges. They should be installed with staggered vertical joints to give a continuous layer of insulation.

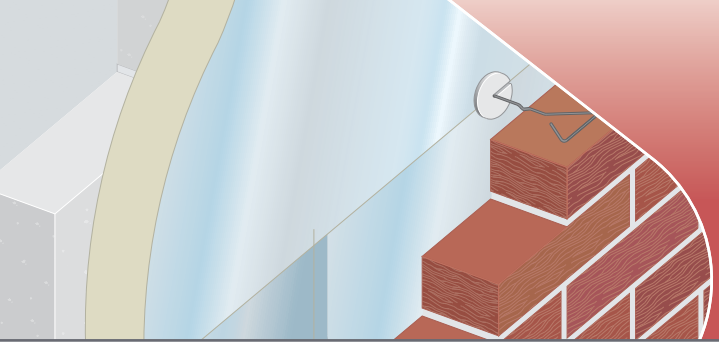
The thickness of Ballytherm insulation required to meet regulations may be determined from table 08.

Table 08 Thickness (mm) of Ballytherm required for insulating partial fill cavity walls

U-value	Block conductivity	1.33	0.50	0.30	0.19	0.15	0.11
0.20	-	-	-	-	-	75	75
0.21	Republic of Ireland	-	-	75	75	70	65
0.25	Scotland	65	65	60	55	55	50
0.30	Northern Ireland / England & Wales	50	50	45	45	40	35

U-values (W/m²K) calculated according to ISO 13770: 2007.

Wall construction: 103mm brick, low emissivity cavity, Ballytherm insulation, 100mm block (conductivity as shown), plaster.



Walls
...partial fill cavity walls

Design guidance

To prevent thermal bridging Ballytherm boards should be fitted tightly to the edges of door and window openings. Lintels which support the inner and outer leaf should have internal insulation or be packed with Ballytherm insulation (figure 18).

Where radon barriers and cavity trays bridge the cavity, the insulation should be extended to the underside of the barrier or tray, then continued immediately above it.

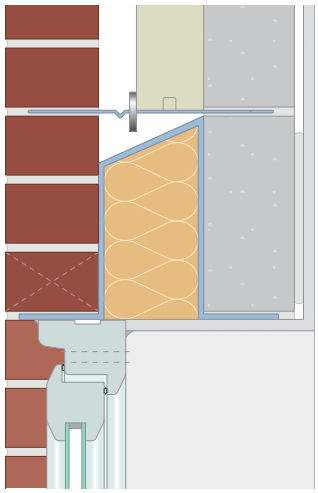
Points to watch

- Ensure wall ties slope down from the inner leaf to outer leaf to prevent water travelling to the inner leaf.
- Use a cavity board across the top of the insulation to prevent mortar building up on the insulation or bridging the cavity.
- Fit Ballytherm neatly to elements which bridge the cavity such as door and window sub-frames, lintels and cavity closers.

Sitework

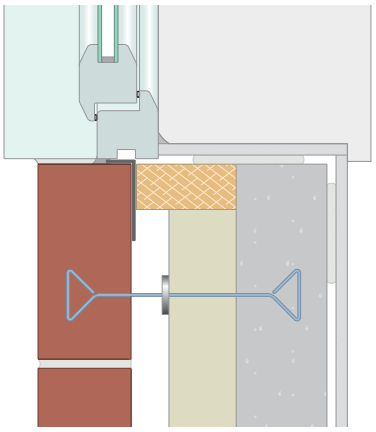
Installation sequence

1. Raise the inner leaf 450mm above the outer leaf (two courses of blockwork or six of brickwork).
2. Fit the first run of Ballytherm boards against the inner leaf, supported on top of wall ties or the concrete cavity fill.
3. Raise outer leaf by 450mm.
4. Notch the top of the Ballytherm boards and fit wall ties.
5. Fit clips to hold the boards against the inner leaf.
6. Repeat the sequence to the required height of the wall, staggering the vertical board joints.



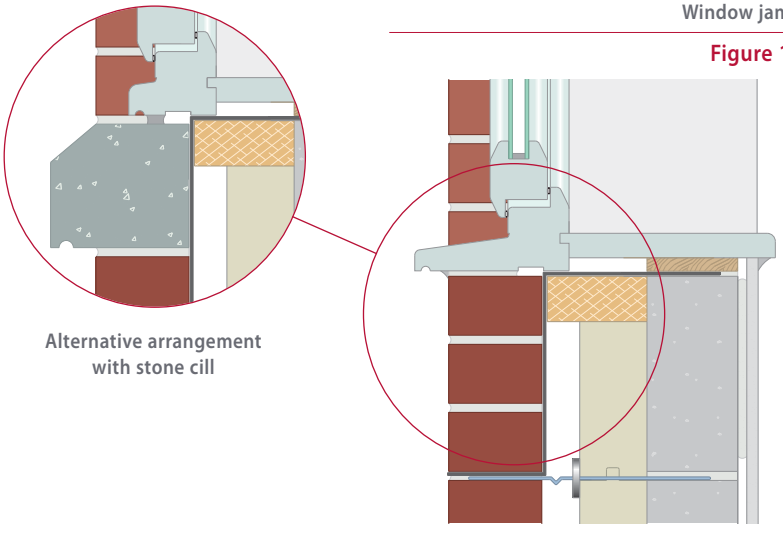
Window head

Figure 18



Window jamb

Figure 19



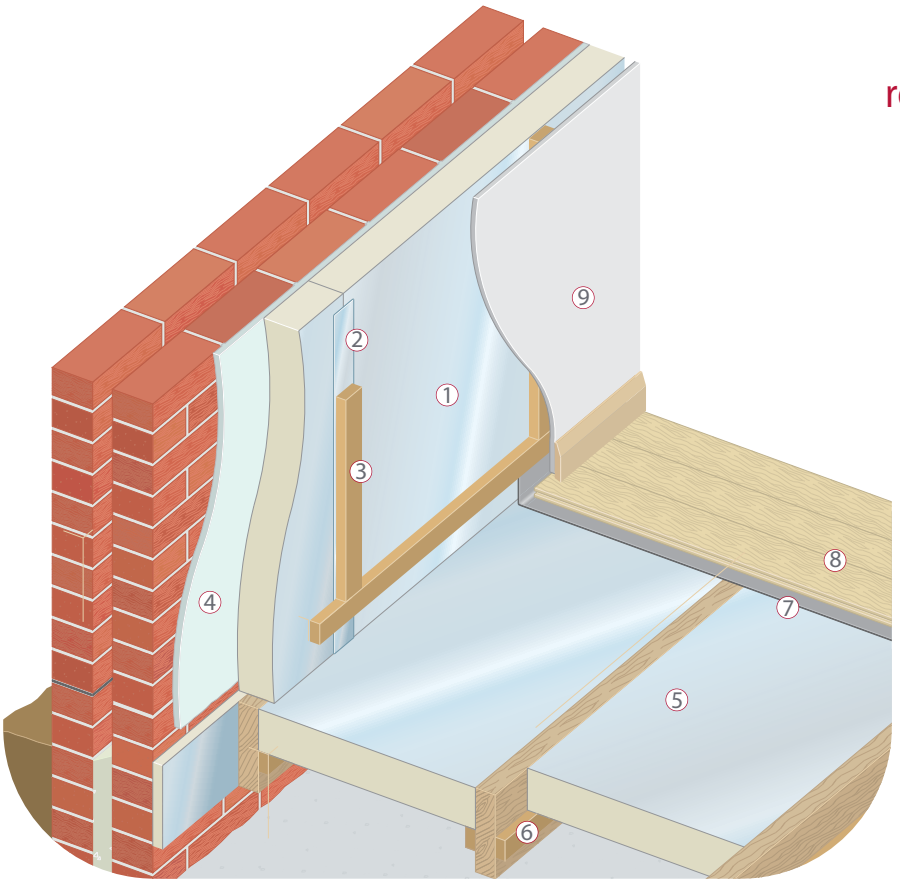
Alternative arrangement with stone cill

Window cill

Figure 20

Walls

Insulating drylined walls



"...is well suited to refurbishment projects where existing walls have to be upgraded..."

Ballytherm wall insulation boards ①
Metalised tape ②
Timber battens ③
Existing plaster ④
Ballytherm floor insulation boards ⑤
Timber joists and support battens ⑥
VCL / slip sheet ⑦
Floor finish ⑧
Plasterboard ⑨

Insulating drylined walls

Figure 21

The thermal performance of walls may be improved by installing an insulated dry-lining system with Ballytherm Insulation behind plasterboard.
This method is well suited to refurbishment projects where existing walls have to be upgraded.
The properties of Ballytherm insulation match those required for this application: its low thermal conductivity minimises the thickness of insulation required, thus limiting the loss of internal volume whilst giving the necessary thermal performance.

The Ballytherm boards may be installed directly behind the plasterboard and restrained by the plasterboard fixings. Alternatively, the boards may be restrained by timber battens fixed through to the wall, with the plasterboard secured to the battens to leave voids between the insulation and the plasterboard.

The reflective surface of the boards reduce radiation heat loss across the air spaces and further improve the thermal performance of the wall.

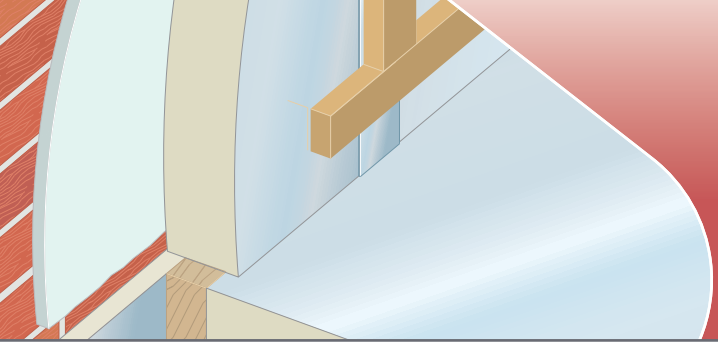
The thickness of Ballytherm insulation required to meet regulations may be determined from table 09.

Table 09 **Thickness (mm) of Ballytherm required for insulating drylined walls**

U-value	Wall Construction	215 brick	500 stone	215 block	215 aircrete
		0.75	2	1.33	0.19
0.20	-	100	100	-	85
0.21	Republic of Ireland	95	95	100	80
0.25	Scotland	80	80	80	60
0.30	Northern Ireland / England & Wales	60	60	60	40

U-values (W/m^2K) calculated according to ISO 6946: 2007.

Wall construction: masonry wall (thickness and thermal conductivity as shown), Ballytherm insulation, low emissivity cavity, plasterboard.



Walls
...dry-lining walls

Design guidance

To minimise thermal bridging at window and door reveals insulation should be installed along the face of the reveal and butted to the window frame (figure 22). If space constraints preclude the use of battens, the plasterboard should be fixed to the wall through the Ballytherm insulation boards.

Thermal bridges can also occur where interior walls meet external walls; one solution is to extend the insulation for at least a metre along both faces of the internal wall, although to avoid projections in the wall it may be appropriate to continue the insulation to an internal corner (figure 23).

In intermediate floors, insulation should be placed between the inner surface of wall and the joist which runs next to it (figure 24).

Walls must be prepared for installation: projections such as skirting boards, architraves and copings should be removed to give a smooth surface, uneven walls may need to be rendered; service fixtures such as sockets and switches should be removed to be re-fitted later.

Existing finishes with a high vapour resistance, such as vinyl wallpaper or gloss paint should be removed to avoid problems with condensation.

The cavities formed by the battens may be used for service runs to reduce penetrations through the insulation: where existing services are taken through the insulation the penetrations should be sealed. Lightweight fittings may be fixed to the plasterboard, but fixings for heavier fittings should be taken back to the masonry.

Additional battens should be used to support heavy horizontal items.

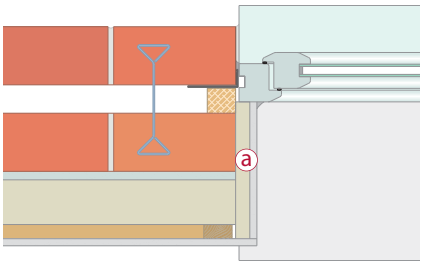
Sitework

Installation sequence - with battens

1. Prepare the wall surfaces, removing projections and high vapour resistance finishes.
2. Fit Ballytherm boards against the wall. Fix in place with timber battens.
3. Tape board joints with metalised tape.
4. Fix plasterboard to battens and skim.
5. Refix skirtings and surrounds. Re-install services.

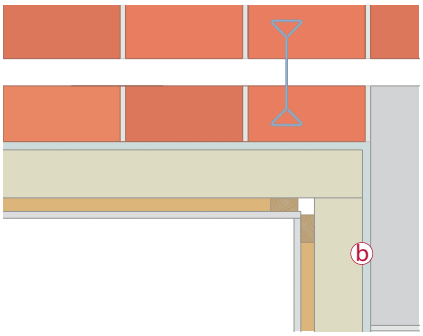
Points to watch

- Run services in the batten space behind the plasterboard. Where services run behind the insulation, chase into the wall, not the Ballytherm boards.
- Fix Ballytherm boards to window and door reveals to avoid thermal bridging.



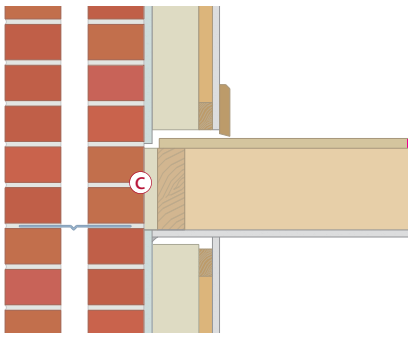
Reducing thermal bridging at window/door jamb

Figure 22



Reducing thermal bridging at interior wall junctions

Figure 23



Reducing thermal bridging of intermediate floors

Figure 24

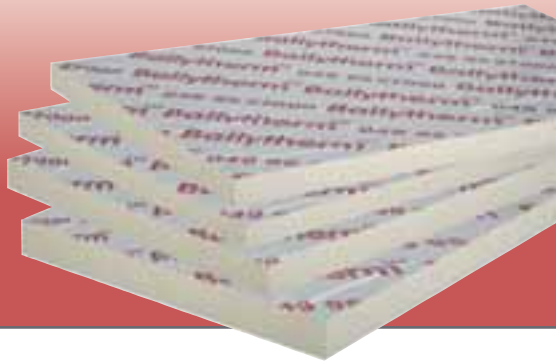
NOTES

a insulation fitted along face of reveal

b insulation extended along face of internal wall

c insulation between inner face of wall and joist

Roofs
General considerations



Introduction

In warm roof constructions the insulation is fitted in the plane of the rafters rather than at ceiling line.

Warm roofs enable all the space within the building envelope to be utilised, whether that means maximising the usable floor area, creating dramatic cathedral roofs or simply providing a controlled environment for running complex services. Warm roof construction has benefits for the roof structure, protecting it from the effects of wide variations in temperature and humidity and also increases the racking strength.

Ballytherm insulation boards are ideal for forming warm pitched roofs: in new build the insulation can be fitted over and between the rafters, or between and beneath the rafters, while in refurbishment projects the insulation can be installed from inside the loft to upgrade the thermal performance of the roof without disturbing the existing roof covering.

General considerations

Structural

The insulation in warm roof applications must be self-supporting. Where it is laid across the top of the rafters it must be able to withstand the imposed loads from the roof covering transferred through the counterbattens. Ballytherm Insulation is strong enough for that application.

Thermal performance

Ballytherm insulation installed above or below the rafters is not affected by thermal bridging by the roof structure, whereas the thermal performance of an insulation layer set between the rafters is reduced by as much as a third.

Although using more insulation above the rafters will improve the thermal performance it can create problems: the forces upon the fixings increase, so more fixings are required; detailing at eaves becomes more complex, and it also becomes more difficult to drive the fixings accurately into the rafters. Consequently, it is important to avoid an excessive amount of insulation above the rafters by installing some insulation between the rafters.

Cavities

Where Ballytherm insulation takes up only part of the rafter depth, the resulting cavities will each have a low emissivity surface formed by the reflective foil face of the board.

Those surfaces will then reduce the rate of radiation heat transfer across the cavity and improve the thermal performance of the roof.

However, in refurbishment projects the air movement through the cavities will eliminate much of the benefit from the low emissivity surface.

Condensation

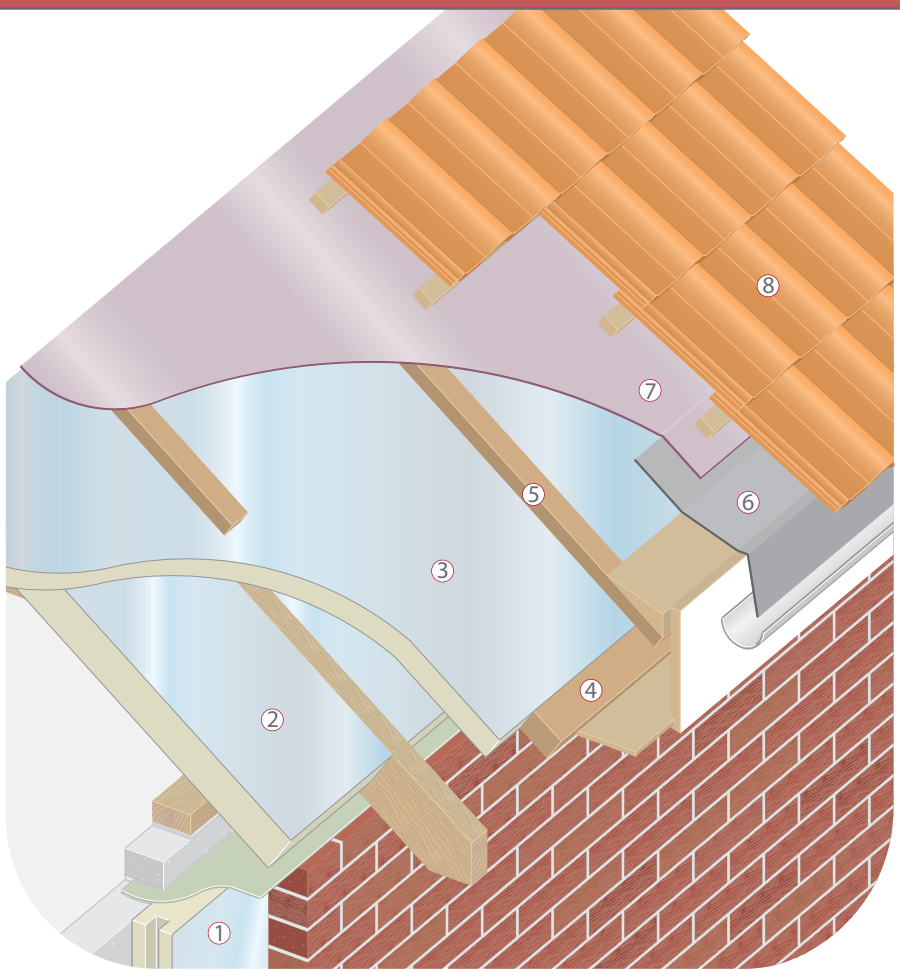
Roofs must be designed to avoid the formation of condensation which can threaten the structural stability of the roof and promote the growth of mould and rot. Designers should carry out condensation risk analysis to assess the likelihood of problems and modify the roof design if condensation is predicted.

To reduce condensation risk, designers should:

- minimise the amount of moisture entering the roof: moisture generated by activities such as washing and cooking should be extracted at source and a vapour control layer - such as 1000 gauge polyethylene - should be specified on the warm side of the insulation.
- ensure any moisture which does enter can escape to atmosphere: specify a vapour open underlay which will allow water vapour to disperse into the batten space and ensure there is sufficient air movement between the batten space and atmosphere (it may be necessary to vent the batten space beneath tight coverings such as sheet metal). In refurbishment projects where the underlay has a high vapour resistance there must be a 50mm vented cavity beneath the underlay.

Further guidance on controlling condensation may be found in BS 5250: 2011.

Warm Roof
Insulating above and between the rafters



"...is well suited to new build projects and to refurbishments..."

Ballytherm wall insulation boards ①
Ballytherm roof insulation boards between rafters ②
Ballytherm roof insulation boards above rafters ③
Stop batten ④
Counterbatten ⑤
Eaves piece ⑥
Breather membrane ⑦
Roof covering ⑧

Insulating above and between the rafters

Figure 25

Ballytherm insulation may be used to form warm pitched roofs by applying it over and between the rafters.
Applying a layer of insulation over the rafters brings the whole roof within the insulated envelope and maximises the available head room. This method is well suited to new build projects and to refurbishments where the roof covering is being stripped off and replaced.

The properties of Ballytherm insulation match those required for this application: its low thermal conductivity minimises the thickness of insulation required, whilst it is strong enough to support the loads imposed from the roof covering via the battens.

The Ballytherm boards should be set in two layers, one extending in a continuous layer over the top of the rafters, which is restrained by counterbattens, and the second cut to fit between the rafters and held in place by battens, clips or partially driven nails. The insulation is protected by the internal finish fixed to the underside of the rafters. The reflective surface of the boards reduce radiation heat loss across the air spaces and further improve the thermal performance of the roof.

The thickness of Ballytherm insulation required to meet regulations may be determined from table 10.

Table 10 Thickness (mm) of Ballytherm required for insulating above and between rafters

U-value		Above	Above and between
0.14	-	-	70 + 90
0.16	Republic of Ireland	-	55 + 95
0.18	Scotland	-	50 + 70
0.20	Northern Ireland / England & Wales	95	50 + 55

U-values (W/m²K) calculated according to ISO 6946: 2007.

Roof construction: tiles, battens and counterbatten cavity, vapour open underlay, Ballytherm board above rafters, Ballytherm board between rafters (second column only), low emissivity cavity, plasterboard.

Design guidance

Where condensation risk analysis indicates a risk of condensation a vapour control layer should be installed behind the finish.

The underlay should have a vapour resistance of less than 0.25MNs/g and may be laid directly over the insulation or draped over the counterbattens. A rigid eaves carrier may be required to prevent ponding and avoid UV degradation. Counterbattens should be a minimum of 38 x 50mm and should be fixed through the Ballytherm boards to the rafters with fixings such as Helfix Inscrew or Proctor PR nails: consult the fixing manufacturer for information on loadings and spacings. There should be a stop batten fixed across the rafters at eaves to prevent the insulation slipping down the roof.

There is no need to ventilate beneath the underlay, but there must be sufficient air movement between the batten space and outside air to allow moisture to disperse. Roof coverings such as tiles and slates will allow enough air flow through the laps, however, air spaces beneath tight coverings should be vented.

To avoid thermal bridging the roof insulation should meet that in the walls: if a cavity wall is finished with a closer, additional insulation should be fitted from the top of the closer to the upper face of the rafters, where it will butt the over-rafter insulation. At verges the wall insulation should run to the top of the wall and butt the underside of the over-rafter insulation which is extended across the wall head.

At ridges, hips and valleys where roof planes intersect, the over-rafter insulation should be cut to form a continuous layer of insulation. Junctions may be sealed with expanding foam insulation.

Sitework

When working at a height ensure risk assessments have been carried out and that all necessary protective measures are in place.

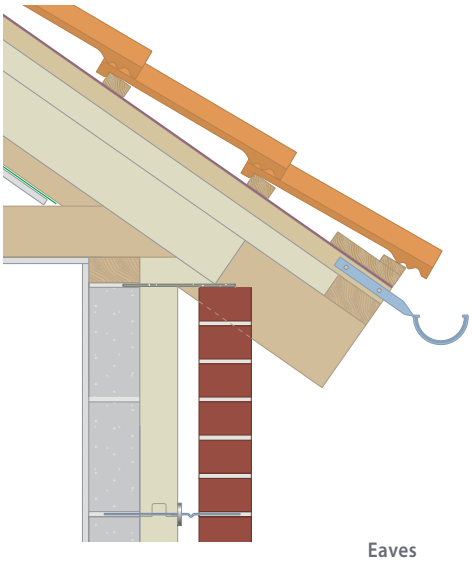
Do not walk on Ballytherm boards nor use them as a working platform.

Installation sequence (working from the outside)

1. Fit battens to the sides of the rafters to support the between rafter insulation.
2. Cut Ballytherm insulation to fit tightly between the rafters. Set insulation on the battens.
3. Fix a stop batten across the ends of the rafters.
4. Lay the first row of Ballytherm insulation boards across the rafters, resting firmly against the stop batten. Tack in place with clout nails.
5. Lay the next rows of Ballytherm insulation boards. Stagger board junctions between rows.
6. Fix counterbattens to the rafters.*
7. Lay the underlay, following manufacturer's instructions.
8. Install the roof covering

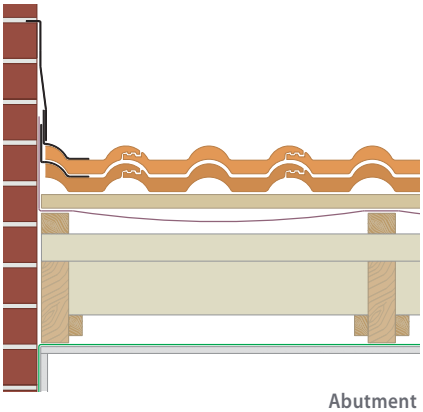
Points to watch

- Cut boards to fit neatly around penetrations such as SVPs.
- Seal gaps and junctions with expanding foam.



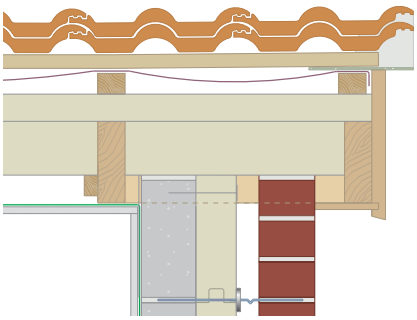
Eaves

Figure 26



Abutment

Figure 27

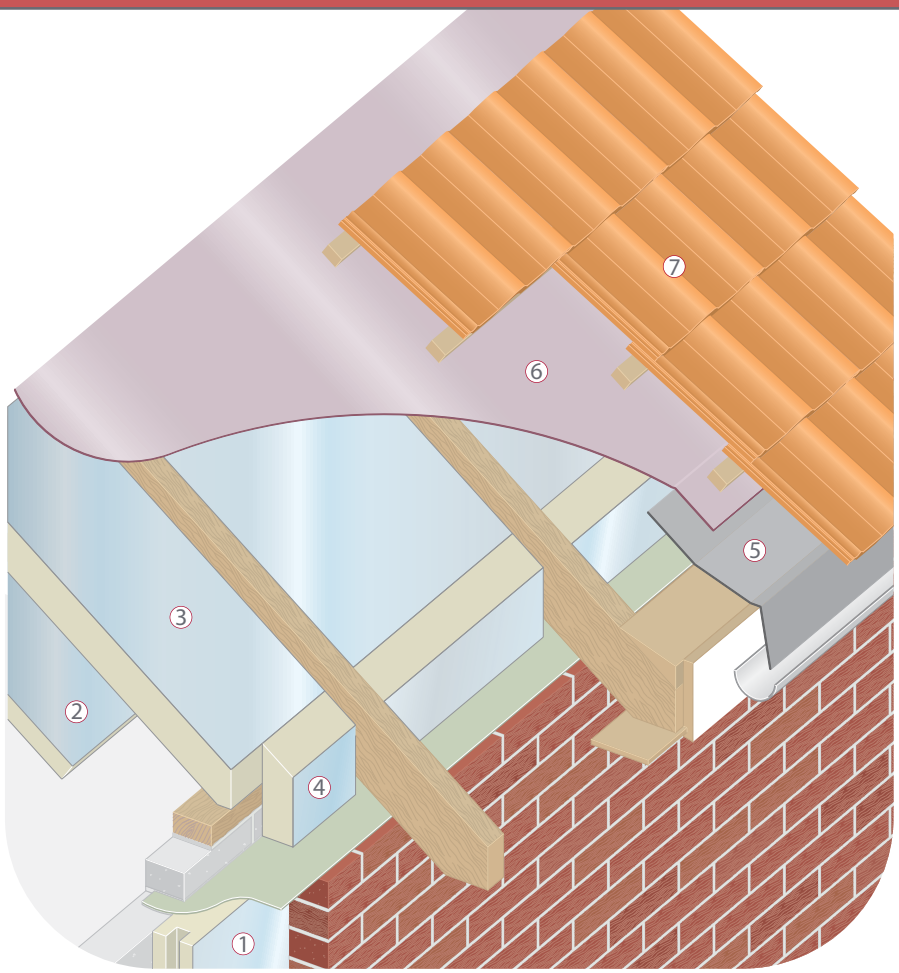


Verge

Figure 28

* where the underlay is installed under the counterbattens reverse the order of points 6 and 7.

Warm Roofs
Insulating between and below the rafters



"...is well suited to projects where the roof covering is being stripped off and replaced..."

Ballytherm wall insulation boards ①
Ballytherm roof insulation boards beneath rafters ②
Ballytherm roof insulation boards between rafters ③
Ballytherm roof insulation infill ④
Eaves piece ⑤
Breather membrane ⑥
Roof covering ⑦

Insulating between and below the rafters

Figure 29

Ballytherm insulation may be used to form warm pitched roofs when applied between and below the rafters.
Applying a layer of insulation beneath the rafters avoids the use of long fixings and enables all the insulation to be applied from inside the roof.
This method is well suited to new build projects and to refurbishments where the roof covering is being stripped off and replaced.

The properties of Ballytherm insulation match those required for this application: its low thermal conductivity minimises the thickness of insulation required, whilst it is strong enough to span the distances between the rafters without bowing. The Ballytherm boards should be set in two layers, one set between the rafters and the second extending in a continuous layer across the underside of the rafters and restrained by battens.

The insulation is protected by the internal finish. The reflective surface of the boards reduce radiation heat loss across the air spaces and further improve the thermal performance of the roof.

The thickness of Ballytherm insulation required to meet regulations may be determined from table 11.

Table 11 Thickness (mm) of Ballytherm required for insulating between and below rafters

U-value		Between and below
0.14	-	100 + 60
0.16	Republic of Ireland	100 + 50
0.18	Scotland	100 + 30
0.20	Northern Ireland / England & Wales	100 + 25

U-values (W/m²K) calculated according to ISO 6946: 2007.

Roof construction: tiles, batten cavity, vapour open underlay, Ballytherm board between rafters, Ballytherm board beneath rafters, low emissivity cavity, plasterboard.

Design guidance

Where condensation risk analysis indicates a risk of condensation a vapour control layer should be installed behind the finish. The two layers of insulation should be in contact to minimise air movement between them: timber battens fixed to the sides of the rafters may be used to restrain the insulation between the rafters.

The underlay should have a vapour resistance of less than 0.25MNs/g and may be draped over the rafters or the counterbattens. A rigid eaves carrier may be required to prevent ponding and avoid UV degradation. There is no need to ventilate beneath the underlay, but there must be sufficient air movement between the batten space and outside air to allow moisture to disperse: counterbattens (min. 38 x 50mm) may be used to form a deep air space above the underlay. Roof coverings such as tiles and slates will allow enough air flow through the laps, however, air spaces beneath tight coverings should be vented.

To avoid thermal bridging the roof insulation should meet the insulation in the walls: where a cavity wall is finished with a closer, additional insulation should be fitted from the top of the closer to the upper face of the rafters, where it will butt the Ballytherm insulation between the rafters (figure 30). At verges the wall insulation should extend to the top of the wall, the gap between the wall and the first rafter should be packed with insulation and the insulation under the rafter should be butted and sealed against the wall (figure 32).

At ridges, hips and valleys where roof planes intersect, the under-rafter insulation should be cut to form a continuous layer of insulation. Junctions may be sealed with expanding foam insulation.

Sitework

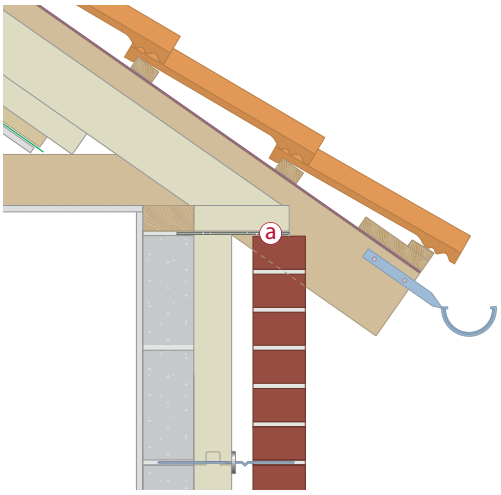
When working at a height ensure risk assessments have been carried out and that all necessary protective measures are in place. Do not walk on Ballytherm boards nor use them as a working platform.

Installation sequence (working from inside the roof)

1. Fix timber battens to the sides of the rafters so the space below the battens matches the thickness of the Ballytherm Insulation boards.
2. Cut Ballytherm insulation boards to fit tightly between the rafters. Starting at eaves, fit the boards between the rafters, starting at eaves and working towards the ridge. Push the boards against the battens.
3. Set Ballytherm boards across the underside of the rafters in a continuous layer. Secure with timber battens. Tape board joints with Ballytherm metalised tape.
4. Fix plasterboard to the battens and skim.

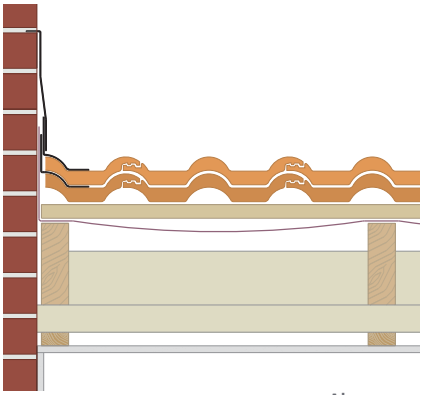
Points to watch

- At verges cut and fit Ballytherm insulation between the wall and first rafter.
- Cut boards to fit neatly around penetrations such as SVPs.
- Seal gaps and junctions with expanding foam.



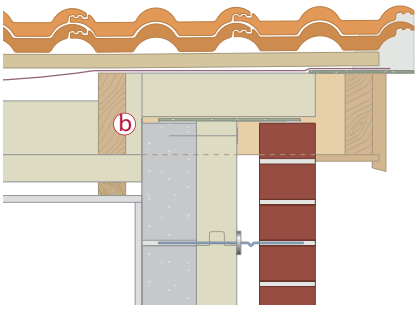
Eaves

Figure 30



Abutment

Figure 31



Verge

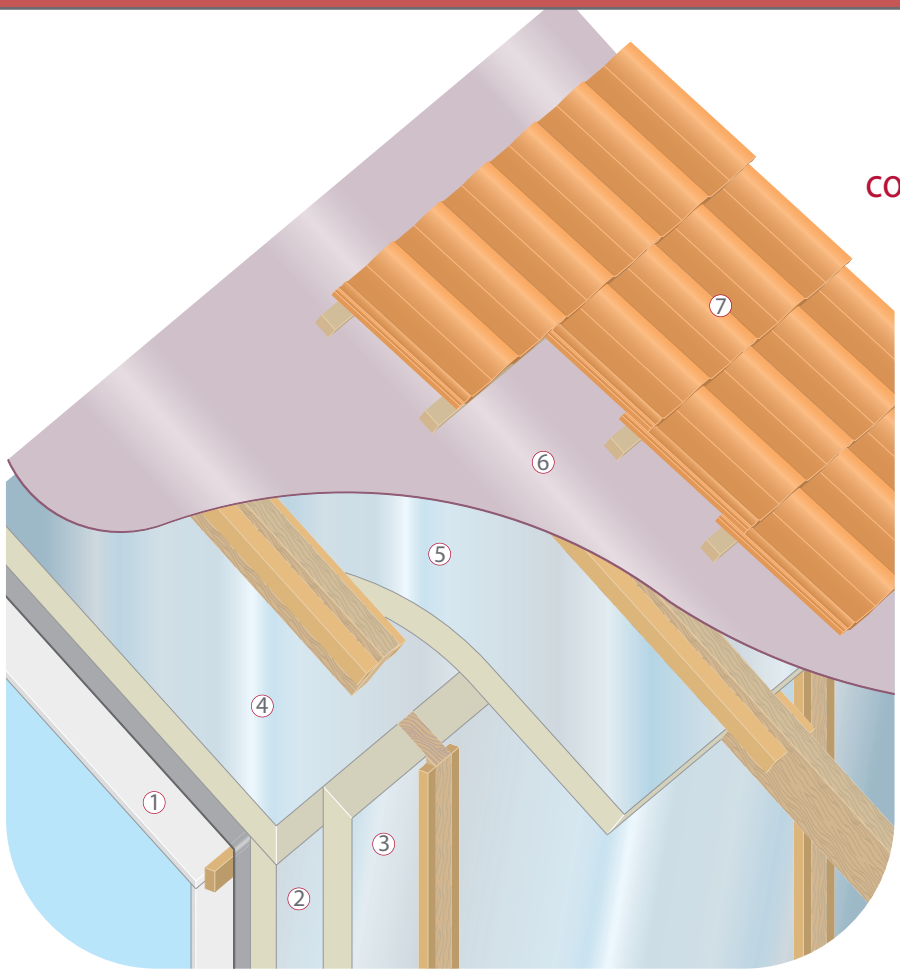
Figure 32

NOTES

a additional insulation to avoid thermal bridging

b insulation between inner face of wall and joist

Loft conversions
Insulating between and below the rafters



"...is well suited to loft conversions and refurbishment projects where the roof covering is being retained..."

Internal finish ①
Ballytherm wall insulation boards ②
Ballytherm wall insulation boards between timber studs ③
Ballytherm roof insulation boards beneath rafters ④
Ballytherm roof insulation boards between rafters ⑤
Roof underlay ⑥
Roof covering ⑦

Loft conversions

Figure 33

Ballytherm insulation may be used to form warm pitched roofs when applied between and below the rafters.
This method is well suited to loft conversions and refurbishment projects where the roof covering is being retained. The properties of Ballytherm insulation match those required for this application: its low thermal conductivity minimises the thickness of insulation required, whilst it is strong enough to span the distances between the rafters without bowing.

The Ballytherm boards should be set in two layers, one layer between the rafters and the second extending across the underside of the rafters and restrained by battens. The insulation is protected by the internal finish fixed to the underside of the rafters.

The reflective surface of the boards reduce radiation heat loss across the air spaces and further improves the thermal performance of the roof.

The thickness of Ballytherm insulation required to meet regulations may be determined from table 12.

Design guidance

Where the existing construction includes an underlay with a high vapour resistance, such as a 1F bituminous felt, there is a risk of condensation forming on the underside of the underlay and damaging the roof.

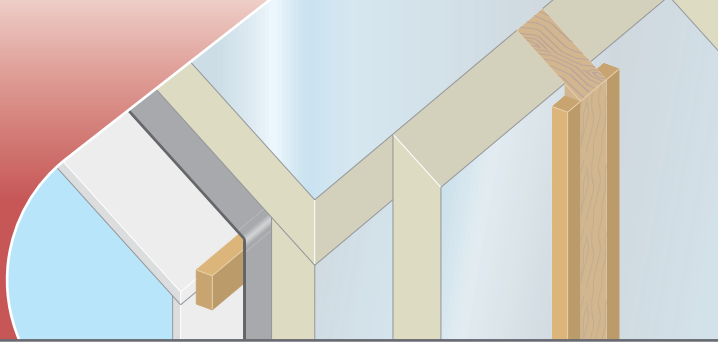
Table 12 Thickness (mm) of Ballytherm required for insulating loft conversions

U-value		Between and below
0.15	Scotland*	100 + 65
0.18	England & Wales / Scotland* / Northern Ireland	100 + 45
0.20	-	100 + 30
0.25	Republic of Ireland	100 + 25

U-values (W/m²K) calculated according to ISO 6946: 2007.

Roof construction: tiles, batten cavity, bituminous underlay, ventilated cavity, Ballytherm board between rafters, Ballytherm board beneath rafters, plasterboard.

*For Scotland the lower U-value limit applies if the original roof has a U-value worse than 0.25W/m²K.



To minimise that risk there must be 50mm min. air space between the insulation and the underlay, vented to remove moist air to atmosphere and prevent a harmful build up. To assist with setting the insulation at the correct depth and prevent it blocking the air spaces, timber battens may be fixed to the sides of the rafters as stops: with a draped underlay, the air space should be 75mm deep when measured at rafters to give the 50mm minimum depth at the centre of the air space. Each air space should be vented with a vent opening equivalent to a 25mm continuous opening at the base and 5mm at the top: that requirement applies to all air spaces, including those formed by roof windows and other penetrations.

If the rafters are not sufficiently deep for the required insulation and the cavity, their depth may be increased by fixing battens to the undersides of the rafters. Alternatively, a second layer of insulation may be fitted across the underside of the rafters.

In loft conversions it is often difficult to extend the insulation between the rafters as far as the wall head, also the practicalities of creating usable space results in the construction of stud walls between the joists and rafters.
Those walls should be insulated with Ballytherm boards cut to fit between the studs (figure 34). To prevent thermal bridging, the insulation between the rafters should extend as far as the rear face of the stud wall.

Where a horizontal ceiling is formed beneath the apex of the roof, the ceiling insulation must be fitted tightly between the rafters.

Gable walls should be insulated with Ballytherm Insulation board fitted behind the plasterboard lining. It is good practice to improve the thermal performance of the ceiling beyond the stud walls by laying insulation across the ceiling joists, taking care not to block any eaves vents.

To minimise heat loss through service penetrations the plasterboard lining may be set on battens to form a cavity for running services. At roof windows the insulation should be butted tightly to the back of the frames. Gaps at penetrations should be sealed with expanding foam.

Sitework

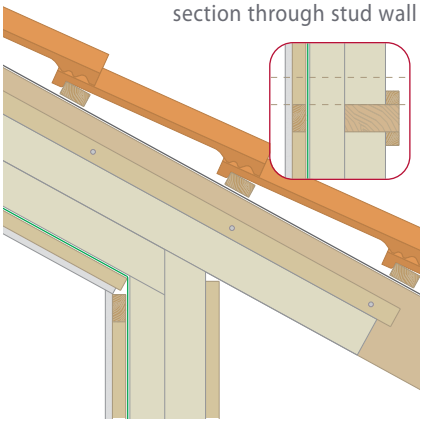
Installation sequence

1. Fix timber battens to the sides of the rafters to keep the insulation at least 50mm below the underlay.
2. Cut Ballytherm insulation boards to size and fit between rafters.
3. Fix a second layer of Ballytherm insulation boards across the underside of the rafters and secure with battens.
4. Tape board joints with Ballytherm metalised tape.
5. Fit the internal finish to the battens.

Points to watch

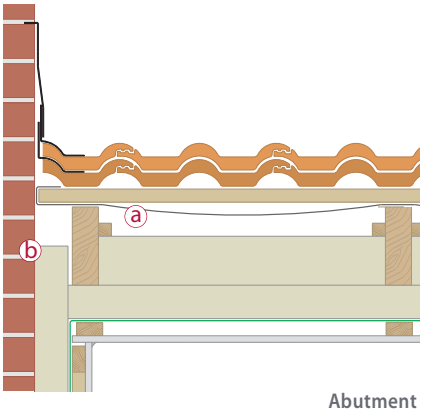
- Ensure all airspaces beneath the underlay are clear and vented.
- Cut Ballytherm boards to fit neatly around penetrations. Seal with expanding foam.

section through stud wall



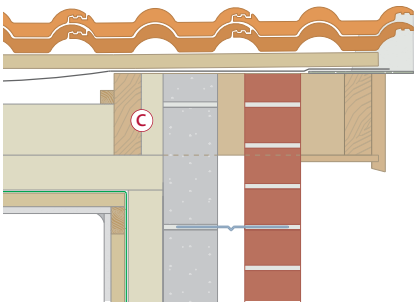
Junction of roof slope and stud wall

Figure 34



Abutment

Figure 35



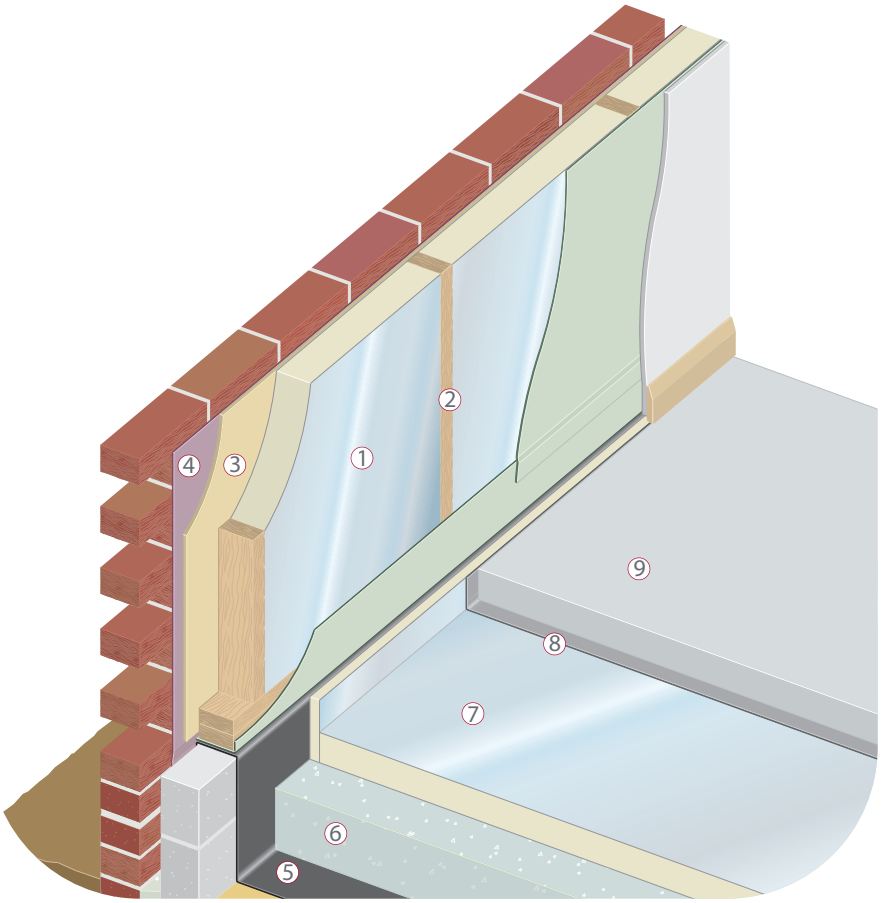
Verge

Figure 36

NOTES

a timber battens used as insulation stops
b vertical insulation extended up wall face
c insulation between inner face of wall and joist

Timber frame construction



"...is well suited to new build projects and extensions to existing buildings..."

Ballytherm wall insulation board 1
Studs 2
Sheathing board 3
Breather membrane 4
DPM / radon barrier 5
Concrete slab 6
Ballytherm floor insulation board 7
VCL / slip sheet 8
Screed 9

Ballytherm Insulation between the studs

Figure 37

Timber frame construction offers many advantages;

- thinner walls with good thermal performance;
  the possibility of more airtight construction;
- less moisture built into the construction than with masonry reduces drying-out times and the risk of condensation;
- may be faced with brick, tile/slate hanging, boarding and even rendered block.

Ballytherm insulation may be used to insulate timber framed buildings and is well suited to new build projects and extensions to existing buildings.

The properties of Ballytherm insulation match the requirements of this application: its low thermal conductivity minimises the thickness of insulation required, making best use of the available space. The use of Ballytherm insulation in floors and roofs of timber frame buildings is covered on pages 26 - 29.

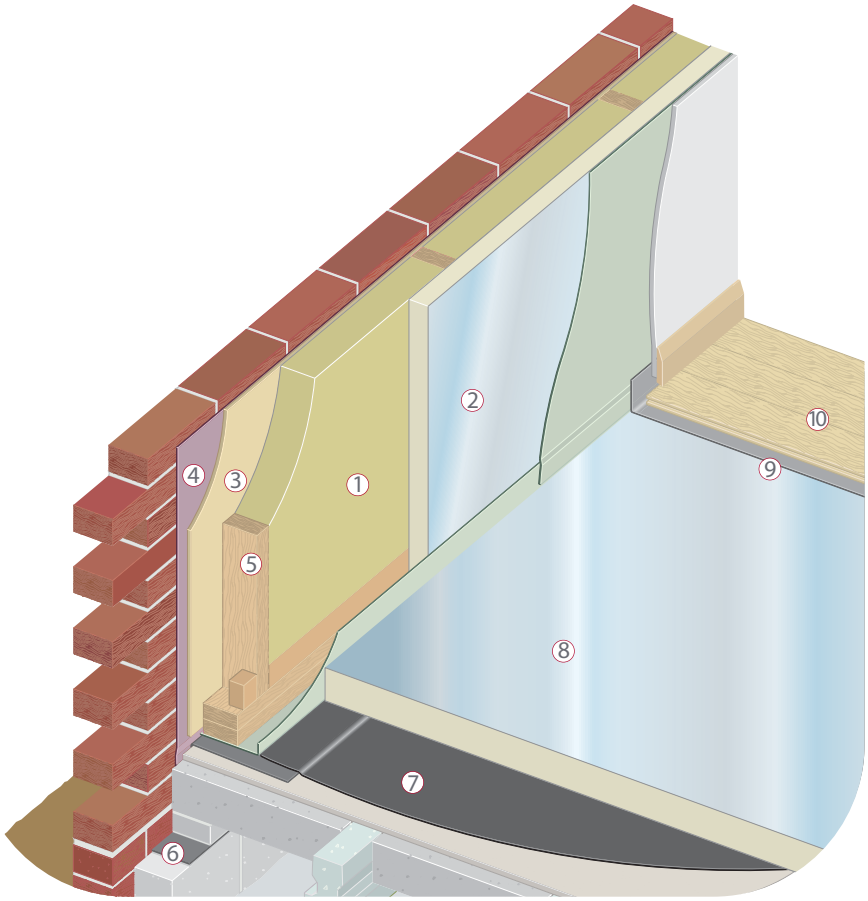
Table 13 **Thickness (mm) of Ballytherm required for insulating timber framed walls**

U-value		Ballytherm Between studs	140mm mineral fibre between studs, Ballytherm across face of studs
0.20	-	N/a	35
0.21	Republic of Ireland	N/a	30
0.25	Scotland	95	25
0.30	Northern Ireland / England & Wales	100	N/a

U-values (W/m2K) calculated according to EN ISO 6946: 1997

Wall construction: 103mm brick, cavity, 19mm plywood sheathing, insulation (as shown), plasterboard.

* With efficient heating: otherwise lower U-value applies



1. Insulation between studs
2. Ballytherm wall insulation board
3. Sheathing board
4. Breather membrane
5. Timber studs
6. Cavity tray
7. Radon barrier
8. Ballytherm floor insulation board
9. VCL / slip sheet
10. Floor finish

Ballytherm insulation on face of studs

Figure 38

There are two methods of insulating timber framed walls with Ballytherm insulation:

1. Ballytherm insulation installed between the studs and faced with plasterboard. With standard 140mm thick studs U-values as low as 0.22W/m^{2}K are possible.
2. Insulation packed between the studs, with a layer of Ballytherm insulation installed across the face of the studs and fixed directly to the studs or restrained with battens: U-values as low as 0.18W/m^{2}K are possible. When installed with battens, the reflective surface of the Ballytherm boards reduce radiation heat loss across the air spaces and further improves the thermal performance of the wall.

The thickness of Ballytherm insulation required to meet regulations may be determined from table 13.

Timber frame construction

Design guidance

Control of condensation is vital for timber framed buildings. To prevent the build up of moisture which can lead to condensation the designer must:

a. make provision for extracting moisture at the point of generation (e.g. bathrooms and kitchens)

b. prevent moisture from entering the construction, means of a vapour control layer (VCL)

c. allow moisture within the construction to pass to atmosphere, by using materials with high vapour resistance on the warm side of the insulation and those with low vapour resistance on the cold side of the insulation. To avoid problems which may arise because of the high vapour resistance of the plywood conventionally set on the outside of the studs, the designer may specify materials with a lower vapour resistance, site the plywood on the inside of the studs or specify a high performance VCL.

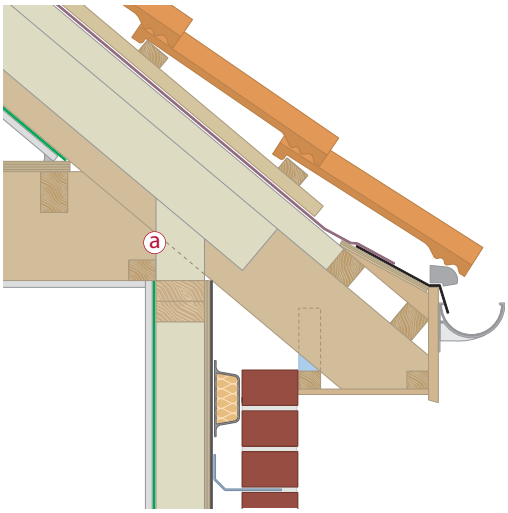
Condensation risk analysis to EN ISO 13788 should be carried out for all projects.

There is a risk of thermal bridging at the floor/wall junction: where Ballytherm insulation is being applied across the face of the studs it should be extended as far as the surface of the floor.

It is difficult to form a continuous layer of insulation at intermediate floors, but some control of thermal bridging may be achieved by packing Ballytherm insulation between the wall headers and the floor perimeter (figure 40).

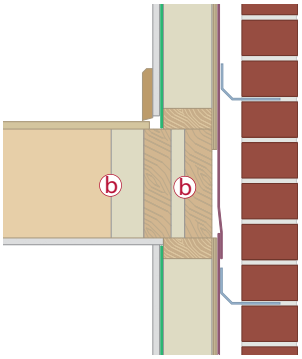
To avoid thermal bridging at doors and windows Ballytherm insulation must be butted tightly against horizontal and vertical members. Door and window reveals may also be lined with 20mm thick Ballytherm boards.

At the wall/roof junction continuity of insulation may be achieved by fitting Ballytherm insulation between the rafters to fill the gap between the wall plate and the underside of the roof insulation (figure 39).



Eaves

Figure 39



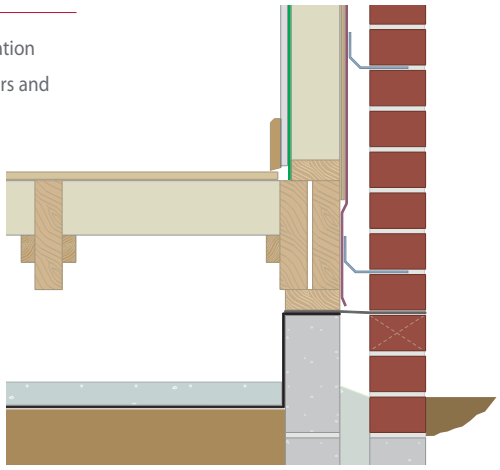
Intermediate floor

Figure 40

NOTES

a fill gap between wall and roof insulation

b pack insulation between wall headers and floor perimeter



Suspended timber floor

Figure 41

Design guidance

Fixings which penetrate wall insulation, such as wall ties or screws, will reduce the thermal performance of the insulation layer: the use of stainless steel fixings or plastic ties and fixings with small cross-sectional areas will minimise that effect.

Where flues from boilers and other heating appliances penetrate the walls precautions must be taken to avoid the hot pipe coming into contact with the insulation. There should either be a 25mm gap between the insulation and the flue - provided by a pipe sleeve - or a combination flue should be specified.

Sitework

Installation sequence (Ballytherm insulation between studs)

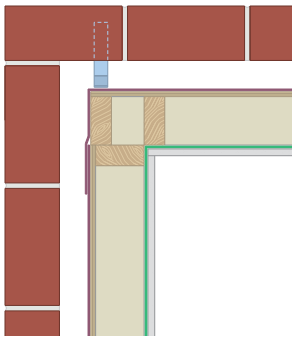
1. Cut Ballytherm insulation to size.
2. Set between studs.
3. Fix VCL and internal finish.

Installation sequence (Ballytherm insulation across the face of the studs)

1. Pack fibrous insulation between the studs
2. Set Ballytherm insulation across the face of the studs and tack in place.
3. Tape board joints with Ballytherm metalised tape.
4. Fix battens through Ballytherm insulation to studs.
5. Fix plasterboard to battens.

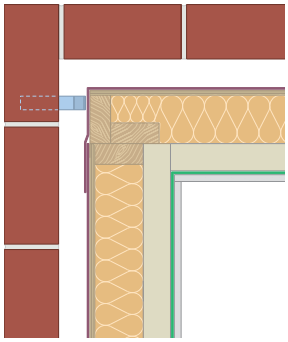
Points to watch

- Seal around services to reduce air leakage.



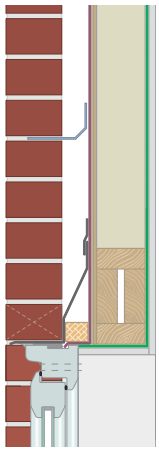
Corner - Ballytherm insulation between studs

Figure 42



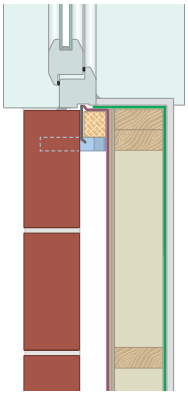
Corner - Ballytherm insulation on face of studs

Figure 43



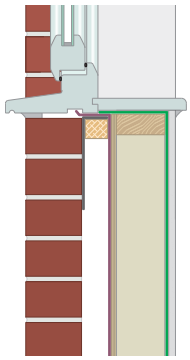
Window head

Figure 44



Window jamb

Figure 45



Window cill

Figure 46

Sitework
Ordering, supply and delivery

Ballytherm insulation may be ordered through your local builders' merchants or distributor.

Ballytherm insulation is supplied in shrink wrapped packs on pallets. For pack sizes see table 3.

Handling and storage

Store Ballytherm boards on a level surface supported on battens. Protect boards from moisture and direct sunlight.

Only unpack the quantity of boards required for the day's work. Take care not to knock and damage board edges and corners.

Working

Ballytherm insulation can be worked with normal hand tools and may be cut with a fine tooth saw or craft knife. Where a large amount of cutting is expected make arrangements for dust extraction.

Technical support

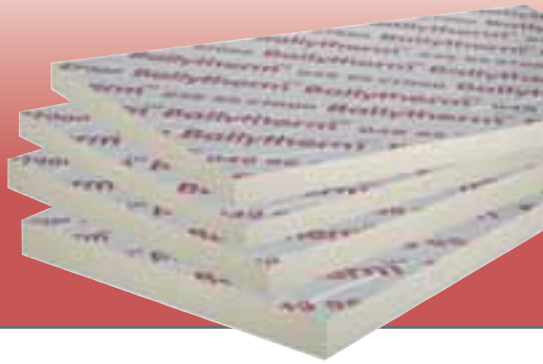
Ballytherm Ltd. offers designers and installers a full technical support service to advise them on the best way of utilising Ballytherm insulation in new build and renovation projects.

The service includes:

- Technical literature
- Copies of reports and certificates
- U-value calculations
- Condensation risk analysis
- Design advice
- Samples
- Site visits

Disclaimer: the information contained in this brochure is based on our best information at the time of issue, however Ballytherm Ltd, cannot accept any responsibility for errors or any liability out of the use of information provided on the material supplied.

References



References

Building regulations - England and Wales:

- Approved Document C Site preparation and resistance to contaminants and moisture.
- Approved Document L1A Conservation of fuel and power in new dwellings.
- Approved Document L1B Conservation of fuel and power in existing dwellings.
- Approved Document L2A Conservation of fuel and power in new buildings other than dwellings.
- Approved Document L2B Conservation of fuel and power in existing buildings other than dwellings.

Building regulations - Republic of Ireland

- Technical Guidance Document C - Site Preparation and Resistance to Moisture.
- Technical Guidance Document L - Conservation of Fuel and Energy - Dwellings.
- Technical Guidance Document L - Conservation of Fuel and Energy - Buildings other than dwellings.

Building regulations - Northern Ireland

- Technical booklet C Site preparation and resistance to moisture.
- Technical booklet F1 Conservation of fuel and power in dwellings.
- Technical Booklet F2 Conservation of fuel and power in buildings other than dwellings.

Building regulations - Scotland

- Technical handbook - domestic buildings, sections 3 and 6.
- Technical handbook - non-domestic buildings, sections 3 and 6.

Standards

- BS 5250: 2011. Code of practice for control of condensation in buildings.
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