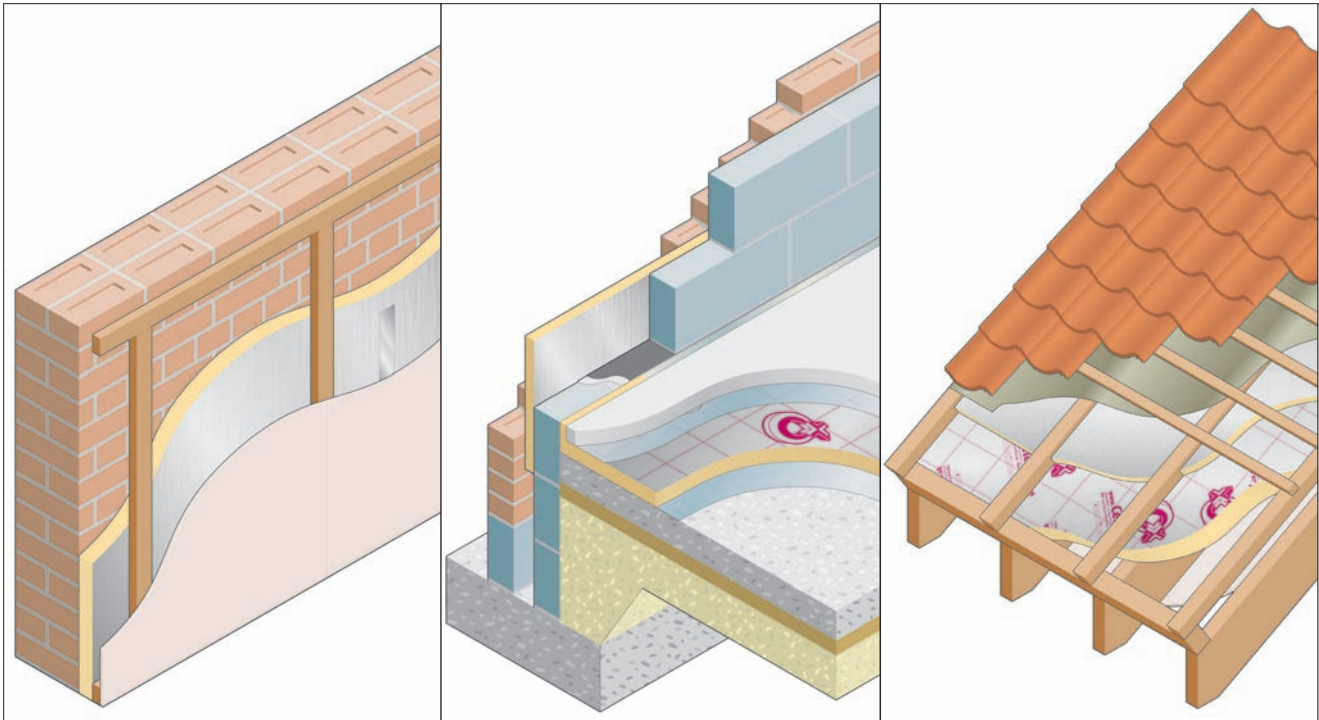


Designated by Government to issue European Technical Approvals

CELOTEX T-BREAK TB3000, TUFF-R GA3000, EXTRA-R XR3000 AND FAST-R FF3000

Isolation
Wärmedämmung

Product



- THIS CERTIFICATE RELATES TO CELOTEX T-BREAK TB3000, TUFF-R GA3000, EXTRA-R XR3000 AND FAST-R FF3000, RIGID POLYISOCYANURATE-MODIFIED POLYURETHANE FOAM BOARD WITH A FOIL/KRAFT/FOIL TRILAMINATE FACING ON BOTH SIDES.

- The products are manufactured and marketed by the Certificate holder. These Front Sheets must be read in conjunction with the accompanying Detail Sheets, which provide information specific to the particular boards and application.

Regulations

1 The Building Regulations 2000 (as amended) (England and Wales)

The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of thermal insulation with the Building Regulations. In the opinion of the BBA, Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: A1	Loading
Comment:	Floors incorporating these products can meet this Requirement. See the <i>Floor loading</i> section of the accompanying Detail Sheets.
Requirement: B3(2)	Internal fire spread (structure)
Comment:	When the products are used as an insulation in pitched roofs, junctions between roofs and compartment walls must be fire-stopped. See the tinted areas of the <i>Behaviour in relation to fire</i> section of the relevant accompanying Detail Sheets.
Requirement: B4(2)	External fire spread
Comment:	The products will not affect the external fire rating of a tiled or slated roof in which it is installed. See the relevant tinted area of the <i>Behaviour in relation to fire</i> section of the accompanying Detail Sheets.

Requirement:	C2(c)	Resistance to moisture
Comment:		The products used in wall, ceiling and floor application are acceptable. See the relevant tinted area of <i>Condensation</i> section of the accompanying Detail Sheets.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The products can enable or contribute to enabling a building meeting its Target Emission Rate. See the relevant tinted areas of the <i>Thermal insulation</i> section of the accompanying Details Sheets.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The products are acceptable. See the tinted areas of the <i>Durability</i> section of the accompanying Detail Sheets.

2 The Building (Scotland) Regulations 2004 (as amended)



In the opinion of the BBA, Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Mandatory Standards as listed below.

Regulation:	8	Fitness and durability of materials and workmanship
Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The products can contribute to a construction satisfying this Regulation. See the <i>Durability</i> section and <i>Installation</i> part of the accompanying Detail Sheets.
Regulation:	9	Building standards – construction
Standard:	1.1(b)	Structure
Comment:		Floors incorporating these products can meet this Standard. See the <i>Floor loading</i> section of the accompanying Detail Sheets.
Standard:	2.2	Separation
Standard:	2.4	Cavities
Standard:	2.8	Spread from neighbouring buildings
Comment:		When the products are used as an insulation in pitched roofs, junctions between roofs and compartment walls, separating walls or walls enclosing a protected zone must be fire stopped, with reference to clauses 2.2.7 ⁽¹⁾⁽²⁾ , 2.4.1 ⁽¹⁾ , 2.4.2 ⁽¹⁾ , 2.4.7 ⁽¹⁾ , 2.4.9 ⁽²⁾ and 2.6.5 ⁽¹⁾⁽²⁾ . See the tinted areas of the <i>Behaviour in relation to fire</i> section of the relevant accompanying Detail Sheets.
Standard:	3.15	Condensation
Comment:		The products used in wall/roof and floor applications can satisfy this Standard, with reference to clauses 3.15.1 ⁽¹⁾ , 3.15.3 ⁽¹⁾ and 3.15.4 ⁽¹⁾ . See the relevant tinted areas of the <i>Condensation</i> section of the accompanying Detail Sheets.
Standard:	6.1(1)(2)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		See the relevant tinted areas of the <i>Thermal insulation</i> section of the accompanying Detail Sheets.
Regulation:	12	Building standards – conversions
Comment:		All comments given for these products under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ .
		(1) Technical Handbook (Domestic).
		(2) Technical Handbook (Non-Domestic).

3 The Building Regulations (Northern Ireland) 2000 (as amended)



In the opinion of the BBA, Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The products are acceptable. See the tinted areas of the <i>Durability</i> section of the accompanying Detail Sheets.
Regulation:	C5	Condensation
Comment:		The products used in wall/ceiling and floor applications are acceptable. See the relevant tinted areas of the <i>Condensation</i> section of the accompanying Detail Sheets.
Regulation:	D1	Stability
Comment:		Floors incorporating these products can meet this Regulation. See the <i>Floor loading</i> section of the accompanying Detail Sheets.

Regulation:	E3	Internal fire spread — Structure
Comment:		Junctions between roofs and compartment walls must be fire-stopped. When the products are used as an insulated dry lining with the appropriate internal lining the construction may be used on the internal surfaces of buildings in every purpose group. See the tinted areas of the <i>Behaviour in relation to fire</i> section of the relevant accompanying Detail Sheets.
Regulation:	E4	External fire spread
Comment:		When the products are used as insulation in pitched roofs, the products will not affect the external fire rating of a tiled or slated roof in which it is incorporated. See the relevant tinted area of the <i>Behaviour in relation to fire</i> sections of the accompanying Detail Sheets.
Regulation:	F2(a)(i)	Conservation measures
Comment:		The products can meet or contribute to meeting this Regulation. See the relevant tinted areas of the <i>Thermal insulation</i> section of the accompanying Detail Sheets.

4 Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: *5 Delivery, storage and site handling* (5.3) of these Front Sheets and the *General (Installation)* section of the relevant Detail Sheets.

Technical Specification

5 Delivery and site handling

5.1 Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 is delivered to site in packs. Each pack contains a label bearing the manufacturer's name, board dimensions and the BBA identification mark incorporating the number of this Certificate. The batch number is also marked on each pack.

5.2 Boards should be stored off the ground on a clean, level surface and under cover to protect from precipitation and prolonged exposure to sunlight.

5.3 Care must be exercised when handling individual boards to avoid crushing the edges and

corners. Care must also be taken to avoid exposure to open flame or other ignition sources and contact with solvents and materials containing volatile organic components such as coal tar, pitch or timber newly treated with creosote

Additional Information

The management systems of Celotex Limited have been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2000 by SGS UK Ltd (Certificate No 91/504).

Bibliography

BS EN ISO 9001 : 2000 *Quality management systems — Requirements*

Conditions of Certification

6 Conditions

6.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

6.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

6.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine

- are reviewed by the BBA as and when it considers appropriate.

6.4 In granting this Certificate, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

6.5 Any information relating to the manufacture, supply, installation, use and maintenance of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.



In the opinion of the British Board of Agrément, Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000, are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 95/3197 is accordingly awarded to Celotex Limited.

On behalf of the British Board of Agrément

Date of Third issue: 13th November 2007

A handwritten signature in black ink, appearing to read 'G. A. Cooper', is written over a light grey background.

Chief Executive

**Original Front Sheet issued 31st March 1996. This amended version includes change of product names, reference to revised national Building Regulations, and new Conditions of Certification.*

British Board of Agrément

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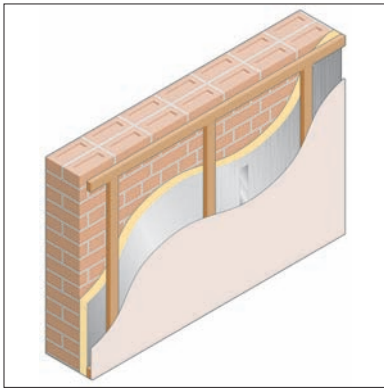
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website: www.bbacerfs.co.uk



For technical or additional information, contact the Certificate holder (see front page).
For information about the Agrément Certificate, including validity and scope, tel: Hotline 01923 665400, or check the BBA website.

Product



- THIS DETAIL SHEET RELATES TO CELOTEX T-BREAK TB3000 AND TUFF-R GA3000 (INSULATED DRY LINING).
- The products are for use in conjunction with appropriate internal lining boards as an insulating dry lining system to improve the thermal insulation of existing and new, solid or cavity masonry walls or timber-frame walls of dwellings or buildings of similar occupancy, type and conditions.
- The products may also be used in locations where the insulated surface is inaccessible, eg existing ceilings of flat roofs.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the Conditions of Certification.

Technical Specification

1 Description

1.1 Celotex T-Break TB3000 and tuff-R GA3000 (Insulated Dry Lining) are rigid polyisocyanurate-modified polyurethane foam board with a foil/kraft/foil tri-laminate facing on both sides. The boards are installed in conjunction with an appropriate lining panel, for example standard gypsum plasterboard to BS EN 520 : 2004.

1.2 The insulation boards are available in nominal dimensions⁽¹⁾ of:

length (mm)	2400
width (mm)	1200
thickness (insulation) (mm)	
TB3000	12-45
GA3000	50-100

(1) Other sizes may be available to special order.

1.3 Ancillary materials include large-headed nails, screws, washers, self adhesive aluminium foil and sealant.

Design Data

2 General

2.1 Celotex T-Break TB3000 and tuff-R GA3000 (Insulated Dry Lining) will significantly improve the thermal insulation of new and existing, solid or cavity masonry walls (masonry includes clay and calcium silicate bricks, concrete blocks, natural and reconstituted stone blocks) or timber-frame walls of dwellings and buildings of similar occupancy, type and condition.

2.2 The walls of new buildings should be designed and constructed in accordance with the

relevant codes of practice, eg BS 5628-3 : 2005 and BS 8000-3 : 2001.

2.3 All walls must be in a good state of repair with no evidence of rain penetration, damp or frost damage.

2.4 The surfaces of masonry walls should be sound and free from loose material; large projections should be removed and holes filled and levelled. A survey of the wall may be required to establish the extent of any packing that may be required to ensure the support battens provide a uniform plane for the boards to be fixed.

2.5 The installation of insulated dry lining systems requires careful detailing around doors and windows to achieve a satisfactory surface for finishing. In addition, every attempt should be made to minimise the risk of cold bridging at reveals and where heavy separating walls are attached to the external wall. In new work, the construction must be designed to accommodate the thickness of the dry lining, particularly at reveals, heads, sills and in relation to ceiling height. On existing walls consideration should be given to lining the reveals with a thinner layer of insulation and lining board.

2.6 Services can be incorporated in the void formed between the insulation and the lining boards, making chasing of the wall unnecessary. Where the services have a greater depth than the void, the wall should be chased in preference to the insulation. It is recommended that services penetrating the insulation or any vapour check lining board, eg light switches, power outlets, be kept to a minimum to limit possible penetration of water vapour.

2.7 When the products are to be installed in existing buildings it should be realised that a small reduction in room size will occur and that permanent fixtures, eg baths, will present difficulties.

3 Thermal insulation

3.1 Calculations of the thermal transmittance (U value) of a specific construction using insulated dry lining should be carried out in accordance with BS EN ISO 6946 : 1997 and BRE report (BR 443 : 2006) *Conventions for U-value calculations*, using the declared ($\lambda_{90/90}$ value) thermal conductivity of $0.023 \text{ Wm}^{-1}\text{K}^{-1}$ for the dry lining, comprising a PIR board with composite Kraft paper facings. The U value of a typical wall construction will depend on the insulation value of the wall and its finish. Example U values are given in Table 1.

Table 1 Example U values ($\text{Wm}^{-2}\text{K}^{-1}$)

Insulation thickness (mm)	U value ($\text{Wm}^{-2}\text{K}^{-1}$)
40	0.38
60	0.28
80	0.23

Note:

- Gypsum plaster, thickness 13 mm (λ 0.51 $\text{Wm}^{-1}\text{K}^{-1}$), CIBSE Guide A : 2006 *Environmental design*, Table 3.38.
- Timber battens, softwood, thickness 22 mm (λ 0.13 $\text{Wm}^{-1}\text{K}^{-1}$), CIBSE Guide A, Table 3.39.
- Gypsum plasterboard, thickness 12.5 mm (λ 0.16 $\text{Wm}^{-1}\text{K}^{-1}$), CIBSE Guide A, Table 3.38.



3.2 Subject to the selection of an appropriate insulation thickness and construction, the product can contribute to a wall construction achieve the following design U values:

England and Wales and Northern Ireland

- $0.30 \text{ Wm}^{-2}\text{K}^{-1}$ standard for new thermal elements such as those constructed as part of an extension specified in Approved Documents; L1B (Table 4), L2B (Table 6)
- $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ thermal elements constructed as replacements for existing elements as specified in Approved Documents; L1B (Table 4), L2B (Table 6).
- $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ required for 'notional' dwellings in SAP 2005 and buildings other than dwellings in SBEM
- $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ limit average U value specified in Approved Documents; L1A (Table 2), L2A (Table 4), Technical Booklets F1 (Table 2.2) and F2 (Table 2.4)
- $0.70 \text{ Wm}^{-2}\text{K}^{-1}$ limit U value for an individual element specified in Approved Document L1A (Table 2), L2A (Table 4), Technical Booklets F1 (Table 2.2) and F2 (Table 2.4).

Scotland

- $0.20 \text{ Wm}^{-2}\text{K}^{-1}$ U value required for the 'simplified approach – solid fuel package 6' 'notional' dwelling in Mandatory Standard 6.1, clause 6.1.6⁽¹⁾ (see section 3.3)
- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ required for 'notional' dwellings in SAP 2005 (for Scotland) and the 'simplified approach – packages 1 to 5' in Mandatory Standard 6.1, clause 6.1.6⁽¹⁾
- $0.27 \text{ Wm}^{-2}\text{K}^{-1}$ maximum U value for building elements of the insulation envelope for extensions

or reconstruction of elements, in Mandatory Standard 6.2, clauses 6.2.9⁽¹⁾, 6.2.10⁽²⁾, 6.2.11⁽¹⁾ and 6.2.12⁽²⁾

- $0.30 \text{ Wm}^{-2}\text{K}^{-1}$ limit average specified in Mandatory Standard 6.2, clause 6.2.1⁽¹⁾⁽²⁾
- $0.70 \text{ Wm}^{-2}\text{K}^{-1}$ limit for an individual element specified in Mandatory Standard 6.2, clauses 6.2.1⁽¹⁾⁽²⁾, 6.2.9⁽¹⁾ and 6.2.10⁽²⁾.

Technical Handbook (Domestic).

Technical Handbook (Non-Domestic).

3.3 Where a proposed wall U value is greater than, the 'notional' value specified in section 3.2 additional energy saving measures will be required in the building envelope and/or services to achieve the required overall carbon dioxide emission rate reduction of about 20% in dwellings (18% to 25% in Scotland) and 23% to 28% in buildings other than dwellings.

3.4 Compliance with the guidance referred in section 3.5 will allow the use of the default psi values from Table 3 of BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings* and Table K1 of *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* (SAP 2005), in Target Emission Rate calculations to SAP 2005 or the Simplified Building Energy Model (SBEM)⁽¹⁾.

(1) Use 'simplified approach' for Scotland



3.5 The product can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between the external wall and other building elements. Guidance in this respect, and on limiting heat loss by air infiltration, can be found in:

England and Wales

Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings TSO 2002.

Scotland

Accredited construction details (Scotland)

Northern Ireland

Accredited Construction Details (version 1.0).

4 Condensation

4.1 It can be shown by calculations that it is feasible to design dry-lined walls and ceilings that will not suffer from condensation within the structure. However, when using the boards as a vapour control layer, consideration must be taken in the overall installation to minimise perforations by services. Joints at wall/ceiling and wall/floor level must be well sealed.

4.2 As with other types of insulation applied to the inside of a wall, there may be a risk of cold bridging from the floors or ceilings, particularly in concrete slab construction. It has been demonstrated that the use of coving at the wall ceiling joint will significantly reduce this risk.

Surface condensation



4.3 Walls will limit the risk of surface condensation adequately when the thermal transmittance (U value) does not exceed $0.7 \text{ Wm}^{-2}\text{K}^{-1}$ at any point, and the junctions with other elements are designed in accordance with the relevant requirements of TSO publication (see section 3.4 of this Certificate) or of BRE Information Paper IP 1/06.



4.4 Walls and ceilings will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $1.2 \text{ Wm}^{-2}\text{K}^{-1}$ at any point. Guidance may be obtained from Section 8 of BS 5250 : 2002 and BRE report (BR 262 : 2002) *Thermal insulation : avoiding risks*.

4.5 Insulated dry lining has been used successfully in the rehabilitation of buildings suffering from surface condensation of walls where the dampness has been caused by the lack of thermal insulation.

Interstitial condensation



4.6 Walls incorporating the products will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2002 (Section 8 and Annex D).

4.7 The boards have a minimum water vapour resistance of 150 MNsg^{-1} and will therefore provide a significant resistance to water vapour transmission, provided that all joints between the boards are taped in accordance with the Certificate holder's literature.

5 Infestation

The use of the products do not in itself promote infestation. The creation of voids within the structure, ie gaps between the wall lining and the boards, may provide habitation for insects or vermin in areas already infested. Care should be taken to ensure, wherever possible, that all voids are sealed, as any infestation may be difficult to eradicate. There is no food value in the materials used.

6 Behaviour in relation to fire

6.1 When properly installed, the insulation will be contained between the wall and internal lining board until one is destroyed. Therefore, the insulation will not contribute to the development stages of a fire or present a smoke or toxic hazard.

6.2 With regard to the national Building Regulations the product can be used in all situations requiring a Class 0 surface where the lining board has a Class 0 surface. Details of such situations are contained in the relevant documents.

6.3 Recessed lighting must not be used in ceilings with this form of insulation.

7 Proximity of flues and appliances

When installing the products in close proximity to certain flue pipes and/or heat-producing appliances, the relevant provisions of the national Building Regulations are acceptable:

England and Wales

Approved Document J

Scotland

Mandatory Standard 3.19

Northern Ireland

Technical Booklet L.

8 Impact resistance

Impact damage would be no greater than would be expected from the internal lining alone.

9 Materials in contact – wiring installations

The boards do not present a risk of reaction between them and PVC insulated electric cables when they are in contact. As with any other form of insulation, de-rating of electrical cables should be considered where the insulation restricts the air cooling of cables.

10 Wall-mounted fittings

The recommendations of the Certificate holder should be followed. Any object fixed to the wall, other than lightweight items, eg framed pictures, should be fixed through the lining board, timber battens and insulation into the wall behind, using recommended proprietary fixings. Ceiling fixtures will require longer screws to secure them to the structure.

11 Durability



The durability of the boards is satisfactory. Provided they are used in accordance with the Certificate holder's instructions, and are fixed to satisfactory stable and durable backgrounds by fully trained site labour, they should have a life equal to that of the building in which they are installed. Under normal conditions of occupancy the wall lining is unlikely to suffer damage, but if damage does occur repairs can be carried out.

Installation

12 General

12.1 It is recommended that Celotex T-Break TB3000 and tuff-R GA3000 (Insulated Dry Lining) are installed by trained dry lining operatives.

12.2 The boards are for installation on internal walls and ceilings.

12.3 Installation should be in accordance with good dry lining practice and the relevant parts of the Certificate holder's literature, which should be referred to for a detailed description of the method of installation.

12.4 Before fixing the products, sufficient time must be allowed for the dispersion of solvents contained in some wood preservatives and damp-proofing treatments where applied. Backgrounds should be allowed to dry out before fixing the system.

12.5 All installations of insulated dry lining require careful planning and setting out.

13 Procedure

13.1 The wall is surveyed to establish its flatness and suitability for receiving the system. This system may be used on any stable, dry walls capable of taking the fixings for the timber battens.

13.2 The insulation boards are cut to fit and placed against the wall; joints and perforations are sealed with self-adhesive aluminium foil tape. The insulation boards are temporarily secured in place. Permanent fixing is provided by the timber battens and internal lining board with suitable mechanical fixings (see Figures 1 and 2). The timber battens are placed against the insulation boards and mechanically fixed through the insulation into the wall substrate.

13.3 The battens must be of sufficient thickness (greater than 25 mm) and spacing (up to 600 mm) to provide adequate grounds to which the lining board can be fixed, and provide for any services that are to be incorporated into the void between the insulation board and lining board. Horizontal battens should be fitted at the top and bottom of walls and openings.

13.4 It is recommended that the timber battens be treated with preservative.

13.5 Jointing and finishing of the lining is carried out in the appropriate manner. Timber skirting can be fixed into the horizontal batten at floor level.

Timber-frame walls

13.6 Insulation boards may be cut to fit and placed against the timber frame with joints and perforations sealed with self-adhesive aluminium foil tape. Temporary fixing may be achieved with large-headed clout nails. The lining board may then be mechanically fixed through insulation and into the timber frame in the conventional manner. Alternatively, timber battens may first be fixed over the insulation boards to create a service void, if required.

Figure 1 General configuration

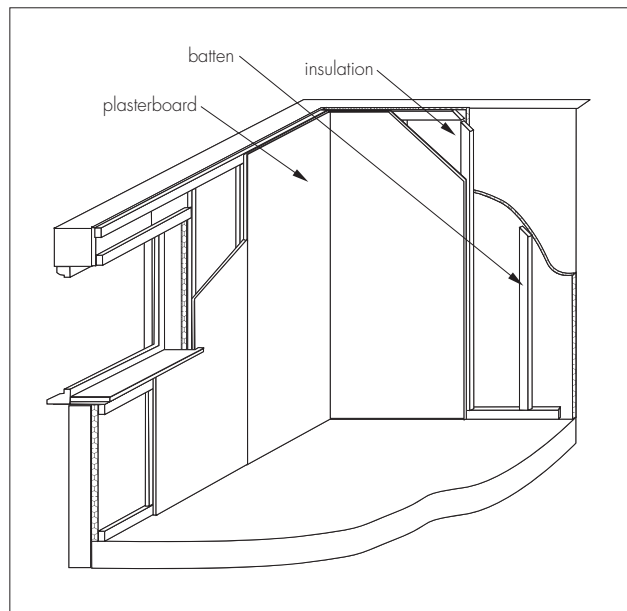
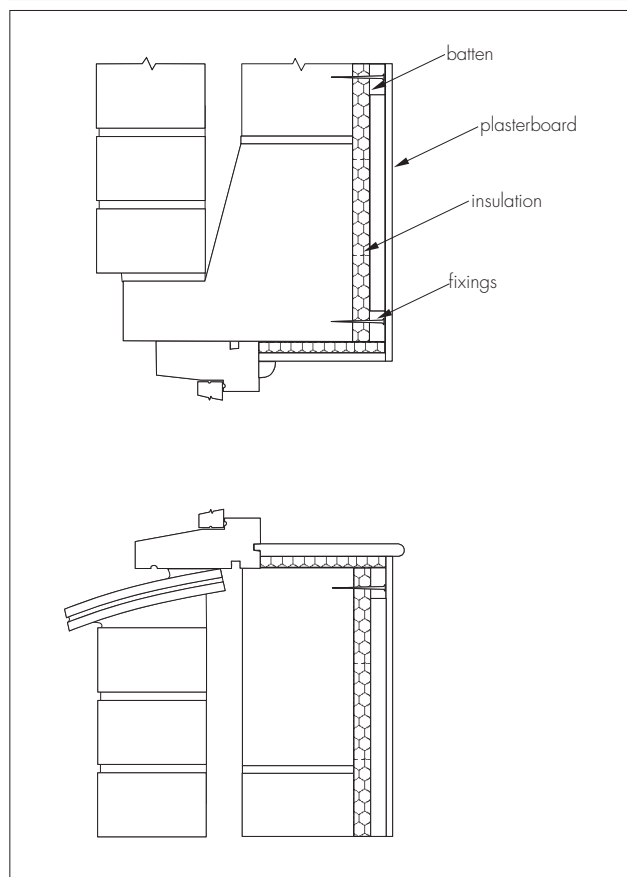


Figure 2 Opening detail



Technical Investigations

The following is a summary of the technical investigations carried out on Celotex T-Break TB3000 and tuff-R GA3000 (Insulated Dry Lining).

14 Tests

Tests were carried out to determine thermal conductivity.

15 Investigations

An examination was made of data relating to:

- dimensional accuracy
- density
- compressive strength
- thermal conductivity
- vapour resistance.

16 Other investigations

16.1 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

16.2 A theoretical analysis of the hygrothermal behaviour of various installations was carried out.

Bibliography

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

BS 5628-3 : 2005 *Code of practice for the use of masonry — Materials and components, design and workmanship*

BS 8000-3 : 2001 *Workmanship on building sites — Code of practice for masonry*

BS EN 520 : 2004 *Gypsum plasterboards — Definitions, requirements and test methods*

BS EN ISO 6946 : 1997 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*



On behalf of the British Board of Agrément

Date of Third issue: 13th November 2007

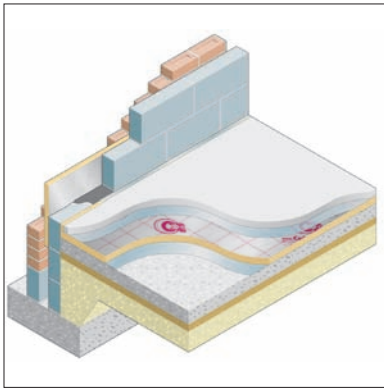
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Chief Executive

**Original Detail Sheet issued on 31st March 1996. This amended version includes change of product names, reference to revised national Building Regulations and British Standards, updated Thermal insulation and Condensation sections.*



Product



- THIS DETAIL SHEET RELATES TO CELOTEX T-BREAK TB3000, TUFF-R GA3000, EXTRA-R XR3000 AND FAST-R FF3000 (FLOORING INSULATION).
- The products are for use on ground-supported or suspended concrete or timber floors and also for use with exposed or semi-exposed intermediate concrete or timber floors.
- The products are used to reduce the thermal transmittance of new or existing floors of dwellings or buildings of similar occupancy, type and condition.
- It is essential that the floors comply with the conditions set out in the Design Data and Installation parts of this Certificate.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the Conditions of Certification.

Technical Specification

1 Description

Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation) are rigid polyisocyanurate-modified polyurethane foam boards with a foil/kraft/foil tri-laminate facing on both sides. The boards are available in nominal dimensions given in Table 1.

Table 1 Nominal dimensions

	Board type			
	TB3000	GA3000	XR3000	FF3000
Length (mm)	2400	2400	2400	1200
Width (mm)	1200	1200	1200	600
Thickness (mm)	12-45	50-100	110-200	50-150

Design Data

2 General

2.1 Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation) are effective in reducing the U value (thermal transmittance) of new or existing concrete or timber floors.

2.2 Ground-supported floors incorporating the boards must include a suitable damp-proof membrane, laid in accordance with the relevant sections of CP 102 : 1973 , BS 8102 : 1990 and/or BS 8215 : 1991 (see section 4 of this Detail Sheet).

2.3 Suspended concrete or timber ground floors incorporating the boards must include suitable ventilation of the sub-floor void or a damp-proof membrane (see section 4).

2.4 The overlay to the boards should be:

- a floor screed, laid in accordance with the relevant clauses of BS 8204-1 : 2003 and BS 8204-2 : 2003, or
- wood-based floor, eg tongue-and-groove plywood 16 mm thick (minimum) to BS EN 636 : 2003, flooring grade particle board (Types P4 to P7) to BS EN 312 : 2003 or oriented strand board of types OSB/2 to OSB/4 to BS EN 300 : 1997, 18 mm thick (minimum), installed in accordance with DD ENV 12872 : 2000, or
- a concrete slab.

3 Behaviour in relation to fire

3.1 The boards do not prejudice the fire resistance properties of the floor.

3.2 When properly installed on concrete or timber floors the boards will not add significantly to any existing fire hazard. The boards will be contained within the floor by the overlay until the overlay itself is destroyed and therefore, will not contribute to the development stages of a fire or present a smoke or toxic hazard.

4 Moisture penetration

4.1 The boards are not a water vapour control layer, however, they will not allow moisture to cross the completed floor construction.

4.2 For floors subject to national Building Regulations, construction should be as detailed or designed in accordance with:

England and Wales

Approved Document C, Technical Solutions 4.13 to 4.20

Scotland

Mandatory Standard 3.4, clauses 3.4.2⁽¹⁾⁽²⁾ to 3.4.4⁽¹⁾⁽²⁾ and 3.4.6⁽¹⁾⁽²⁾

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland

Technical Booklet C, Section 1.

5 Thermal performance


5.1 Calculations of the thermal transmittance (U value) of a floor should be carried out in accordance with BS EN ISO 6946 : 1997, BS EN ISO 13370 : 1998 and BRE report (BR 443 : 2006) *Conventions for U-value calculations* using the declared thermal conductivity ($\lambda_{90/90}$ value) of the insulation of $0.023 \text{ Wm}^{-1}\text{K}^{-1}$.

5.2 The U value of a floor will depend on the thickness of the board, the perimeter/area ratio and the floor type. Examples of U values are given in Table 1. This table is for use as guidance only, a detailed calculation should be carried out for each proposed application.

Table 1 Floor U values⁽¹⁾ ($\text{Wm}^{-2}\text{K}^{-1}$)

Floor type	Perimeter/area ratio	Insulation thickness (mm)			
		25	50	70	75
Slab on ground supported	0.2	0.24	0.19	0.16	0.15
	0.4	0.35	0.25	0.20	0.19
	0.6	0.41	0.28	0.22	0.21
	0.8	0.45	0.30	0.24	0.23
Suspended beam and block	1.0	0.47	0.31	0.25	0.23
	0.2	0.25	0.20	0.17	0.16
	0.4	0.33	0.24	0.20	0.19
	0.6	0.37	0.26	0.21	0.20
Suspended timber	0.8	0.40	0.28	0.22	0.21
	1.0	0.42	0.29	0.23	0.22
	0.2	0.29	0.24	0.21	0.20
	0.4	0.39	0.30	0.25	0.24
	0.6	0.44	0.32	0.27	0.26
	0.8	0.48	0.34	0.28	0.27
	1.0	0.50	0.36	0.29	0.28

(1) Excluding edge insulation for the ground-supported floor system.

 5.3 Subject to the selection of an appropriate construction, P/A ratio and insulation thickness, a floor construction can contribute to achieving the following design U values:

England and Wales and Northern Ireland

- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ required for 'notional' dwellings in SAP 2005
- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ limit average specified in Approved Documents L1A (Table 2), and Technical Booklet F1 (Table 2.2)
- $0.70 \text{ Wm}^{-2}\text{K}^{-1}$ limit for an individual element specified in Approved Documents L1A (Table 2), and Technical Booklets F1 (Table 2.2).

Scotland

- $0.20 \text{ Wm}^{-2}\text{K}^{-1}$ required for the 'simplified approach' — solid fuel packages 3 and 6 'notional' dwelling
- $0.22 \text{ Wm}^{-2}\text{K}^{-1}$ required for 'notional' dwellings in SAP 2005 (for Scotland) and the 'simplified approach' — packages 1, 2, 4 and 5' in Mandatory Standard 6.1, clause 6.1.2⁽¹⁾⁽²⁾
- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ required for notional dwellings as described in Mandatory Standard 6.1, clause 6.1.6⁽¹⁾
- $0.22 \text{ Wm}^{-2}\text{K}^{-1}$ for extensions the value described by the Table to Mandatory Standard 6.2, clauses 6.2.9⁽¹⁾ and 6.2.10⁽²⁾
- $0.70 \text{ Wm}^{-2}\text{K}^{-1}$ limit for an individual element specified in Mandatory Standard 6.2, clause 6.2.1⁽¹⁾.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

5.4 Where a proposed floor U value is not greater than the relevant 'notional' value specified in section 5.3, additional energy saving measures will be required in the building envelope and/or services to achieve the required overall carbon dioxide emission rate reduction of about 20% in dwellings (18% to 25% in Scotland).

5.5 Compliance with the guidance referred to in section 5.6 will allow the use of the default psi values from Table 3 of BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings* and Table K1 of *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* (SAP 2005), in Target Emission Rate calculations to SAP 2005 or the simplified approach in Scotland.

5.6 The product can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between the external wall and other building elements. Guidance in this respect, and on limiting heat loss by air infiltration, can be found in:

England and Wales

Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings TSO 2002.

Scotland


Accredited Construction Details (Scotland)

Northern Ireland

Accredited Construction Details (version 1.0).

6 Condensation

Surface condensation

 6.1 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $0.7 \text{ Wm}^{-2}\text{K}^{-1}$ at any point, and the junctions with walls are designed in accordance with the relevant

requirements of *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings*, TSO 2002 or BRE Information Paper IP 1/06.



6.2 Floors will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $1.2 \text{ Wm}^{-2}\text{K}^{-1}$ at any point. Guidance may be obtained from Section 8 of BS 5250 : 2002 and BRE report (BR 262 : 2002) *Thermal insulation: avoiding risks*.

Interstitial condensation



6.3 Floors will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2002, Section 8.5 and Appendix D.

6.4 When the products are used above the damp-proof membrane on a ground-supported floor, or on a beam-and-block floor, a vapour control layer is installed on the warm side of the insulation to inhibit the risk of interstitial condensation on the upper slab surface.

6.5 For a timber suspended ground floor, it is not necessary to introduce a vapour control layer as long as adequate sub-floor cross ventilation is provided.

7 Floor loading

7.1 The design loadings for self-contained dwelling units as defined in BS 6399-1 : 1996 are:

intensity of distributed load (kPa)	1.5
concentrated load (kN)	1.4



7.2 The insulation boards covered with particle board or screed can support these design loadings without undue deflection.

7.3 A BRE survey of imposed floor loading in domestic buildings (see BRE current paper No 2/77 *Floor loadings in domestic buildings — the results of a survey*) indicates that loadings in flats are commonly in the region of 0.6 kPa and loadings of 1.5 kPa are normally associated with fixed items.

7.4 Where the boards are used under a concrete slab, resistance to concentrated and distributed loads is a function of the slab specification.

8 Durability



The boards are rot-proof, dimensionally stable and, when installed with the overlays specified in this Detail Sheet, will remain effective as an insulating material for the life of the building in which they are incorporated.

Installation

9 General

9.1 Typical methods of installing Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation) are shown in Figures 1 and 2. Reference should also be made to BR 262 : 2002.

Figure 1 Ground supported concrete floor

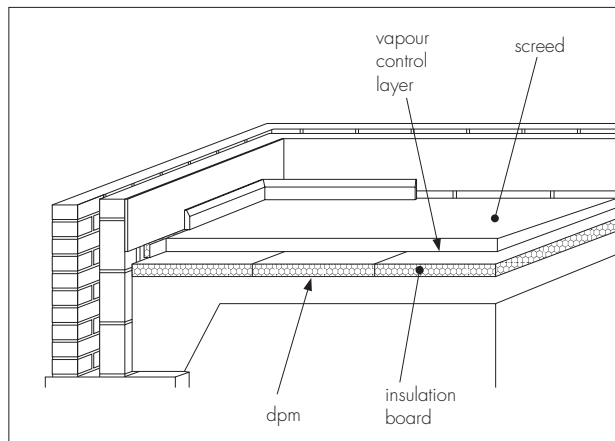
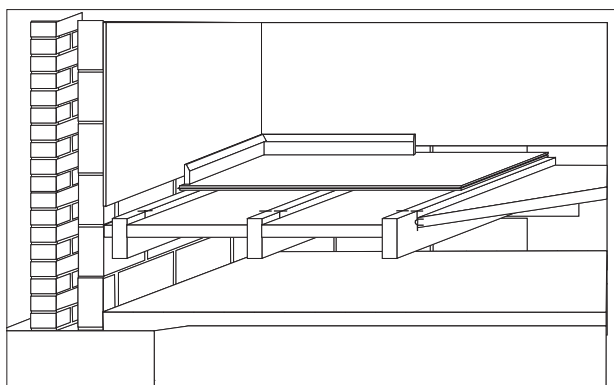


Figure 2 Suspended timber floor



9.2 The concrete floor over which the boards are to be laid should be left for as long as possible to maximise drying out and dissipation of constructional moisture.

9.3 The floor surface should be smooth and flat to within 5 mm when measured with a two-metre straight-edge. Irregularities greater than this must be removed. Minor irregularities (up to 10 mm deep) may be levelled with mortar.

9.4 The boards can be used on a beam and block suspended concrete floor that is the subject of a current Agrément Certificate and installed in accordance with, and within the limitations imposed by, that Certificate. Where the board is laid over a suspended block and beam floor a levelling screed or compound may be required.

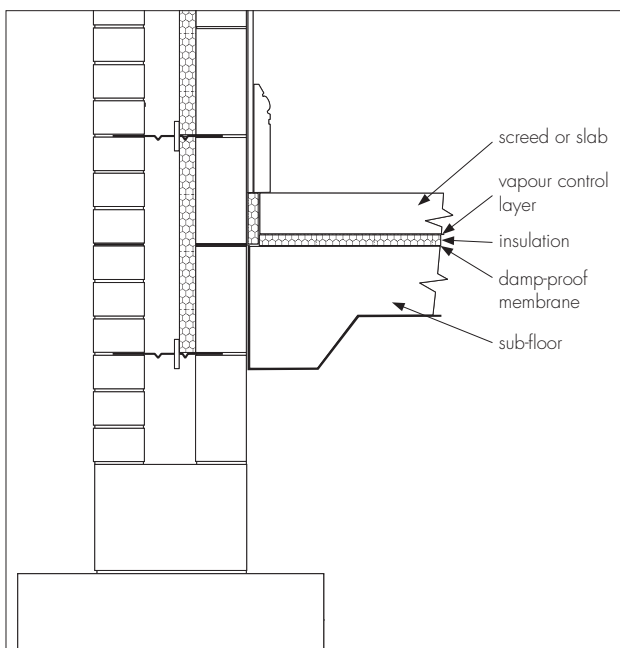
9.5 Where the boards are used over ground-supported concrete floor slabs a suitable damp-proof membrane, for example, in accordance with CP 102 : 1973, should be incorporated to resist moisture from the ground. If a liquid-type damp-

proof membrane is applied to the slabs, it should be of a type compatible with the boards and be allowed to dry out fully before laying the boards.

9.6 Where the boards are used on hard core bases under ground-supported concrete slabs, the hardcore must be blinded and a dpm laid over before the boards are laid.

9.7 Where a screed or concrete slab is laid over the product, vertical upstands of insulation should be provided and be of sufficient depth to fully separate the screed or slab from the wall. In addition, a polyethylene vapour check (minimum 0.125 mm thick) should be laid over the boards with 150 mm laps and turned up at abutments before laying the screed or slab (see Figure 3).

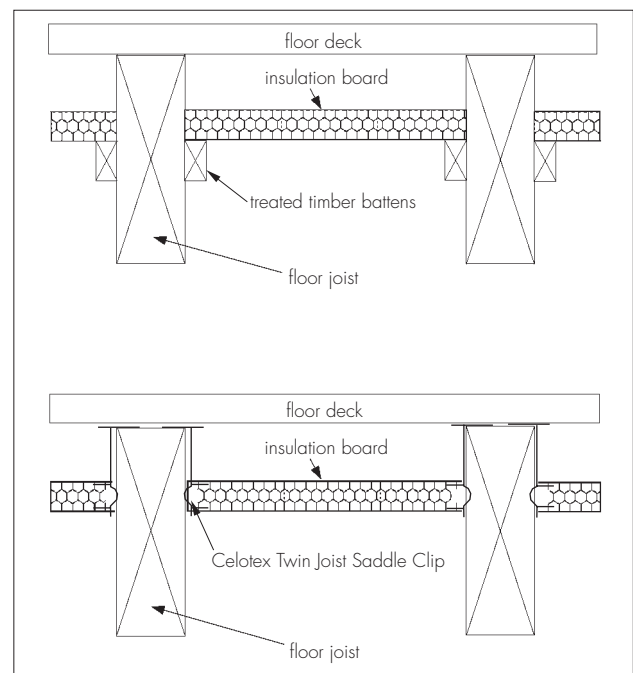
Figure 3 Ground supported floor



9.8 To limit the risk of damage from condensation and other sources of dampness, the boards and the overlay should only be laid after the construction is made substantially weathertight, eg after glazing. The boards must also be protected from water spillage, plaster droppings, traffic, during construction.

9.9 Boards are installed between floor joists using Celotex insulation saddle clips or timber stop beads. Tongue-and-groove particle board flooring or softwood floor boarding is then installed in the conventional manner (see Figure 4).

Figure 4 Suspended timber floors



10 Procedure

10.1 The boards are cut to size, as necessary, and laid with closely butted joints.

Screed overlay

10.2 A polyethylene vapour control layer, minimum 0.125 mm thick, is laid over the boards with 150 mm laps. A properly-compacted screed of mean thickness 65 mm is then laid over. The relevant clauses of BS 8204-1 : 2003 or BS 8204-2 : 2003 should be followed and BRE *Building Elements, floors and flooring*, chapter 4.2, should be consulted.

Particle board or oriented strand board (OSB) overlay

10.3 Before laying the boards, preservative-treated battens, in accordance with BS 1282 : 1999, are positioned at doorways and to support partitions. Adequate time should be allowed for CCA-based preservatives to be fixed, and the solvents from solvent-based preservatives to evaporate.

10.4 Tongue-and-groove particle board Grade P4 to P7 or OSB/3 or OSB/4, 18 mm thick, to the relevant clauses in DD ENV 12872 : 2000 is laid with staggered cross-joints.

10.5 An expansion gap between the particle board and the perimeter walls should be provided at the rate of 2 mm per metre run or a minimum of 10 mm, whichever is the greater.

10.6 Where there are long, uninterrupted lengths of floor, eg corridors, proprietary expansion joints should be installed at intervals on the basis of a 2 mm gap per metre run of particle board.

10.7 Before the boards are interlocked, either a PVA or panel adhesive is applied to the joints.

10.8 Once the particle board is laid, temporary wedges are inserted between the walls and the floor to maintain tight joints until the adhesive has set.

10.9 To prevent cold-bridging a suitable compressible filler, eg pieces of insulation, should be fitted around the perimeter of the floor between the particle board and the walls when the wedges are removed and before the skirting boards are affixed.

10.10 Where there is a likelihood of regular water spillage (such as kitchens, bathrooms, shower and utility rooms), additional particle board protection may be considered, eg by the use of flexible vinyl sheet flooring with welded joints and cove skirtings.

Concrete slab overlay (ground-bearing only)

10.11 Perimeter edge pieces are cut and placed around the edges and taped at joints. A vapour control layer, minimum 0.125 mm thick, is laid over the boards with 150 mm laps. The concrete slab is laid to the required thickness.

Timber floors

10.12 Insulation boards can be supported between timber joists using either Celotex insulation clips or timber beads. Where timber beads are used, a void may be incorporated above the insulation to accommodate services, if required.

10.13 Boards are cut to size to fit tightly between the joists. The clip spikes are pressed into the long edges of the board, ensuring the flange sits flat on the face of the board (see Figure 4). Clips should be fitted at one metre intervals. The board is then pushed into place until the clip is level with the surface of the joist. For additional security, the clip can be fixed to the joist with a small flat head nail driven through the flange of the clip.

10.14 Where a service void is required above the insulation, preservative-treated timber beads may be used to retain the boards. Beads should be

wide enough to retain the boards in place and secured with corrosion-protected nails at a depth that will accommodate the thickness of the insulation board and leave a suitable depth void (minimum 25 mm) between the top of the insulation and the underside of the flooring deck. Boards are cut to fit between the joists and pushed down onto the beads.

11 Incorporation of services

11.1 The maximum continuous working temperature of the boards is 100°C. De-rating of electrical cables should be considered where installation restricts air cooling of cables. Where underfloor heating systems are to be used, the advice of the Certificate holder should be sought.

11.2 Where the boards are installed on a floor of a suspended beam and block design, all services must be installed in accordance with the Agrément Certificate for that floor.

11.3 Where possible, electrical conduits, gas and water pipes or other services should be contained within ducts or channels within the concrete slab. Where this is not possible, the services may be accommodated within the insulation, provided they are securely fixed to the concrete slab (see section 3.2). Electric cables should be enclosed in a suitable conduit. With hot pipes the insulation must be cut back to maintain an air space.

11.4 Where water pipes are installed below the insulation they should be pre-lagged. Generally, insulation will be relatively thin so it would not be possible to install pipes within the insulation. Pipes installed above the insulation will not require lagging, although some provision needs to be made for expansion and contraction.

11.5 For floors incorporating particle board overlays, where access to the services is desirable, a duct may be formed by mechanically fixing to the floor timber bearers of the same thickness as the insulation to provide support for a particle board cover. The duct should be as narrow as possible and not exceed 400 mm in width without intermediate support.

11.6 On intermediate/exposed floors all the services should be incorporated beneath the existing floor, above the insulation if possible.

Technical Investigations

The following is a summary of the technical investigations carried out on Celotex T-Break TB3000, tuff-R GA3000, Extra-R XR3000 and fast-R FF3000 (Flooring Insulation).

16 Tests

Tests were carried out to determine:

- load compression characteristics
- effect of cyclic loading
- thermal conductivity
- compressive strength.

17 Investigations

17.1 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

17.2 An examination was made of data relating to:

- thermal conductivity (fresh and aged)
- dimensional accuracy
- dimensional stability
- water vapour resistance
- compressive strength at 10% compression
- density
- fire risk.

17.3 An assessment of the risk of interstitial condensation in typical constructions was made.

Bibliography

BS 1282 : 1999 *Wood preservatives — Guidance on choice, use and application*

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

BS 6399-1 : 1996 *Loading for buildings — Code of practice for dead and imposed loads*

BS 8102 : 1990 *Code of practice for protection of structures against water from the ground*

BS 8204-1 : 2003 *Screeds, bases and in-situ floorings — Concrete bases and cement sand levelling screeds to receive floorings — Code of practice*

BS 8204-2 : 2003 *Screeds, bases and in-situ floorings — Concrete wearing surfaces — Code of practice*

BS 8215 : 1991 *Code of practice for design and installation of damp-proof courses in masonry construction*

BS EN 300 : 1997 *Oriented Strand Boards (OSB) — Definitions, classification and specifications*

BS EN 312 : 2003 *Particleboards — Specifications*

BS EN 636 : 2003 *Plywood — Specifications*

BS EN ISO 6946 : 1997 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

BS EN ISO 13370 : 1998 *Thermal performance of buildings — Heat transfer via the ground — Calculation methods*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

DD ENV 12872 : 2000 *Wood-based panels — Guidance on the use of load-bearing boards in floors, walls and roofs*



On behalf of the British Board of Agrément

Date of Third issue: 13th November 2007

A handwritten signature in black ink, appearing to read 'G. A. Cooper', is positioned to the right of the date.

Chief Executive

**Original Detail Sheet issued on 31st March 1996. This amended version includes change of product names, reference to revised national Building Regulations and British Standards and updated Thermal insulation and Condensation sections.*



Celotex Limited

CELOTEX T-BREAK TB3000, TUFF-R GA3000 AND EXTRA-R XR3000 (PITCHED ROOF INSULATION)

Certificate No 95/3197

DETAIL SHEET 3

Third issue*

Product



- THIS CERTIFICATE RELATES TO CELOTEX T-BREAK TB3000, TUFF-R GA3000 AND EXTRA-R XR3000 (PITCHED ROOF INSULATION).
- The products are for use as insulation above, between and/or below rafters in tiled or slated pitched roofs designed and constructed in accordance with the relevant clauses of BS 5534 : 2003.
- The boards are for use where the ceiling follows the pitch of the roof and encloses a habitable space, or where the ceiling is horizontal and encloses a loft space.
- The products must be used in conjunction with a suitable water vapour permeable roof tile underlay.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the Conditions of Certification.

Technical Specification

1 Description

1.1 Celotex T-Break TB3000, tuff-R GA3000 and Extra-R XR3000 (Pitched Roof Insulation) are rigid polyisocyanurate-modified polyurethane foam board with a foil/kraft/foil tri-laminate facing on both sides and are available in nominal dimensions given in Table 1.

Table 1 Nominal dimensions

	Board type		
	TB3000	GA3000	XR3000
Length (mm)	2400	2400	2400
Width (mm)	1200	1200	1200
Thickness (mm)	12-45	50-100	110-200

1.2 Ancillary products used with the boards are:

- roof tile underlay — fully-supportable vapour permeable and the subject of a current Agrément Certificate
- aluminium foil self-adhesive tape
- Helifix InSkew 600
- stainless steel fixings
- nails
- battens
- roofing slates or tiles
- internal lining board.

1.3 Other proprietary fixings approved by the BBA can be used with the boards. Names and addresses of suppliers of approved fixings are available from the Certificate holder.

Design Data

2 General

2.1 Celotex T-Break TB3000, tuff-R GA3000 and Extra-R XR3000 (Pitched Roof Insulation) boards are satisfactory for use above, between and/or below roof rafters in conjunction with internal lining board, roof tile underlay, timber counter battens and tiling battens in tiled or slated, pitched roofs, designed and constructed in accordance with the relevant clauses of BS 5534 : 2003 for dwellings or other buildings with similar temperature and humidity conditions.

2.2 The boards are for use in constructions where the ceiling follows the pitch of the roof and encloses a habitable space, or where the ceiling is horizontal and encloses a loft space.

2.3 Although the boards will contribute to the buckling and racking strengths of the roof, normal cross-bracing is necessary when using them.

2.4 During installation the boards must not be walked on except over supporting roof timbers. The boards have insufficient nail holding ability to be considered as an alternative to timber sarking.

2.5 It is essential that detailing and jointing of the boards achieves a convection-free envelope of high vapour resistance (see section 8). Any gaps should be filled, and/or taped. Ridges, abutments and penetrations should also be sealed. Flue pipes passing through the insulation should be suitably sleeved.

3 Strength


The boards, when installed in accordance with the Certificate holder's instructions, will resist the loads likely to be met during installation and in service, (see sections 2.4 and 11.2).

4 Structural stability

4.1 The resistance to wind uplift and likely dead loads depends upon factors peculiar to each project, ie roof geometry, geographical location. The effect of wind loading should be calculated in accordance with BS 6399-2 : 1997 and snow loadings should be calculated in accordance with BS 6399-3 : 1988, for each case.

4.2 When calculating the fixing spacing required to resist the calculated loadings the requirements of BS 5268-2 : 2002 should be followed where possible. When using proprietary fixings and improved nails, the Certificate holder must advise on the correct type in accordance with BS 5268-2 : 2002.

5 Behaviour in relation to fire

 5.1 The boards must not be carried over junctions between roofs and walls required to provide a minimum period of fire resistance. The continuity of fire resistance must be maintained, for example as described in:

England and Wales

Approved Document B, paragraphs 9.28 to 9.31

Scotland

Mandatory Standard 2.20

Northern Ireland

Technical Booklet E, paragraph 3.15.


5.2 The use of the boards will not affect the rating obtained by tiled or slated roofs when evaluated by assessment or tested to BS 476-3 : 2004.

5.3 When installed with an internal lining board the insulation will be contained between the roof and internal lining board until one is destroyed. Therefore, the insulation will not contribute to the development stages of a fire or present a smoke or toxic hazard.

6 Thermal insulation

6.1 Calculations of the thermal transmittance (U value) of specific roof constructions should be carried out in accordance with BS EN ISO 6946 : 1997 and BRE⁽¹⁾ report (BR 443 : 2006) *Conventions for U-value calculations*, using the declared thermal conductivity ($\lambda_{90/90}$ value) of the boards as $0.023 \text{ Wm}^{-1}\text{K}^{-1}$. The U value of a typical warm pitched roof construction will depend on the insulation thickness and rafter depth.

(1) Building Research Establishment.

 6.2 The product can contribute to a roof system achieving the following design U values as outlined in the national Building Regulations thus:

England and Wales and Northern Ireland

- $0.16 \text{ Wm}^{-2}\text{K}^{-1}$ required for 'notional' dwellings in SAP 2005 (see also section 6.3)
- $0.25 \text{ Wm}^{-2}\text{K}^{-1}$ limit average specified in Approved Documents; L1A (Table 2), L2A (Table 4), Technical Booklets F1 (Table 2.2) and F2 (Table 2.4)
- $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ limit for an individual element specified in Approved Document L1A (Table 2), L2A (Table 4), Technical Booklets F1 (Table 2.2) and F2 (Table 2.4).

Scotland

- $0.16 \text{ Wm}^{-2}\text{K}^{-1}$ required for the 'simplified approach' – packages 1 to 6 'notional' dwelling in Mandatory Standard 6.1, clause 6.1.6⁽¹⁾
- $0.20 \text{ Wm}^{-2}\text{K}^{-1}$ limit average specified in Mandatory Standard 6.2, clause 6.2.1⁽¹⁾⁽²⁾
- $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ limit for an individual element specified in Mandatory Standard 6.2, clause 6.2.1⁽¹⁾⁽²⁾.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic)

6.3 Where a proposed wall U value is not better than (or is greater than in Scotland) the relevant 'notional' value specified in section 6.2, additional energy saving measures will be required in the building envelope and/or services to achieve the required overall carbon dioxide emission rate reduction of about 20% in dwellings (18% to 25% in Scotland) and 23% to 28% in buildings other than dwellings.

6.4 Compliance with the guidance referred to in section 6.2 will allow the use of the default psi values from Table 3 of BRE Information Paper IP/06 *Assessing the effects of thermal bridging at junctions and around openings* and Table K1 of *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* (SAP 2005), in Target Emission Rate calculations to SAP 2005 or the Simplified Building Energy Model (SBEM) (use 'simplified approach' for Scotland).

6.5 The product can maintain or contribute to maintaining continuity of thermal insulation at junctions between the external wall and the other building elements. Guidance in this respect, and on limiting heat loss by air infiltration, can be found in:

England and Wales

Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings TSO 2002

Scotland

Accredited Construction Details (Scotland)

Northern Ireland

Accredited Construction Details (version 1.0).

7 Condensation

Interstitial condensation



7.1 Roofs will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2002, Section 8.4 and Appendix D.

7.2 Where the boards are installed in a roof with an existing horizontal ceiling, a 'warm space' is created and no ventilation is required. Any insulation at ceiling level, however, should be removed.

7.3 The risk of interstitial condensation is greatest when the building is drying out after construction. Guidance on preventing condensation from this and other sources is given in BRE Digest 369 *Interstitial condensation and fabric degradation* and BRE report (BR 262 : 2002) *Thermal insulation: avoiding risks*.

Surface condensation



7.4 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $0.35 \text{ Wm}^{-2}\text{K}^{-1}$ at any point and the junctions with walls are designed in accordance with the relevant requirements of TSO publication *Limiting thermal bridging and air leakage : Robust construction details for dwellings and similar buildings*, TSO 2002 or BRE Information Paper IP 1/06.



7.5 Roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $1.2 \text{ Wm}^{-2}\text{K}^{-1}$ at any point. Guidance may be obtained from Section 8 of BS 5250 : 2002 and BRE report (BR 262 : 2002).

8 Resistance to moisture

The boards will not be adversely affected by rain showers during installation, nor by wind-driven snow or rain penetrating the tiling in service. Water absorption is low and its influence on the λ value is minimal.

9 Maintenance and repair

Damaged boards can be replaced easily prior to the installation of counter battens.

10 Durability



The boards will have a life equivalent to that of the roof structure in which they are incorporated.

Installation

11 General

11.1 Installation of Celotex T-Break TB3000, tuff-R GA3000 and Extra-R XR3000 (Pitched Roof Insulation) boards must be in accordance with the relevant clauses of BS 5534 : 2003 and the manufacturer's instructions, and can be carried out in all conditions normal to roof work.

11.2 The boards are light to handle but some handling difficulties may be experienced in windy conditions. Once laid the boards will not support the weight of operatives, appropriate care must be taken during installation and tiling.

11.3 The boards can be cut easily but care must be taken to prevent damage particularly to edges. Damaged boards should not be used. Small areas of damaged facer may be repaired with self-adhesive aluminium foil tape.

11.4 It is important to fill/seal gaps and joints in the insulation envelope (see section 2.5).

11.5 Roof tiles or slates are installed in accordance with the relevant clauses of BS 5534 : 2003.

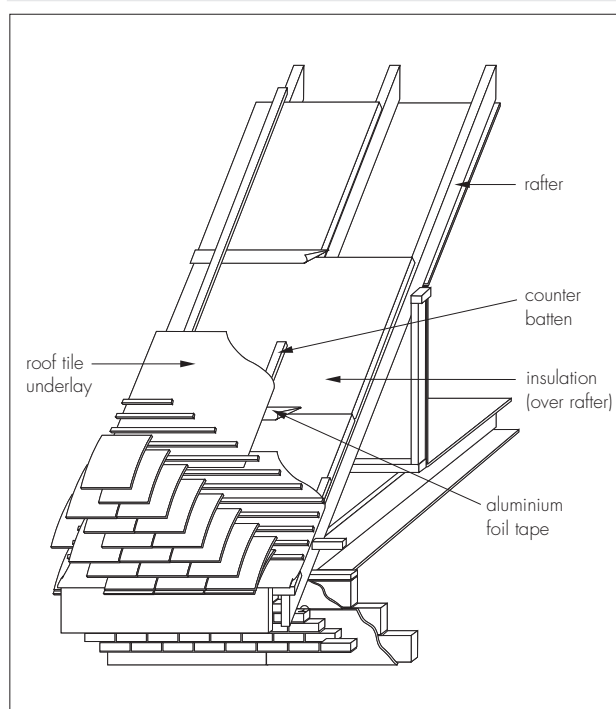
11.6 When applying roof tiles or slates to a warm roof construction, the recommendations of the manufacturer should be followed.

12 Procedure

Over rafters insulation (see Figure 1)

12.1 A treated-timber stop batten, equal in thickness to the insulation board, is fixed at eaves level and the boards butted directly against it.

Figure 1 Over rafters insulation



12.2 The boards should be temporarily fixed onto the rafters using broad-headed clout nails and with joints running up the roof slope occurring over the rafters. Cross-joints may be unsupported.

12.3 All board joints should be tightly butted. At ridges and verges the boards should be cut to achieve a close butt joint.

12.4 Once the boards have been fixed to the rafters, all joints between boards and between boards and stop battens should be sealed using self-adhesive aluminium foil tape.

12.5 Counter battens, underlay and tiling battens should be installed using one of the following alternative methods of fixing.

Method 1

12.6 Counter battens (38 mm by 50 mm) should be fixed using Helifix InSkew fixings at maximum centre-to-centre spacing of 400 mm. These fixings should pass through the counter batten and insulation and penetrate the supporting timber by a minimum of 37 mm.

12.7 The roof tile underlay should be installed in the conventional manner. Tiling battens should be nailed through the underlay into the counter batten in accordance with BS 5534 : 2003 at the required batten gauge. Where permeable tile underlays are used they should be installed in accordance with the appropriate Agrément Certificate.

Method 2

12.8 Counter battens 12 mm by 50 mm (or 19 mm by 50 mm in Scotland) should be fixed using Helifix InSkew fixings at maximum centre-to-centre spacing of 900 mm. These fixings should pass through the counter batten and the insulation and penetrate the supporting timber by a minimum of 37 mm.

12.9 The roof tile underlay should be installed in the conventional manner and held in place by tiling battens fixed by the Helifix InSkew fixings passing through the tiling batten, roof tile underlay, counter batten and insulation and penetrating the supporting timber by a minimum of 37 mm at the required batten gauge in accordance with BS 5534 : 2003. Where vapour permeable tile underlays are used they should be installed in accordance with the appropriate Agrément Certificate.

12.10 When the board thickness is not greater than 25 mm, the counter battens (38 mm by 50 mm) may be fixed through the insulation to the supporting timber by means of slab nails (3.35 mm diameter, 100 mm long) at maximum centre-to-centre spacing of 400 mm.

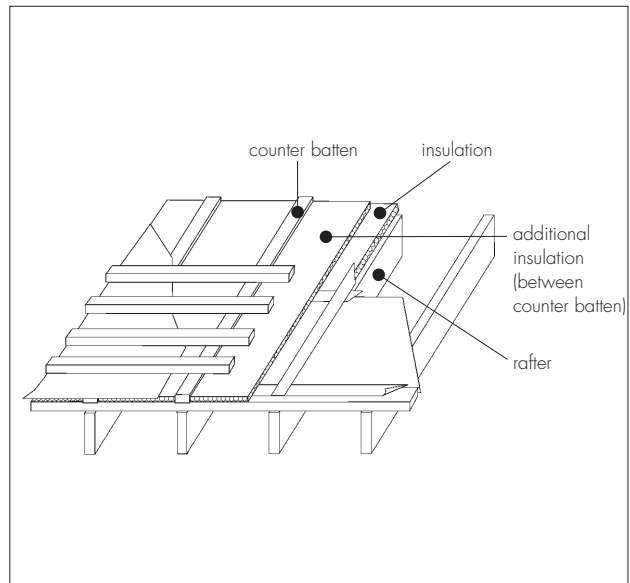
12.11 The roof tile underlay should be installed in the appropriate manner. Tiling battens should be nailed through the underlay into the counter battens

in accordance with BS 5534 : 2003 at the required batten gauge. Where vapour permeable tile underlays are used they should be installed in accordance with the appropriate Agrément Certificate.

Method 3 (see Figure 2)

12.12 Where additional insulation is required, an additional layer of insulation can be installed between the counter battens, but the counter battens should be at least 12 mm thicker than the insulation boards.

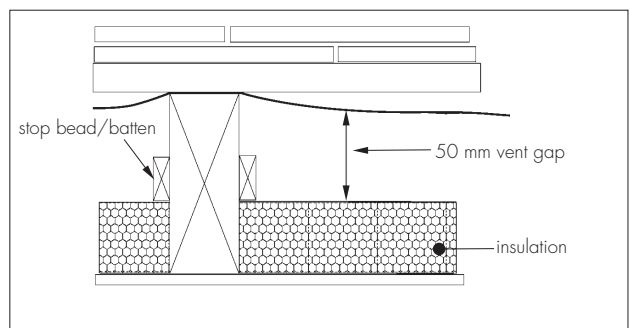
Figure 2 Additional insulation



Between rafters insulation

12.13 Boards are cut and from the inside, fitted tightly between the rafters flush with the underside and butt against stop beads or battens which maintain a ventilated air gap at least 50 mm deep (see Figure 3). Where vapour permeable roof tile underlays are used, the insulation may be installed without a ventilated air space (see section 7.1).

Figure 3 Fitted board

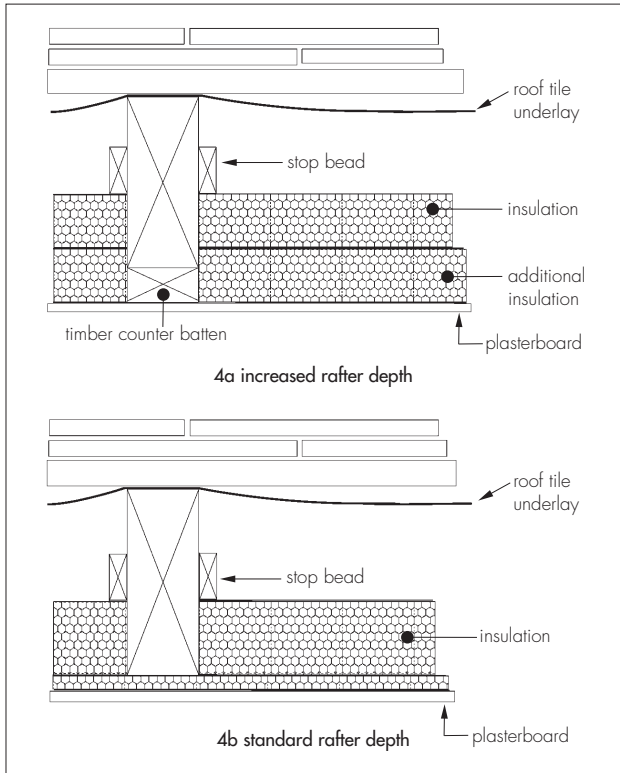


12.14 Horizontal joints are butted and taped and a vapour control layer is fitted to the underside of the rafters.

12.15 Where the rafter depth cannot accommodate the required thickness of insulation and maintain the required 50 mm ventilated gap, one of the following options may be considered:

- increase the rafter depth by attaching timber counter battens to the underside of the rafter (see Figure 4a), or preferably,
- add a second layer of insulation to the underside of the rafters (see Figure 4b).

Figure 4 Additional insulation



Under rafters insulation

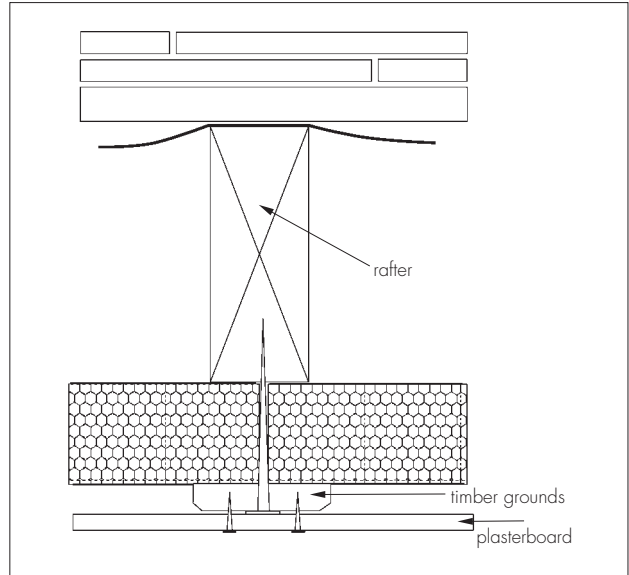
12.16 Boards may be attached to the underside of rafters either as a single layer or in conjunction with insulation boards between the rafters.

12.17 Boards are temporarily fixed with broad-headed clout nails and joints butted and taped. Appropriate internal lining panels may then be

fixed through the insulation and into the underside of the rafters.

12.18 Where the insulation thickness makes securing of the internal lining panels impractical, timber grounds of appropriate depth may be fixed through to the rafters and the panels secured to the grounds (see Figure 5).

Figure 5 Added timber grounds



Finishing

12.19 Roof tiles or slates are installed in accordance with the relevant clauses of BS 5534 : 2003.

12.20 Internal lining panels appropriate to the application and required decoration are applied.

Technical Investigations

The following is a summary of the technical investigations carried out on Celotex T-Break TB3000, tuff-R GA3000 and Extra-R XR3000 (Pitched Roof Insulation) boards.

13 Tests

Tests were carried out to determine thermal conductivity.

14 Investigations

An examination was made of data relating to:

- dimensional accuracy
- density
- compressive strength
- dimensional stability with temperature
- thermal conductivity (fresh and aged)
- closed cell count.

15 Other investigations

15.1 The hygrothermal properties of typical constructions was assessed.

15.2 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BS 476-3 : 2004 *Fire tests on building materials and structures — Classification and method of test for external fire exposure to roofs*

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

BS 5268-2 : 2002 *Structural use of timber — Code of practice for permissible stress design, materials and workmanship*

BS 5534 : 2003 *Code of practice for slating and tiling (including shingles)*

BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*

BS 6399-3 : 1988 *Loading for buildings — Code of practice for imposed roof loads*

BS EN ISO 6946 : 1997 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*



On behalf of the British Board of Agrément

Date of Third issue: 13th November 2007

A handwritten signature in black ink, appearing to read "G. A. Cooper".

Chief Executive

**Original Detail Sheet issued on 31st March 1996. This amended version includes change of product names and reference to revised national Building Regulations and British Standards, updated Thermal insulation and Condensation sections.*

